Report

Liberty High School Aquifer Storage and Recovery Permit Application and Supplemental Information

Prepared on behalf of

HILLSBORO SCHOOL DISTRICT

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Prepared by

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1. Introduction

On behalf of Hillsboro School District (District), GSI Water Solutions, Inc. (GSI), prepared this permit application package to operate an aquifer storage and recovery (ASR) system at Liberty High School (Liberty) in Hillsboro, Oregon. In support of the ASR permit application, 7 years of ASR pilot testing are summarized and presented. Additional information, including laboratory reports and hydrogeologic data, are available in previous annual reports submitted to the Oregon Water Resources Department (OWRD).

ASR pilot testing was conducted at the Liberty ASR Well (ASR Well) under ASR Limited License (LL) #017 starting in 2010 (OWRD, 2010; Figure 1). The purpose of the ASR testing was to evaluate the dynamic response of the Columbia River Basalt Group (CRBG) aquifer to ASR operations and to develop operational criteria for a full-scale ASR system and corresponding ASR permit. Please note that all tables and figures are presented at the end of this report.

This report includes all of the requirements for an ASR permit application, as specified in Oregon Administrative Rules (OAR) 690-350-0030. The following items are included as attachments to this application:

Appendix A: Permit Application Form
Appendix B: Water Right Holder Agreement
Appendix C: Limited License
Appendix D: Evidence of Legal Land Use
Appendix E: Application Map
Appendix F: Permit Monitoring Plan

The required Supplemental Information in support of this application is presented in the following sections.

2. Pre-Application Meeting

A pre-application meeting was conducted on September 19, 2017. Participants included representatives from OWRD, Oregon Health Authority Drinking Water Program (OHA-DWP), Oregon Department of Environmental Quality (DEQ), the District, and GSI. The details of this ASR permit application were discussed during the meeting, and no major issues or concerns with the general framework for the District's ASR permit application (e.g., injection rates, recovery rates, water quality monitoring, and proposed monitoring of the aquifer) were identified by participants in the meeting, with the understanding that agencies will need to review the ASR permit application before making final determinations on conditions of the permit.

3. Background

The District installed an irrigation well (WASH 58925) in 2002 with the intent to provide roughly 175 gallons per minute (gpm) for irrigating Liberty's athletic fields. The well was completed in basalt as shown in Figure 2. The District applied for a native groundwater

right from OWRD, but because of concerns of declining groundwater levels in this area, a permit was not issued. The District operated the existing well under a temporary permit (Permit G-16052) for several years while trying to obtain an existing water right to transfer to WASH 58925. When unable to acquire a water right, the District was left with the following options: (1) use Tualatin Valley Water District (TVWD) water for irrigation, or (2) consider using the existing well to store TVWD water for summer-time use. The system development charges for using TVWD water for irrigation were substantial because it required a 3-inch diameter connection line.

The District commissioned GSI to evaluate the option of using the existing well for ASR purposes; a smaller connection (1-inch diameter connection line) could be used to recharge the well during the winter with roughly 10 to 20 million gallons (MG) of water for summer-time irrigation. An ASR feasibility study was completed by GSI in March 2010 (GSI, 2010a), and the District moved forward with submitting an ASR LL application to OWRD and retrofitted the wellhead for ASR purposes.

Since 2010, the District has been operating an ASR system at Liberty, using water from the ASR Well to irrigate roughly 22 acres of athletic fields. ASR pilot testing was authorized under ASR LL #017 from 2010 to 2015, and was renewed from 2015 to 2020 (OWRD, 2015). ASR LL #017 authorizes a maximum injection rate of 100 gpm, a maximum recovery rate of 320 gpm, and a maximum storage volume of 30 MG. The ASR LL application submitted to OWRD in April 2010 and the project's Operations and Maintenance (O&M) Manual (GSI, 2011) describe in detail the data collection associated with the ASR project, including groundwater level monitoring, water quality sampling, a tentative cycle operation schedule, and a proposed ASR annual reporting format. A description of the ASR system and data collection since the start of ASR at Liberty is summarized below.

4. ASR LL Testing Results 2010 – 2017

ASR testing was initiated in December 2010 and conducted annually. Cycle 7 testing concluded at the end of water year 2017.

4.1 Hydrogeologic Framework

A detailed description of the geologic and hydrogeologic framework that is host to the ASR Well is presented in the ASR LL application and Pilot Test Work Plan (GSI, 2010b) that were submitted to OWRD in April 2010. A general geologic map and cross section of the ASR Well are presented in Figures 3 and 4, respectively; these figures originally were developed as part of the ASR LL application.

As shown in the ASR Well as built, fine-grained valley fill sediments consisting of silts and clays (Willamette Silt; Schlicker and Deacon, 1967) are present from the ground surface to 296 feet below ground surface (bgs). Decomposed CRBG is present from 296 to 485 feet bgs and more competent basalt is present from 485 to total depth of 648 feet bgs. The basalt beneath Liberty consists of the Grand Ronde Formation of the CRBG, according to mapping by Tolan and Beeson (1986). The primary aquifer in the CRBG is typically the interflow zones and pillow complexes, although fracture flow does occur in the interior portion of individual basalt flows if secondary fracturing has occurred and the fractures have not been

healed by secondary mineralization. For the ASR Well, the first interflow zone was sealed from 500 to 510 feet bgs and a second interflow, roughly interpreted from the driller's log, is present from 574 to 582 feet bgs (thickness of the interflow is roughly 8 feet). This deeper interflow zone is the target aquifer for the Liberty ASR project.

The yield of the ASR Well is approximately 250 gpm or more, but the well experiences significant drawdown of more than 350 feet during pumping. As such, the ASR Well has a low pumping specific capacity of about 0.6 gallon per day per foot of drawdown (gpd/ft). Specific capacity, defined as the rate of water flow per foot of water level change in the well (drawup during injection and drawdown during pumping), is a bulk aquifer parameter useful for describing aquifer and well productivity. Given the ASR Well's exposure to one small and less transmissive basalt interflow, it is not highly productive. However, the ASR Well is capable of storing enough water to allow Liberty to irrigate its athletic fields and common areas. Based on a groundwater gradient in the area of roughly 0.0015 foot/foot (using water levels in wells near Liberty), the groundwater velocity is roughly 0.06 foot per day toward the deeper part of the basin – southwesterly. This estimated groundwater velocity is based on a transmissivity value of 2,500 gpd/ft (350 ft^2/day) and an aquifer thickness of 8 feet.

4.2 Flow Direction and Theoretical Area Affected by ASR Activities

The general potentiometric surface of the CRBG groundwater in the Liberty area most likely favors a down-dip (i.e., westerly) groundwater flow direction, which would be subject to the geologic characteristics that could modify hydraulic behavior (e.g., faults) and influenced by irrigation wells pumping in the area in addition to ASR activities.

The area affected by the ASR Well was estimated using the Theis equation to calculate the areal extent of mounding in the CRBG aquifer (Fetter, 1994):

$$\Delta s = \frac{Q}{4\pi T} \ln\left(\frac{4Tt}{1.78r^2 S}\right)$$

Where s is mounding (feet), Q is injection rate (ft3/day), T is transmissivity (ft2/day), t is time (days), r is radial distance from the well with a mounding of s (feet), and S is storativity (dimensionless).

The areal extent of mounding (i.e., area affected by the ASR Well) was defined as the portion of the CRBG that experiences more than 2.0 feet of water level rise during ASR testing. Assuming T = 2,600 gpd/ft (350 ft^2/day), Q= 50 gpm (9,600 ft^3/day), t= 240 days, s = 2.0 feet, and S = 0.001, GSI calculated that the areal extent of mounding (i.e., r, the area affected by the ASR Well) is approximately 1.5 miles. Therefore, the area affected by the ASR Well in the basalt aquifer should occur within a 1- to 2-mile radius of the ASR Well (Figure 5). A discussion of the actual mounding impact as a result of ASR testing is presented in the next section.

Given that more than 290 feet of fine-grained sediments overlay the basalt at the Liberty ASR site and the drawup within the ASR Well, which is far greater (50% or more) than the groundwater level outside the borehole. With that, the groundwater rise in the well and

aquifer does not extend above the ground surface and the likely impact to surface water as a result of ASR activities at Liberty is highly improbable, especially given the overlying thickness of the fine-grained sediments.

4.3 Impact of ASR Mounding and Observation Well Data

4.3.1 Impact on Observation Well

As part of the ASR LL #017 proposed Pilot Test Work Plan, OWRD agreed that the Country Haven Trailer Park Well (Country Haven Observation Well; WASH 5344/5343) would serve as the observation well for the Liberty ASR program. The Country Haven Observation Well is roughly 4,500 feet (less than a mile) west of the ASR Well (Figure 1). It was originally drilled to 85 feet bgs in April 1969 (WASH 5344) and then deepened to 700 feet bgs in July 1969 (WASH 5343). As described in the drilling log, basalt was encountered at 510 feet bgs with some possible decomposed basalt (logged as brown sandstone) drilled prior to 510 feet bgs (OWRD, 1969).

During Cycle 6 in the Country Haven Observation Well, water levels rose approximately 1.9 feet during the injection period and fell approximately 4.1 feet below the pre-injection static water level during the recovery period (Figure 6). The Country Haven Observation Well water level started to rise before the start of injection and the trend flattened at the end of the injection period. The water level at the Country Haven Observation Well stayed somewhat level at the beginning of the recovery period, then had a sharper decline mid-way through the recovery period, and the water level started to rise at the end of the recovery period. The water level in the Country Haven Observation Well has never approach the ground surface.

It is important to note that the basalt system that hosts the ASR Well is a confined aquifer with a storativity coefficient of roughly 0.001. Given that, the fluctuations in water levels at the Country Haven Observation Well likely are attributed to seasonal trends rather than the pressure response in the basalt aquifer caused by ASR testing at the Liberty ASR Well.

There is significant evidence that there are pronounced external stresses, other than ASR testing, that affect the response at the Country Haven Observation Well. The data collected for the Liberty ASR program do not support a strong, if any, hydraulic connection between ASR activities at Liberty and the Country Haven Observation Well.

4.3.2 Impact within a 2-mile Radius

Figure 5 shows the ASR Well, Country Haven Observation Well, and several other wells completed in the basalts within about a 2-mile radius of the ASR Well. The water level data for the latter basalt wells were provided by OWRD with the caveat that although the data are public information, the data are not available on OWRD's website because they cannot be verified for quality assurance. Where a sufficient record are available, the hydrographs (Figure 5) do not appear to show a direct response to ASR testing, which began in December 2010. The hydrograph for WASH 5213 shows an abrupt rise that occurred before the start of ASR activities at Liberty and little to no change since 2010. In contrast, the hydrograph for WASH 1383 shows a rise in the water level after ASR testing started. The hydrograph for WASH 66930 does not appear to correlate with ASR activities at Liberty with the possible

exception of WASH 1383. The hydrographs in Figure 5 suggest that ASR activities at Liberty are not causing a major impact to the groundwater level in the aquifer based on a theoretical radius of influence of roughly 1.5 miles due to ASR activities.

Other stresses, such as rainfall and ASR carryover volume, could affect the hydraulic responses observed in the basalt wells shown in Figure 5. The cumulative departure from the average precipitation in the ASR testing area, using the Hillsboro Airport gauging station, shows that the cumulative departure from the average precipitation has been declining since roughly 2010 (Figure 7). As such, any rise in the groundwater level since 2010 does not correlate with precipitation. Conversely, the basalt aquifer water levels in the ASR testing area appear stable, despite the downward trend in the cumulative departure from the average precipitation.

Figure 8 presents a long-term hydrograph of the ASR Well along with the cumulative ASR carryover volume. From the start of ASR testing in December 2010 until the end of water year 2017, a total of 7.24 MG of carryover volume remains in the aquifer. Although it is difficult to discern a post-recovery static water level at the ASR Well given that the system is operated for irrigation purposes, an averaged December water level suggests that there has not be a marked increase or decrease in the groundwater table because of ASR activities. In other words, the residual carryover has not caused a discernable increase in the water level and water stored does not appear to have been lost because of temporary head changes related to ASR activities.

4.3.3 Overall Impact of ASR Mounding

The following observations are made based on data collected during 7 years of ASR testing at Liberty:

- Detailed data for the Country Haven Observation Well indicate that the fluctuations in water levels likely are attributed to seasonal trends rather than the pressure response in the basalt aquifer caused by ASR testing at the Liberty ASR Well.
- Water level data provided by OWRD for other basalt hosted wells within a 2-mile radius of the ASR Well do not clearly indicate a change in the water level because of ASR activities.
- Because limited amounts of water are injected and recovered as part of the Liberty ASR program, the response observed in the basalt aquifer may be so minimal that it is not easily discernable from fluctuations related to other stresses, such as nearby wells pumping and natural recharge related to precipitation.

4.4 Storage Volume

Table 1 presents an ASR water account summary since the start of ASR activities at Liberty. The cumulative carryover volume as of 2017, taking into account reductions as outlined in the ASR LL #017, is 7.24 MG. The maximum amount of water stored in any given ASR cycle was 20.89 MG, before recovery in 2015. ASR LL #017 allows up to 30 MG of treated water to be stored in the basalt aquifer. As outlined in Section 4.3 and shown in Figure 5, the maximum storage volume that occurred in 2015 did not result in a sharp rise in water levels

of the nearby basalt wells; that reinforces the conclusion that the ASR stored water does not have a discernable impact on the groundwater system in the area.

4.5 Water Quality Observations

Water quality monitoring has been conducted during ASR testing for 7 years (Table 2). The sections below present key water quality observations. For the water quality discussion in this report, the following terms will be used:

- **Native groundwater** is groundwater before to the start of ASR testing. This sample was collected before Cycle 1 in 2010.
- **Source water** is treated drinking water supplied from TVWD, and is a blend of a Joint Water Commission (JWC) source water (water right certificates 67891, 81026, 81027, and 85913) and a Portland Water Bureau (PWB) source water (Bull Run watershed; ORS 538.420 and the South Shore Wellfield groundwater permits G-10479, G-10124, G-8755, G-10455 and Certificates 89117 and 89115). Source water samples for ASR testing have been collected at the Liberty pump house.
- **Groundwater** is the water in the aquifer affected by ASR testing. This water is the result of mixing between native groundwater and source water.
    - Originally, all groundwater (i.e., pre-injection, storage water, and recovered water) samples were collected in the Liberty pump house, downstream of a pressure tank and backflow valves. After a suspicious storage water sample in 2015, a sample port was installed on the ASR wellhead for all subsequent groundwater samples.
- **Pre-injection groundwater** is groundwater sampled immediately before the start of injection. The first pre-injection groundwater sample was collected in Cycle 2, after ASR testing had started.
- **Storage water** is a groundwater sample collected immediately before the start of the recovery period. For the purposes of discussion, it is essentially an initial recovered water sample.
- **Recovered water** is groundwater pumped from the ASR Well, which feeds directly into the irrigation system.

4.5.1 Source Water Quality and Protection of the Aquifer

All source water is treated drinking water that comes from the JWC and/or PWB, through the TVWD distribution system. The ratio of JWC water to PWB water in the source water changes throughout the injection period, and from year to year. Historical water quality results from the JWC treatment facility and the Bull Run treatment facility are presented in Table 3. Both water sources (JWC and PWB) are represented in the source water results collected at the Liberty pump house.

The following source water samples are collected as outlined in the Pilot Test Work Plan:

- Initial (zero percent) full-suite sample (volatile organic compounds [VOCs], synthetic organic compounds [SOCs], radiological parameters [rads], disinfection by-products [DPBs], metals, and geochemical parameters) collected at the start of the injection period.
- 50 percent source water partial-suite sample (DBPs, metals, and geochemical parameters) collected approximately halfway through the injection period.

No VOCs or SOCs have been detected in the source water. Concentrations of other regulated contaminants have been below laboratory detection limits or below ASR action levels. An exception is one sample in 2011 with a concentration of combined radium 226/228 (2.9 picoCuries per liter [pCi/L]) that was above the ASR action limit of 2.5 pCi/L, but below the maximum contaminant level (MCL) of 5 pCi/L. Concentrations of combined radium 226/228 have been below laboratory detection limits in source water since 2014.

4.5.2 Groundwater Quality and Irrigation Water

As stated previously, groundwater samples consist of pre-injection groundwater, storage water (or initial recovered water), and recovered water samples. All groundwater is directly fed into Liberty's irrigation system, or pumped to waste. Signs are posted throughout the Liberty campus stating that irrigation water is not potable. The groundwater quality needs to meet irrigation standards for the athletic fields and other vegetated areas on the campus.

The following groundwater samples are collected as outlined in the Pilot Test Work Plan:

- Pre-injection groundwater partial-suite sample (DBPs, metals, and geochemical parameters) collected just before the start of the injection period.
- Storage water full-suite sample (VOCs, SOCs, rads, DBPs, metals, and geochemical parameters) collected at the end of the storage period and just before the start of the recovery period.
- 50 percent recovered water partial-suite sample (DBPs, metals, and geochemical parameters) collected approximately halfway through the recovery period.

No VOCs have been detected in the groundwater samples. Concentrations of other regulated contaminants have been below laboratory detection limits or below ASR action levels, with the following exceptions:

- Total coliforms have been detected over the course of ASR testing. In all samples, fecal coliform has not been detected. Total coliforms are not a concern for irrigation purposes.
- Sodium has consistently exceeded the maximum contaminant level goal (MCLG), or advisory level, of 20 milligrams per liter (mg/L) in all pre-injection groundwater and recovered water samples. All pre-injection groundwater and recovered water samples have a lower sodium value than the native groundwater sample (73 mg/L). The MCLG for sodium is a recommendation for taste and human health, assuming the water is used as drinking water, and does not constitute degradation of the groundwater resource.

- Aluminum exceeded the secondary MCL (SMCL) of 0.05 mg/L in various pre-injection groundwater and storage water samples. All recovered water samples were below laboratory standards or detected below the SMCL. Specifically, SMCLs are non-enforceable guidelines for cosmetic and aesthetic purposes, and are not considered a risk to human health.
- Total iron exceeded the SMCL of 0.3 mg/L in multiple storage water samples. All recovered water samples were below laboratory standards or detected below the SMCL.
- Total manganese exceeded the SMCL of 0.05 mg/L in a couple of storage water samples. All recovered water samples were below laboratory standards or detected below the SMCL.
- Selenium was detected once during ASR testing, in Cycle 1's recovered water sampled in 2010. This dectection exceeded the DEQ's maximum measureable levels of contaminants in groundwater (OAR 340-040-0090) of 0.01 mg/L. Selenium has not been detected above laboratory detection limits since then.
- Color exceeded the SMCL of 15 apparent color units (ACU) in various storage water samples.
- Di(2-theylhexyl)phthalate (DEHP) exceeded the MCL of 0.006 mg/L in a storage water sample in 2012. In 2015, DEHP was detected below the MCL in a storage water sample, but above the ASR action level of 0.003 mg/L. DEHP is an endocrine disrupting chemical and has a low acute toxicity (EPA, 2000). Therefore, it does not pose a threat to individuals playing on the athletic fields or the athletic fields themselves.

Five of the eight parameters (i.e., sodium, aluminum, iron, manganese, and color) listed above have an MCLG or SMCL regulatory standard. These are considered guidelines for aesthetic purposes in drinking water, which are not applicable for irrigation. Total coliforms and DEHP exceedances are not a concern for irrigation purposes. High levels of selenium can impact the health of the athletic fields, but not at the level detected and it has not been detected above laboratory standards since the initial recovery sample. All of these constituents have not been detected at levels high enough to pose any impact to the athletic fields.

4.5.3 Geochemical Compatibility of Source Water and Groundwater

Comparison of major ionic compositions of source water and recovered water has yielded consistent results:

- There is little variation in source water ionic composition.
- Major ion concentrations are lower in source water than in recovered water.
- Recovered water composition indicates a simple mixture of source water and native groundwater.

- There is no indication of adverse chemical reactions occurring in the aquifer as a result of ASR.

For more detailed geochemical analysis, refer to annual reports submitted to OWRD, DEQ, and OHA at the conclusion of every ASR testing cycle.

4.6 ASR Operations

Typically, injection starts between late October and December, and continues until dry weather initiates the need for irrigation, which is between April and June. Injection is continuous with the exception of system backflushing episodes, shutoffs caused by the high groundwater level alarm, or other issues that can take several days to several weeks to identify. The storage period is generally short, between zero and 9 days. Recovery typically continues through October.

As described in the O&M Manual, the ASR Well was monitored using a telemetry system which recorded the injection flow rate, recovery flow rate, and groundwater level via a pressure transducer every 30 minutes. Periodic manual measurements using an electronic tape also were collected. Additionally, water quality samples were collected at the ASR Well during the injection, storage, and recovery periods.

As discussed above, Table 1 summarizes annual injection, recovery, and carryover volumes since ASR testing began in 2010 through 2017. Below are some observations:

- Maximum injected volume in a single year: 11.64 MG (Cycle 4, water year 2014)
- Maximum storage volume (including carryover): 20.89 MG (Cycle 5, water year 2015)
- Maximum recovery in a single year: 8.99 MG (Cycle 6, water year 2016)

As previously presented, the Country Haven Observation Well was monitored for groundwater levels. A pressure transducer was installed to record measurements every 30 minutes, and periodic manual water level measurements were collected. The Country Haven Observation Well is located approximately 4,500 feet west of the ASR Well (Figure 1). The data collected during cycle testing (presented in section 4.3.1) for the Liberty ASR program do not support a strong, if any, hydraulic connection between ASR activities at Liberty and the Country Haven Observation Well.

5. Proposed System Design

The Liberty ASR system uses treated drinking water from TVWD for source water consisting of a mixture of JWC and Portland sources. The District's meter pulls the treated drinking water from TVWD's line on Jacobson Road to the pump house approximated 110 feet away. Within the pump house, the source water travels through a flow meter and then is injected into the ASR Well approximately 10 feet north of the pump house. The total depth of the ASR Well is 648 feet bgs, which taps into the CRBG. The well has a cement seal from ground surface to 510 feet bgs and is an open borehole from 510 to 648 feet bgs. A submersible pump is located approximately 490 feet bgs. When the ASR Well was retrofitted for ASR operation in 2009, a 1.5-inch diameter injection pipe was installed to 150 feet bgs as the injection tube versus using the pump column and injecting through the

submersible pump, set at 490 feet bgs. This injection design allows any entrained air during initial startup injection to be contained in the upper cased borehole with little to no chance of reaching the target basalt aquifer. During recovery, the pumped water is delivered directly to the non-potable irrigation system.

The ASR telemetry system records the injection flow rate, recovery flow rate, and groundwater level via a pressure transducer every 30 minutes. Periodic manual measurements have been and will continue to be collected at the ASR Well during operation of the system.

6. Proposed ASR Long-Term Operation

The following are proposed conditions for the ASR permit regarding ASR at Liberty. Some of the proposed conditions differ from ASR LL #017, the Pilot Test Work Plan, and O&M Manual. When OWRD, DEQ, OHA, and the District have reached an agreement regarding the ASR permit conditions listed below, the District will update and modify the attached work plan that is part of this ASR permit application. Until the ASR permit and its associated work plan are approved, the District will operate the ASR system as outlined in ASR LL #017, the Pilot Test Work Plan, and O&M Manual.

6.1 Injection Rate

The maximum injection rate recorded during ASR testing was 54.8 gpm during Cycle 1 (water year 2011), with an average rate of 40.9 gpm throughout cycle testing. As discussed in Sections 4.2 and 4.3, the injection mound is greater within the well casing than what is occurring outside of the borehole, water has never reached the ground surface, and ASR activities at Liberty are not causing a significant impact to the groundwater level in the basalt aquifer, based on a theoretical radius of influence (roughly 1.5 miles). Therefore, the injection rate should be limited only by the well efficiency.

The **proposed maximum injection rate for the ASR permit is 65 gpm**, which is less than maximum diversion rate authorized by ASR LL #017, and is 18 percent greater than the maximum rate tested.

6.2 Storage Volume and Duration

As shown in Table 1, the maximum ASR storage volume achieved during ASR testing was 20.89 MG before recovery in 2015. ASR testing has shown no indications of detrimental effects to the aquifer system or lost water during cycle testing. The **proposed maximum storage volume is 25 MG**, which is 20 percent greater than the maximum volume tested.

The proposed storage duration is ongoing, including carryover storage from ASR testing, which was 7.24 MG at the end of Cycle 7 in 2017 plus 95 percent of any water injected in 2018.

6.3 Recovery Rate and Percentage

The maximum recovery rate observed during ASR testing was 355 gpm. The highest recovery rates occurred during the initiation of the recovery period to fill the irrigation system water lines, which are drained for winterization. After the irrigation system is pressurized, the recovery rate averaged around 150 gpm. While it is unlikely that the recovery rate will be sustained at a higher rate, the District requests that the permit allow some flexibility to respond to the abbreviated high rates during startup every year. Therefore, the **proposed maximum recovery rate is 425 gpm**, which is 20 percent greater than the maximum rate tested.

ASR LL #017 stipulates a recovery percentage of 95 percent. Based on the nominal change in water level in the ASR Well during the entirety of ASR testing (Figure 9) and the stability in water levels in the basalt aquifer in the ASR testing area (Figure 5), it is likely that the limited amounts of water injected and recovered during Liberty ASR activities are so minimal that they are indiscernible from other stresses in the aquifer. Based on the ASR monitoring data collected since 2010, the **proposed recovery percentage (loss factor) for the ASR permit is 100 percent**.

6.4 Water Level Monitoring

Water level monitoring will be conducted using an update monitoring plan under the ASR permit, and to be finalized after OWRD, DEQ and OHA have approved the proposed ASR operations outlined in this ASR permit application. Water levels will continue to be monitored at the ASR Well, similar that outlined in the O&M Manual. Specifically, the pressure transducer and data logger currently installed in the ASR Well will continue at a sampling frequency of 30 minutes. The data logger will operate on a year-round basis. Manual measurements in the ASR Well will be recorded by the District periodically to verify transducer measurements.

As part of this ASR application, the District requests to **no longer monitor the Country Haven Observation Well or other basalt wells as part of the ASR program moving forward**, based on a lack of direct response to ASR activities at the Country Haven well since 2010. This request is presented with the understanding that the District is open to discuss monitoring options with OWRD in the future if the need arises.

6.5 Water Quality Monitoring and QA/QC Plan

Water quality will be conducted using an updated monitoring plan under the ASR permit, and to be finalized after OWRD, DEQ and OHA have approved the proposed ASR operations outlined in this report.

The District requests that source water quality be monitored on a 3-year cycle. One source water sample will be collected at the Liberty pump house every third year at approximately 50 percent of the injection target volume. The sample will be a full-suite sample, including geochemical parameters, metals, DBPs, rads, SOCs, VOCs, field parameters, and miscellaneous chemistry parameters (Table 4). During the other 2 years, source water quality will be monitored using the reported results from the JWC and PWB treatment

facilities for partial-suite parameters, including DBPs, geochemical parameters, metals, and miscellaneous chemistry parameters (Table 5). Table 6 outlines the source water analysis schedule.

Groundwater quality has been established during ASR testing. Therefore, the District requests to cease monitoring pre-injection groundwater, storage water, and recovered water, especially since this is an ASR system used for irrigation purposes. At the District's discretion, geochemical parameters may be analyzed in recovered water to continue monitoring compatibility between source water and groundwater, and results will be reported if analyzed.

A quality assurance and quality control (QA/QC) plan is included in the Permit Monitoring Plan (Appendix F).

6.6 Reporting

The District will submit an annual report to OWRD, similar to previous reports submitted under ASR LL #017. The report will include the following items:

- Manual water level measurements, transducer data, and flow rates in an electronic format.
- Laboratory analytical results for water quality samples.
- Data collected for the ASR project will be compiled and submitted to the OWRD annually.

6.7 Contingency Plan for Recovered Water

The intended use of the recovered water is irrigation. In the unforeseen and extremely unlikely case that the recovered water cannot be used for irrigation, the water will be (1) discharged to a storm drain, as long as it meets Clean Water Services' water quality standards, or (2) stored and treated onsite to meet Clean Water Services' water quality standards for discharge to the storm drain.

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Tables

Table 1. ASR Water Account Summary

Liberty High School Aquifer Storage and Recovery Permit Application and Supplemental Information

Water Year	Cycle	Injection Period (days)	Maximum Injection Rate (gpm)	Injected Volume (MG)	Stored Volume[1] (MG)	Recovery Period (days)	Maxiumum Recovery Rate (gpm)	Recovered Volume (MG)	Carryover Volume[2] (MG)
2011	1	183	55	11.5	10.9	126	289	4.74	5.87
2012	2	217	54	7.61	13.1	127	317	6.55	6.22
2013	3	143	54	8.75	14.53	148	355	5.23	8.83
2014	4	224	37	11.64	19.89	144	330	7.36	11.90
2015	5	169	44	9.46	20.89	190	319	8.26	12.00
2016	6	135	72	5.64	16.75	173	292	8.99	7.38
2017	7	158	72	7.52	14.15	141	320	6.53	7.24

Notes

gpm = gallons per minute

MG = million gallons

1 Represents the previous year's carryover and 95% of the injected volume, per ASR Limited License #017.

2 Represents 95% of the storage volume minus the recovered volume, per ASR Limited License #017.

Table 2. ASR Water Quality Summary: 2010 - 2017

Liberty High School Aquifer Storage and Recovery Permit Application and Supplemental Information

Class	Analyte	Lowest Regulatory Standard	Units	Regulatory Criteria	Limited License Action Level	Native Groundwater (2010)	Pre-Injection Groundwater (range of concentrations)	Source Water (range of concentrations)	Storage Water (range of concentrations)	Recovered Water (range of concentrations)
Bacteriological	Fecal Coliforms/E.Coli	<1/100 ml	CFU/100 ml	MML	<1/100 ml	Absent	Absent	Absent	Absent	Absent
	Total Coliform	<1/100 ml	CFU/100 ml	MML	<1/100 ml	186	Absent - Present	Absent	Absent - Present	Absent
Disinfection By-Products	Chloroform (Trichloromethane)	None	mg/L	None	None	ND	--	0.0285 - 0.0441	0.0198 - 0.0396	--
	Bromodichloromethane	None	mg/L	None	None	ND	--	0.0013 - 0.0062	ND - 0.0045	--
	Dibromochloromethane	None	mg/L	None	None	ND	--	ND	ND	--
	Bromoform (Tribromomethane)	None	mg/L	None	None	ND	--	ND	ND	--
	Total Trihalomethanes	0.08	mg/L	MCL	0.08	ND	--	0.0312 - 0.0457	0.0198 - 0.0441	--
	Monochloroacetic Acid	None	mg/L	None	None	--	--	ND	ND	--
	Dichloroacetic Acid	None	mg/L	None	None	--	--	0.0012 - 0.0246	ND - 0.0069	--
	Trichloroacetic Acid	None	mg/L	None	None	--	--	0.0123 - 0.0262	ND - 0.0079	--
	Monobromoacetic Acid	None	mg/L	None	None	--	--	ND	ND	--
	Dibromoacetic Acid	None	mg/L	None	None	--	--	ND	ND	--
	Total Haloacetic Acids	0.06	mg/L	MCL	0.06	--	--	0.0182 - 0.0507	ND - 0.0137	--
	Chlorite	1	mg/L	MCL	1	--	--	ND	ND	--
	Bromate	0.01	mg/L	MCL	0.01	--	--	ND	ND	--
Geochemical	Bicarbonate	None	mg/L	None	None	154	80 - 98	12 - 38	18 - 40	63 - 91
	Calcium	None	mg/L	None	None	50	19.4 - 23.4	2.2 - 9.4	4.3 - 8.7	16 - 21.1
	Carbonate	None	mg/L	None	None	ND	ND	ND	ND	ND
	Chloride	250	mg/L	SMCL	250	90	23 - 69	ND - 8.0	3.8 - 9.7	34 - 65
	Hardness (as CaCO3)	None	mg/L	None	None	172.0	88 - 100	8.8 - 36	16 - 35.2	68 - 96
	Magnesium	None	mg/L	None	None	16.1	8.69 - 11.0	0.53 - 2.47	0.88 - 2.76	7.09 - 11.4
	Nitrate as N	10	mg/L	MCL, MML	5	ND	ND - 0.9	ND - 0.86	0.01 - 0.8	ND
	Nitrite as N	1	mg/L	MCL	0.5	ND	ND - 0.110	ND - 0.164	ND - 0.27	ND - 0.0861
	Total Nitrate-Nitrite	None	mg/L	None	None	ND	ND - 0.110	ND - 0.86	0.01 - 1.02	ND - 0.0861
	Potassium	None	mg/L	None	None	7.40	3 - 4.4	ND - 0.96	ND - 1.1	3.2 - 4.6
	Silica	None	mg/L	None	None	32	17 - 23	7.0 - 16	12 - 32	22 - 26
	Sodium	20	mg/L	MCLG	20	73	30.8 - 36.7	3.9 - 11.6	5.7 - 11.3	28.4 - 39.6
	Sulfate	250	mg/L	SMCL	250	ND	4.31 - 7.8	ND - 14.4	4.79 - 15	3.42 - 4.5
	Total Alkalinity	None	mg/L	None	None	154	80 - 98	12 - 38	18 - 40	63 - 91
	Total Dissolved Solids	500	mg/L	SMCL	500	396.0	202 - 250	36 - 86	40 - 80	178 - 228
	Total Organic Carbon	None	mg/L	None	None	2.55	1.43 - 1.81	ND - 2.56	0.83 - 1.46	0.97 - 1.49
	Total Suspended Solids	None	mg/L	None	None	2	ND	ND - 6	ND - 18	ND
Metals	Aluminum	0.05	mg/L	SMCL	0.05	0.100	ND - 0.051	ND - 0.038	ND - 0.52	ND - 0.023
	Antimony	0.006	mg/L	MCL	0.003	ND	ND	ND	ND	ND
	Arsenic	0.01	mg/L	MCL	0.005	ND	ND	ND	ND	ND
	Barium	1	mg/L	MML	0.5	0.060	ND - 0.21	ND - 0.0187	ND - 0.012	0.011 - 0.022
	Beryllium	0.004	mg/L	MCL	0.002	ND	ND	ND	ND	ND
	Cadmium	0.005	mg/L	MCL	0.0025	ND	ND	ND	ND	ND
	Chromium	0.05	mg/L	MML	0.025	ND	ND	ND	ND	ND
	Copper	1	mg/L	SMCL	1	ND	ND	ND - 0.038	ND - 0.0096	ND
	Iron (Total)	0.3	mg/L	SMCL	0.3	ND	ND - 0.183	0.02 - 0.086	0.022 - 4.08	ND - 0.034
	Iron (Dissolved)	None	mg/L	None	None	ND	ND	ND - 0.021	ND - 0.12	ND - 0.020
	Lead	0.05	mg/L	MML	0.025	ND	ND - 0.008	ND - 0.004	ND - 0.007	ND - 0.004
	Manganese (Total)	0.05	mg/L	SMCL	0.05	ND	0.038 - 0.044	ND - 0.024	ND - 0.662	ND - 0.038
	Manganese (Dissolved)	None	mg/L	None	None	ND	0.036 - 0.041	ND - 0.011	ND - 0.032	0.030 - 0.042
	Mercury	0.002	mg/L	MCL, MML	0.001	ND	ND	ND	ND	ND
	Nickel	None	mg/L	None	None	ND	ND - 0.00297	ND - 0.00069	ND	ND
	Selenium	0.01	mg/L	MML	0.005	ND	ND	ND	ND	ND - 3.9
	Silver	0.05	mg/L	MML	0.025	ND	ND	ND	ND	ND
	Thallium	0.002	mg/L	MCL	0.001	ND	ND	ND	ND	ND
	Zinc	5	mg/L	SMCL	5	ND	0.035 - 0.122	ND - 0.041	0.021 - 0.33	ND - 0.059
Miscellaneous	Odor	3	TON	SMCL	3	1	--	ND - 3	ND - 2	--
	Color	15	ACU	SMCL	15	ND	--	ND - 9	ND - 120	--
	Methylene Blue Active Substance	0.5	mg/L	SMCL	0.5	ND	--	ND	ND	--
	Corrosivity (Langelier Saturation Index)	Non-Corrosive	mg/L	SMCL	Non-Corrosive	-0.36	--	-3.31 - -0.69	-3.72 - -1.2	--
	Cyanide (as free cyanide)	0.2	mg/l	MCL	0.1	ND	--	ND	ND	--
	Fluoride	2	mg/L	SMCL	2	ND	--	0.62 - 0.84	0.42 - 0.67	--
Radionuclides	Combined Radium 226/228	5	pCi/L	MCL, MML	2.5	<1.815	--	ND - 2.9	ND - 2	--
	Uranium	0.03	mg/L	MCL	0.015	ND	--	ND	ND	--
	Radon	None	pCi/L	None	None	--	--	ND - -8	126 - 390	--
	Gross Alpha	15	pCi/L	MCL, MML	7.5	ND	--	ND - 2.6	ND - 3.5	--
	Gross Beta	50	pCi/L	MML	25	4.80	--	ND	ND - 6.37	--
Regulated Synthetic Organic Compounds (SOCs)	2,4,5-TP (Silvex)	0.01	mg/L	MML	0.005	ND	--	ND	ND	--
	2,4-D	0.07	mg/L	MCL	0.035	ND	--	ND	ND	--
	Alachlor (Lasso)	0.002	mg/L	MCL	0.001	ND	--	ND	ND	--
	Atrazine	0.003	mg/L	MCL	0.0015	ND	--	ND	ND	--
	Benzo(a)Pyrene	0.0002	mg/L	MCL	0.0001	ND	--	ND	ND	--
	BHC-gamma (Lindane)	0.0002	mg/L	MCL	0.0001	ND	--	ND	ND	--
	Carbofuran	0.04	mg/L	MCL	0.02	ND	--	ND	ND	--
	Chlordane	0.002	mg/L	MCL	0.001	ND	--	ND	ND	--
	Dalapon	0.2	mg/L	MCL	0.1	ND	--	ND	ND	--
	Di(2-ethylhexyl)adipate *(adipates)*	0.4	mg/L	MCL	0.2	ND	--	ND	ND	--
	Di(2-ethylhexyl)phthalate *(phthalates)*	0.006	mg/L	MCL	0.003	ND	--	ND	ND - 0.0463	--
	Dibromochloropropane (DBCP)	0.0002	mg/L	MCL	0.0001	ND	--	ND	ND	--
	Dinoseb	0.007	mg/L	MCL	0.0035	ND	--	ND	ND	--
	Diquat	0.02	mg/L	MCL	0.01	ND	--	ND	ND	--
	Ethylene Dibromide (EDB)	0.00005	mg/L	MCL	0.000025	ND	--	ND	ND	--
	Endothall	0.1	mg/L	MCL	0.05	ND	--	ND	ND	--
	Endrin	0.0002	mg/L	MML	0.0001	ND	--	ND	ND	--
	Glyphosate	0.7	mg/L	MCL	0.35	ND	--	ND	ND	--
	Heptachlor	0.0004	mg/L	MCL	0.0002	ND	--	ND	ND	--
	Heptachlor Epoxide	0.0002	mg/L	MCL	0.0001	ND	--	ND	ND	--
	Hexachlorobenzene (HCB)	0.001	mg/L	MCL	0.0005	ND	--	ND	ND	--
	Hexachlorocyclopentadiene	0.05	mg/L	MCL	0.025	ND	--	ND	ND	--
	Methoxychlor	0.04	mg/L	MCL	0.02	ND	--	ND	ND	--
	Polychlorinated Biphenyls (PCBs)	0.0005	mg/L	MCL	0.00025	ND	--	ND	ND	--
	Pentachlorophenol	0.001	mg/L	MCL	0.0005	ND	--	ND	ND - 0.0001	--
	Picloram	0.5	mg/L	MCL	0.25	ND	--	ND	ND	--

Table 2. ASR Water Quality Summary: 2010 - 2017

Liberty High School Aquifer Storage and Recovery Permit Application and Supplemental Information

Class	Analyte	Lowest Regulatory Standard	Units	Regulatory Criteria	Limited License Action Level	Native Groundwater (2010)	Pre-Injection Groundwater (range of concentrations)	Source Water (range of concentrations)	Storage Water (range of concentrations)	Recovered Water (range of concentrations)
	Simazine	0.004	mg/L	MCL	0.002	ND	--	ND	ND	--
	Toxaphene	0.003	mg/L	MCL	0.0015	ND	--	ND	ND	--
	Vydate (Oxamyl)	0.2	mg/L	MCL	0.1	ND	--	ND	ND	--
Regulated Volatile Organic Compounds (VOCs)	1,1,1-Trichloroethane	0.2	mg/L	MCL, MML	0.1	ND	--	ND	ND	--
	1,1,2-Trichloroethane	0.005	mg/L	MCL	0.0025	ND	--	ND	ND	--
	1,1-Dichloroethylene	0.007	mg/L	MCL, MML	0.0035	ND	--	ND	ND	--
	1,2,4-Trichlorobenzene	0.07	mg/L	MCL	0.035	ND	--	ND	ND	--
	1,2-Dichlorobenzene (o)	0.6	mg/L	MCL	0.3	ND	--	ND	ND	--
	1,2-Dichloroethane (EDC)	0.005	mg/L	MCL, MML	0.0025	ND	--	ND	ND	--
	1,2-Dichloropropane	0.005	mg/L	MCL	0.0025	ND	--	ND	ND	--
	1,4-Dichlorobenzene (p)	0.075	mg/L	MCL, MML	0.0375	ND	--	ND	ND	--
	Benzene	0.005	mg/L	MCL, MML	0.0025	ND	--	ND	ND	--
	Carbon Tetrachloride	0.005	mg/L	MCL, MML	0.0025	ND	--	ND	ND	--
	Chlorobenzene	0.1	mg/L	MCL	0.05	ND	--	ND	ND	--
	cis-1,2-Dichloroethylene	0.07	mg/L	MCL	0.035	ND	--	ND	ND	--
	Ethylbenzene	0.7	mg/L	MCL	0.35	ND	--	ND	ND	--
	Dichloromethane (methylene chloride)	0.005	mg/L	MCL	0.0025	ND	--	ND	ND	--
	Styrene	0.1	mg/L	MCL	0.05	ND	--	ND	ND	--
	Tetrachloroethylene	0.005	mg/L	MCL	0.0025	ND	--	ND	ND	--
	Toluene	1	mg/L	MCL	0.5	ND	--	ND	ND	--
	trans-1,2-Dichloroethylene	0.1	mg/L	MCL	0.05	ND	--	ND	ND	--
	Trichloroethylene	0.005	mg/L	MCL, MML	0.0025	ND	--	ND	ND	--
	Vinyl Chloride	0.002	mg/L	MCL, MML	0.001	ND	--	ND	ND	--
	Total Xylenes	10	mg/L	MCL	5	ND	--	ND	ND	--

Notes:

-- = not analyzed
ACU = apparent color units
CFU/ml = colony forming units per milliliter
mg/L = milligrams per liter
MCL = federal maximum contmainant level for drinking water
MCLG = maximum contaminant level goal, the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
MML = Oregon Department of Environmental Quality's maximum measurable levels for groundwater
ND = not detected
pCi/L = picoCuries per liter
SMCL = federal secondary maximum contaminant levels for drinking water
TON = threshold odor number
Red = concentration exceeds the limited license action level
Samples are unfiltered unless noted (i.e., dissolved)

Table 3. Water Quality Comparison: Joint Water Commission, Portland Water Bureau, and Liberty ASR Testing

Liberty High School Aquifer Storage and Recovery Permit Application and Supplemental Information

Class	Analyte	Lowest Regulatory Standard	Units	Regulatory Criteria	Limited License Action Level	Joint Water Commission[1] 2014-2017 (range of concentrations)	Portland Water Bureau[2] 2012-2017 (range of concentrations)	Liberty ASR Source Water 2010-2017 (range of concentrations)
Bacteriological	Fecal Coliforms/E.Coli	<1/100 ml	CFU/100 ml	MML	<1/100 ml	--	--	Absent
	Total Coliform	<1/100 ml	CFU/100 ml	MML	<1/100 ml	--	--	Absent
Disinfection By-Products	Chloroform (Trichloromethane)	None	mg/L	None	None	0.0072 - 0.0098	0.00067 - 0.024	0.0285 - 0.0441
	Bromodichloromethane	None	mg/L	None	None	0.0012 - 0.0025	ND - 0.00096	0.0013 - 0.0062
	Dibromochloromethane	None	mg/L	None	None	ND	--	ND
	Bromoform (Tribromomethane)	None	mg/L	None	None	ND	--	ND
	Total Trihalomethanes	0.08	mg/L	MCL	0.08	0.0084 - 0.0123	--	0.0312 - 0.0457
	Monochloroacetic Acid	None	mg/L	None	None	--	--	ND
	Dichloroacetic Acid	None	mg/L	None	None	--	--	0.0012 - 0.0246
	Trichloroacetic Acid	None	mg/L	None	None	--	--	0.0123 - 0.0262
	Monobromoacetic Acid	None	mg/L	None	None	--	--	ND
	Dibromoacetic Acid	None	mg/L	None	None	--	--	ND
	Total Haloacetic Acids	0.06	mg/L	MCL	0.06	--	--	0.0182 - 0.0507
	Chlorite	1	mg/L	MCL	1	--	--	ND
	Bromate	0.01	mg/L	MCL	0.01	--	--	ND
Geochemical	Bicarbonate	None	mg/L	None	None	23 - 35.3	6.9 - 12	12 - 38
	Calcium	None	mg/L	None	None	5.67 - 8.3	1.3 - 2	2.2 - 9.4
	Carbonate	None	mg/L	None	None	ND	ND	ND
	Chloride	250	mg/L	SMCL	250	4.0 - 5.28	2.3 - 3.7	ND - 8.0
	Hardness (as CaCO3)	None	mg/L	None	None	21.7 - 32	5.4 - 8.4	8.8 - 36
	Magnesium	None	mg/L	None	None	1.83 - 2.8	0.52 - 0.79	0.53 - 2.47
	Nitrate as N	10	mg/L	MCL, MML	5	0.12 - 0.74	ND - 0.74	ND - 0.86
	Nitrite as N	1	mg/L	MCL	0.5	ND - 0.001	ND	ND - 0.164
	Total Nitrate-Nitrite	None	mg/L	None	None	0.12 - 0.74	--	ND - 0.86
	Potassium	None	mg/L	None	None	ND - 0.78 J	ND - 0.24	ND - 0.96
	Silica	None	mg/L	None	None	14.8 - 18.1	3.6 - 4.8	7.0 - 16
	Sodium	20	mg/L	MCLG	20	7.9 - 11.1	2.8 - 4.1	3.9 - 11.6
	Sulfate	250	mg/L	SMCL	250	9.6 - 14.6	0.35 - 0.46	ND - 14.4
	Total Alkalinity	None	mg/L	None	None	23 - 35.3	6.6 - 16	12 - 38
	Total Dissolved Solids	500	mg/L	SMCL	500	63 - 84	22 - 40	36 - 86
	Total Organic Carbon	None	mg/L	None	None	0.48 - 0.65	0.76 - 1.9	ND - 2.56
	Total Suspended Solids	None	mg/L	None	None	ND	ND - 0.8	ND - 6
Metals	Aluminum	0.05	mg/L	SMCL	0.05	ND - 0.010	0.0091 - 0.059	ND - 0.038
	Antimony	0.006	mg/L	MCL	0.003	ND	ND	ND
	Arsenic	0.01	mg/L	MCL	0.005	ND	ND	ND
	Barium	1	mg/L	MML	0.5	0.003 - 0.005	0.0007 - 0.0013	ND - 0.0187
	Beryllium	0.004	mg/L	MCL	0.002	ND	ND	ND
	Cadmium	0.005	mg/L	MCL	0.0025	ND	ND	ND
	Chromium	0.05	mg/L	MML	0.025	ND - 0.001	ND - 0.0008	ND
	Copper	1	mg/L	SMCL	1	ND	ND - 0.00113	ND - 0.038
	Iron (Total)	0.3	mg/L	SMCL	0.3	ND	0.0186 - 0.1	0.02 - 0.086
	Iron (Dissolved)	None	mg/L	None	None	--	--	ND - 0.021
	Lead	0.05	mg/L	MML	0.025	ND	ND - 0.000063	ND - 0.004
	Manganese (Total)	0.05	mg/L	SMCL	0.05	ND - 0.004	0.00167 - 0.049	ND - 0.024
	Manganese (Dissolved)	None	mg/L	None	None	--	--	ND - 0.011
	Mercury	0.002	mg/L	MCL, MML	0.001	ND	ND	ND
	Nickel	None	mg/L	None	None	ND	ND	ND - 0.00069
	Selenium	0.01	mg/L	MML	0.005	ND	ND	ND
	Silver	0.05	mg/L	MML	0.025	ND	ND	ND
	Thallium	0.002	mg/L	MCL	0.001	ND	ND	ND
	Zinc	5	mg/L	SMCL	5	ND	ND - 0.00124	ND - 0.041
Miscellaneous	Odor	3	TON	SMCL	3	0 - 10.4	--	ND - 3
	Color	15	ACU	SMCL	15	ND	5 - 12	ND - 9
	Methylene Blue Active Substance	0.5	mg/L	SMCL	0.5	ND	--	ND
	Corrosivity (Langelier Saturation Index)	Non-Corrosive	mg/L	SMCL	Non-Corrosive	-2.82 - -1.97	--	-3.31 - -0.69
	Cyanide (as free cyanide)	0.2	mg/l	MCL	0.1	ND	ND	ND
	Fluoride	2	mg/L	SMCL	2	ND	0.025 - 0.089	0.62 - 0.84
Radionuclides	Combined Radium 226/228	5	pCi/L	MCL, MML	2.5	--	--	ND - 2.9
	Uranium	0.03	mg/L	MCL	0.015	--	--	ND
	Radon	None	pCi/L	None	None	--	--	ND - -8
	Gross Alpha	15	pCi/L	MCL, MML	7.5	--	--	ND - 2.6
	Gross Beta	50	pCi/L	MML	25	--	--	ND
Regulated Synthetic Organic Compounds (SOCs)	2,4,5-TP (Silvex)	0.01	mg/L	MML	0.005	ND	--	ND
	2,4-D	0.07	mg/L	MCL	0.035	ND	--	ND
	Alachlor (Lasso)	0.002	mg/L	MCL	0.001	ND	--	ND
	Atrazine	0.003	mg/L	MCL	0.0015	ND	--	ND
	Benzo(a)Pyrene	0.0002	mg/L	MCL	0.0001	ND	--	ND
	BHC-gamma (Lindane)	0.0002	mg/L	MCL	0.0001	ND	--	ND
	Carbofuran	0.04	mg/L	MCL	0.02	ND	--	ND
	Chlordane	0.002	mg/L	MCL	0.001	ND	--	ND
	Dalapon	0.2	mg/L	MCL	0.1	ND	--	ND
	Di(2-ethylhexyl)adipate *(adipates)*	0.4	mg/L	MCL	0.2	ND	--	ND
	Di(2-ethylhexyl)phthalate *(phthalates)*	0.006	mg/L	MCL	0.003	ND	--	ND
	Dibromochloropropane (DBCP)	0.0002	mg/L	MCL	0.0001	ND	--	ND
	Dinoseb	0.007	mg/L	MCL	0.0035	ND	--	ND
	Diquat	0.02	mg/L	MCL	0.01	ND	--	ND
	Ethylene Dibromide (EDB)	0.00005	mg/L	MCL	0.000025	ND	--	ND
	Endothall	0.1	mg/L	MCL	0.05	ND	--	ND
	Endrin	0.0002	mg/L	MML	0.0001	ND	--	ND
	Glyphosate	0.7	mg/L	MCL	0.35	ND	--	ND
	Heptachlor	0.0004	mg/L	MCL	0.0002	ND	--	ND
	Heptachlor Epoxide	0.0002	mg/L	MCL	0.0001	ND	--	ND
	Hexachlorobenzene (HCB)	0.001	mg/L	MCL	0.0005	ND	--	ND
	Hexachlorocyclopentadiene	0.05	mg/L	MCL	0.025	ND	--	ND
	Methoxychlor	0.04	mg/L	MCL	0.02	ND	--	ND
	Polychlorinated Biphenyls (PCBs)	0.0005	mg/L	MCL	0.00025	ND	--	ND
	Pentachlorophenol	0.001	mg/L	MCL	0.0005	ND	--	ND

Table 3. Water Quality Comparison: Joint Water Commission, Portland Water Bureau, and Liberty ASR Testing

Liberty High School Aquifer Storage and Recovery Permit Application and Supplemental Information

Class	Analyte	Lowest Regulatory Standard	Units	Regulatory Criteria	Limited License Action Level	Joint Water Commission[1] 2014-2017 (range of concentrations)	Portland Water Bureau[2] 2012-2017 (range of concentrations)	Liberty ASR Source Water 2010-2017 (range of concentrations)
	Picloram	0.5	mg/L	MCL	0.25	ND	--	ND
	Simazine	0.004	mg/L	MCL	0.002	ND	--	ND
	Toxaphene	0.003	mg/L	MCL	0.0015	ND	--	ND
	Vydate (Oxamyl)	0.2	mg/L	MCL	0.1	ND	--	ND
Regulated Volatile Organic Compounds (VOCs)	1,1,1-Trichloroethane	0.2	mg/L	MCL, MML	0.1	ND	ND	ND
	1,1,2-Trichloroethane	0.005	mg/L	MCL	0.0025	ND	ND	ND
	1,1-Dichloroethylene	0.007	mg/L	MCL, MML	0.0035	ND	ND	ND
	1,2,4-Trichlorobenzene	0.07	mg/L	MCL	0.035	ND	ND	ND
	1,2-Dichlorobenzene (o)	0.6	mg/L	MCL	0.3	ND	ND	ND
	1,2-Dichloroethane (EDC)	0.005	mg/L	MCL, MML	0.0025	ND	ND	ND
	1,2-Dichloropropane	0.005	mg/L	MCL	0.0025	ND	ND	ND
	1,4-Dichlorobenzene (p)	0.075	mg/L	MCL, MML	0.0375	ND	ND	ND
	Benzene	0.005	mg/L	MCL, MML	0.0025	ND	ND	ND
	Carbon Tetrachloride	0.005	mg/L	MCL, MML	0.0025	ND	ND	ND
	Chlorobenzene	0.1	mg/L	MCL	0.05	ND	ND	ND
	cis-1,2-Dichloroethylene	0.07	mg/L	MCL	0.035	ND	ND	ND
	Ethylbenzene	0.7	mg/L	MCL	0.35	ND	ND	ND
	Dichloromethane (methylene chloride)	0.005	mg/L	MCL	0.0025	ND	ND	ND
	Styrene	0.1	mg/L	MCL	0.05	ND	ND	ND
	Tetrachloroethylene	0.005	mg/L	MCL	0.0025	ND	ND	ND
	Toluene	1	mg/L	MCL	0.5	ND	ND	ND
	trans-1,2-Dichloroethylene	0.1	mg/L	MCL	0.05	ND	ND	ND
	Trichloroethylene	0.005	mg/L	MCL, MML	0.0025	ND	ND	ND
	Vinyl Chloride	0.002	mg/L	MCL, MML	0.001	ND	ND	ND
	Total Xylenes	10	mg/L	MCL	5	ND	ND	ND

Notes:

-- = not analyzed
ACU = apparent color units
CFU/ml = colony forming units per milliliter
JWC = Joint Water Commission
mg/L = milligrams per liter
MCL = federal maximum contmainant level for drinking water
MCLG = maximum contaminant level goal, the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
MML = Oregon Department of Environmental Quality's maximum measurable levels for groundwater
ND = not detected
pCi/L = picoCuries per liter
SMCL = federal secondary maximum contaminant levels for drinking water
TON = threshold odor number
Red = concentration exceeds the limited license action level
Samples are unfiltered unless noted (i.e., dissolved)

1 Joint Water Commission sample collected for compliance purposes after treatment at FW Hose, Site ID #1. Downloaded from JWC website.

2 Portland Water Bureau data consist of Bull Run treated water sampled at Lusted Hill Treatment Facility from the Triannaul Water Quality Analyses.

Table 4. Year 3 Source Water Analyte List

Liberty High School Aquifer Storage and Recovery Permit Application and Supplemental Information

Class	Analyte	Lowest Regulatory Standard	Units	Regulatory Criteria	Sample Location
Field Parameters	Temperature	None	Celsius	None	Liberty High School
	Conductivity	None	µS/cm	None	Liberty High School
	pH	6 - 8.5	Units	SMCL	Liberty High School
	Dissolved Oxygen	None	mg/L	None	Liberty High School
	Oxidation-Reduction Potential	None	mV	None	Liberty High School
	Turbidity	None	NTU	None	Liberty High School
Disinfection By-Products	Chloroform (Trichloromethane)	None	mg/L	None	Liberty High School
	Bromodichloromethane	None	mg/L	None	Liberty High School
	Dibromochloromethane	None	mg/L	None	Liberty High School
	Bromoform (Tribromomethane)	None	mg/L	None	Liberty High School
	Total Trihalomethanes	0.08	mg/L	MCL	Liberty High School
	Monochloroacetic Acid	None	mg/L	None	Liberty High School
	Dichloroacetic Acid	None	mg/L	None	Liberty High School
	Trichloroacetic Acid	None	mg/L	None	Liberty High School
	Monobromoacetic Acid	None	mg/L	None	Liberty High School
	Dibromoacetic Acid	None	mg/L	None	Liberty High School
	Total Haloacetic Acids	0.06	mg/L	MCL	Liberty High School
	Chlorite	1	mg/L	MCL	Liberty High School
	Bromate	0.01	mg/L	MCL	Liberty High School
Geochemical	Bicarbonate	None	mg/L	None	Liberty High School
	Calcium	None	mg/L	None	Liberty High School
	Carbonate	None	mg/L	None	Liberty High School
	Chloride	250	mg/L	SMCL	Liberty High School
	Hardness (as CaCO3)	None	mg/L	None	Liberty High School
	Magnesium	None	mg/L	None	Liberty High School
	Nitrate as N	10	mg/L	MCL, MML	Liberty High School
	Nitrite as N	1	mg/L	MCL	Liberty High School
	Total Nitrate-Nitrite	None	mg/L	None	Liberty High School
	Potassium	None	mg/L	None	Liberty High School
	Silica	None	mg/L	None	Liberty High School
	Sodium	20	mg/L	MCLG	Liberty High School
	Sulfate	250	mg/L	SMCL	Liberty High School
	Total Alkalinity	None	mg/L	None	Liberty High School
	Total Dissolved Solids	500	mg/L	SMCL	Liberty High School
	Total Organic Carbon	None	mg/L	None	Liberty High School
	Total Suspended Solids	None	mg/L	None	Liberty High School
Metals	Aluminum	0.05	mg/L	SMCL	Liberty High School
	Antimony	0.006	mg/L	MCL	Liberty High School
	Arsenic	0.01	mg/L	MCL	Liberty High School
	Barium	1	mg/L	MML	Liberty High School
	Beryllium	0.004	mg/L	MCL	Liberty High School
	Cadmium	0.005	mg/L	MCL	Liberty High School
	Chromium	0.05	mg/L	MML	Liberty High School
	Copper	1	mg/L	SMCL	Liberty High School
	Iron (Total)	0.3	mg/L	SMCL	Liberty High School
	Iron (Dissolved)	None	mg/L	None	Liberty High School
	Lead	0.05	mg/L	MML	Liberty High School
	Manganese (Total)	0.05	mg/L	SMCL	Liberty High School
	Manganese (Dissolved)	None	mg/L	None	Liberty High School
	Mercury	0.002	mg/L	MCL, MML	Liberty High School

Table 4. Year 3 Source Water Analyte List

Liberty High School Aquifer Storage and Recovery Permit Application and Supplemental Information

Class	Analyte	Lowest Regulatory Standard	Units	Regulatory Criteria	Sample Location
Metals	Nickel	None	mg/L	None	Liberty High School
	Selenium	0.01	mg/L	MML	Liberty High School
	Silver	0.05	mg/L	MML	Liberty High School
	Thallium	0.002	mg/L	MCL	Liberty High School
	Zinc	5	mg/L	SMCL	Liberty High School
Miscellaneous	Odor	3	TON	SMCL	Liberty High School
	Color	15	ACU	SMCL	Liberty High School
	Methylene Blue Active Substance	0.5	mg/L	SMCL	Liberty High School
	Corrosivity (Langelier Saturation Index)	Non-Corrosive	mg/L	SMCL	Liberty High School
	Cyanide (as free cyanide)	0.2	mg/l	MCL	Liberty High School
	Fluoride	2	mg/L	SMCL	Liberty High School
Radionuclides	Combined Radium 226/228	5	pCi/L	MCL, MML	Liberty High School
	Uranium	0.03	mg/L	MCL	Liberty High School
	Radon	None	pCi/L	None	Liberty High School
	Gross Alpha	15	pCi/L	MCL, MML	Liberty High School
	Gross Beta	50	pCi/L	MML	Liberty High School
Regulated Synthetic Organic Compounds (SOCs)	2,4,5-TP (Silvex)	0.01	mg/L	MML	Liberty High School
	2,4-D	0.07	mg/L	MCL	Liberty High School
	Alachlor (Lasso)	0.002	mg/L	MCL	Liberty High School
	Atrazine	0.003	mg/L	MCL	Liberty High School
	Benzo(a)Pyrene	0.0002	mg/L	MCL	Liberty High School
	BHC-gamma (Lindane)	0.0002	mg/L	MCL	Liberty High School
	Carbofuran	0.04	mg/L	MCL	Liberty High School
	Chlordane	0.002	mg/L	MCL	Liberty High School
	Dalapon	0.2	mg/L	MCL	Liberty High School
	Di(2-ethylhexyl)adipate *(adipates)*	0.4	mg/L	MCL	Liberty High School
	Di(2-ethylhexyl)phthalate *(phthalates)*	0.006	mg/L	MCL	Liberty High School
	Dibromochloropropane (DBCP)	0.0002	mg/L	MCL	Liberty High School
	Dinoseb	0.007	mg/L	MCL	Liberty High School
	Diquat	0.02	mg/L	MCL	Liberty High School
	Ethylene Dibromide (EDB)	0.00005	mg/L	MCL	Liberty High School
	Endothall	0.1	mg/L	MCL	Liberty High School
	Endrin	0.0002	mg/L	MML	Liberty High School
	Glyphosate	0.7	mg/L	MCL	Liberty High School
	Heptachlor	0.0004	mg/L	MCL	Liberty High School
	Heptachlor Epoxide	0.0002	mg/L	MCL	Liberty High School
	Hexachlorobenzene (HCB)	0.001	mg/L	MCL	Liberty High School
	Hexachlorocyclopentadiene	0.05	mg/L	MCL	Liberty High School
	Methoxychlor	0.04	mg/L	MCL	Liberty High School
	Polychlorinated Biphenyls (PCBs)	0.0005	mg/L	MCL	Liberty High School
	Pentachlorophenol	0.001	mg/L	MCL	Liberty High School
	Picloram	0.5	mg/L	MCL	Liberty High School
	Simazine	0.004	mg/L	MCL	Liberty High School
	Toxaphene	0.003	mg/L	MCL	Liberty High School
	Vydate (Oxamyl)	0.2	mg/L	MCL	Liberty High School
Regulated Volatile Organic Compounds (VOCs)	1,1,1-Trichloroethane	0.2	mg/L	MCL, MML	Liberty High School
	1,1,2-Trichloroethane	0.005	mg/L	MCL	Liberty High School
	1,1-Dichloroethylene	0.007	mg/L	MCL, MML	Liberty High School
	1,2,4-Trichlorobenzene	0.07	mg/L	MCL	Liberty High School
	1,2-Dichlorobenzene (o)	0.6	mg/L	MCL	Liberty High School

Table 4. Year 3 Source Water Analyte List

Liberty High School Aquifer Storage and Recovery Permit Application and Supplemental Information

Class	Analyte	Lowest Regulatory Standard	Units	Regulatory Criteria	Sample Location
Regulated Volatile Organic Compounds (VOCs)	1,2-Dichloroethane (EDC)	0.005	mg/L	MCL, MML	Liberty High School
	1,2-Dichloropropane	0.005	mg/L	MCL	Liberty High School
	1,4-Dichlorobenzene (p)	0.075	mg/L	MCL, MML	Liberty High School
	Benzene	0.005	mg/L	MCL, MML	Liberty High School
	Carbon Tetrachloride	0.005	mg/L	MCL, MML	Liberty High School
	Chlorobenzene	0.1	mg/L	MCL	Liberty High School
	cis-1,2-Dichloroethylene	0.07	mg/L	MCL	Liberty High School
	Ethylbenzene	0.7	mg/L	MCL	Liberty High School
	Dichloromethane (methylene chloride)	0.005	mg/L	MCL	Liberty High School
	Styrene	0.1	mg/L	MCL	Liberty High School
	Tetrachloroethylene	0.005	mg/L	MCL	Liberty High School
	Toluene	1	mg/L	MCL	Liberty High School
	trans-1,2-Dichloroethylene	0.1	mg/L	MCL	Liberty High School
	Trichloroethylene	0.005	mg/L	MCL, MML	Liberty High School
	Vinyl Chloride	0.002	mg/L	MCL, MML	Liberty High School
	Total Xylenes	10	mg/L	MCL	Liberty High School

Notes:

µS/cm = micro Siemens per centimeter
ACU = apparent color units
CFU/ml = colony forming units per milliliter
MCL = federal maximum contmainant level for drinking water
MCLG = maximum contaminant level goal, the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
mg/L = milligrams per liter
MML = Oregon Department of Environmental Quality's maximum measurable levels for groundwater
mV = millivolts
NTU = nephelometric turbidity units
pCi/L = picoCuries per liter
SMCL = federal secondary maximum contaminant levels for drinking water
TON = threshold odor number

Table 5. Year 1 and Year 2 Source Water Analyte List

Liberty High School Aquifer Storage and Recovery Permit Application and Supplemental Information

Class	Analyte	Lowest Regulatory Standard	Units	Regulatory Criteria	Sample Location
Disinfection By-Products	Chloroform (Trichloromethane)	None	mg/L	None	JWC and PWB
	Bromodichloromethane	None	mg/L	None	JWC and PWB
	Dibromochloromethane	None	mg/L	None	JWC
	Bromoform (Tribromomethane)	None	mg/L	None	JWC
	Total Trihalomethanes	0.08	mg/L	MCL	JWC
Geochemical	Bicarbonate	None	mg/L	None	JWC and PWB
	Calcium	None	mg/L	None	JWC and PWB
	Carbonate	None	mg/L	None	JWC and PWB
	Chloride	250	mg/L	SMCL	JWC and PWB
	Hardness (as CaCO3)	None	mg/L	None	JWC and PWB
	Magnesium	None	mg/L	None	JWC and PWB
	Nitrate as N	10	mg/L	MCL, MML	JWC and PWB
	Nitrite as N	1	mg/L	MCL	JWC and PWB
	Total Nitrate-Nitrite	None	mg/L	None	JWC
	Potassium	None	mg/L	None	JWC and PWB
	Silica	None	mg/L	None	JWC and PWB
	Sodium	20	mg/L	MCLG	JWC and PWB
	Sulfate	250	mg/L	SMCL	JWC and PWB
	Total Alkalinity	None	mg/L	None	JWC and PWB
	Total Dissolved Solids	500	mg/L	SMCL	JWC and PWB
	Total Organic Carbon	None	mg/L	None	JWC and PWB
	Total Suspended Solids	None	mg/L	None	JWC and PWB
Metals	Aluminum	0.05	mg/L	SMCL	JWC and PWB
	Antimony	0.006	mg/L	MCL	JWC and PWB
	Arsenic	0.01	mg/L	MCL	JWC and PWB
	Barium	1	mg/L	MML	JWC and PWB
	Beryllium	0.004	mg/L	MCL	JWC and PWB
	Cadmium	0.005	mg/L	MCL	JWC and PWB
	Chromium	0.05	mg/L	MML	JWC and PWB
	Copper	1	mg/L	SMCL	JWC and PWB
	Iron (Total)	0.3	mg/L	SMCL	JWC and PWB
	Lead	0.05	mg/L	MML	JWC and PWB
	Manganese (Total)	0.05	mg/L	SMCL	JWC and PWB
	Mercury	0.002	mg/L	MCL, MML	JWC and PWB
	Nickel	None	mg/L	None	JWC and PWB
	Selenium	0.01	mg/L	MML	JWC and PWB
	Silver	0.05	mg/L	MML	JWC and PWB
	Thallium	0.002	mg/L	MCL	JWC and PWB
	Zinc	5	mg/L	SMCL	JWC and PWB
Miscellaneous	Odor	3	TON	SMCL	JWC
	Color	15	ACU	SMCL	JWC and PWB
	Methylene Blue Active Substance	0.5	mg/L	SMCL	JWC
	Corrosivity (Langelier Saturation Index)	Non-Corrosive	mg/L	SMCL	JWC
	Cyanide (as free cyanide)	0.2	mg/l	MCL	JWC and PWB
	Fluoride	2	mg/L	SMCL	JWC and PWB

Table 5. Year 1 and Year 2 Source Water Analyte List

Liberty High School Aquifer Storage and Recovery Permit Application and Supplemental Information

Notes:

µS/cm = micro Siemens per centimeter
ACU = apparent color units
CFU/ml = colony forming units per milliliter
JWC = Joint Water Commission; collected after treatment at FW Hose, Site ID #1.
MCL = federal maximum contmainant level for drinking water
MCLG = maximum contaminant level goal, the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
mg/L = milligrams per liter
MML = Oregon Department of Environmental Quality's maximum measurable levels for groundwater
mV = millivolts
PWB = Portland Water Bureau; collected after treatment at Bull Run's Lusted Hill treatment facility.
SMCL = federal secondary maximum contaminant levels for drinking water
TON = threshold odor number

Table 6. Source Water Analysis Schedule

Liberty High School Aquifer Storage and Recovery Permit Application and Supplemental Information

Water Year	Cycle	Sample Location	Analyses
2019	9	JWC, PWB	Partial Suite
2020	10	JWC, PWB	Partial Suite
2021	11	Liberty High School	Full Suite
2022	12	JWC, PWB	Partial Suite
2023	13	JWC, PWB	Partial Suite
2024	14	Liberty High School	Full Suite

Notes

JWC = Joint Water Commission

PWB = Portland Water Bureau

Partial Suite = disinfection by-products, metals, geochemical parameters, miscellaneaous parameters

Full Suite = disinfection by-products, metals, geochemical parameters, miscellaneous parameters, synthetic organic compounds, volatile organic compounds, radiological parameters

Figures

FIGURE 1

ASR Testing Map

Liberty High School
Aquifer Storage and Recovery
Permit Application and
Supplemental Information

LEGEND

- Country Haven Observation Well
- ASR Well
- Watercourse

N

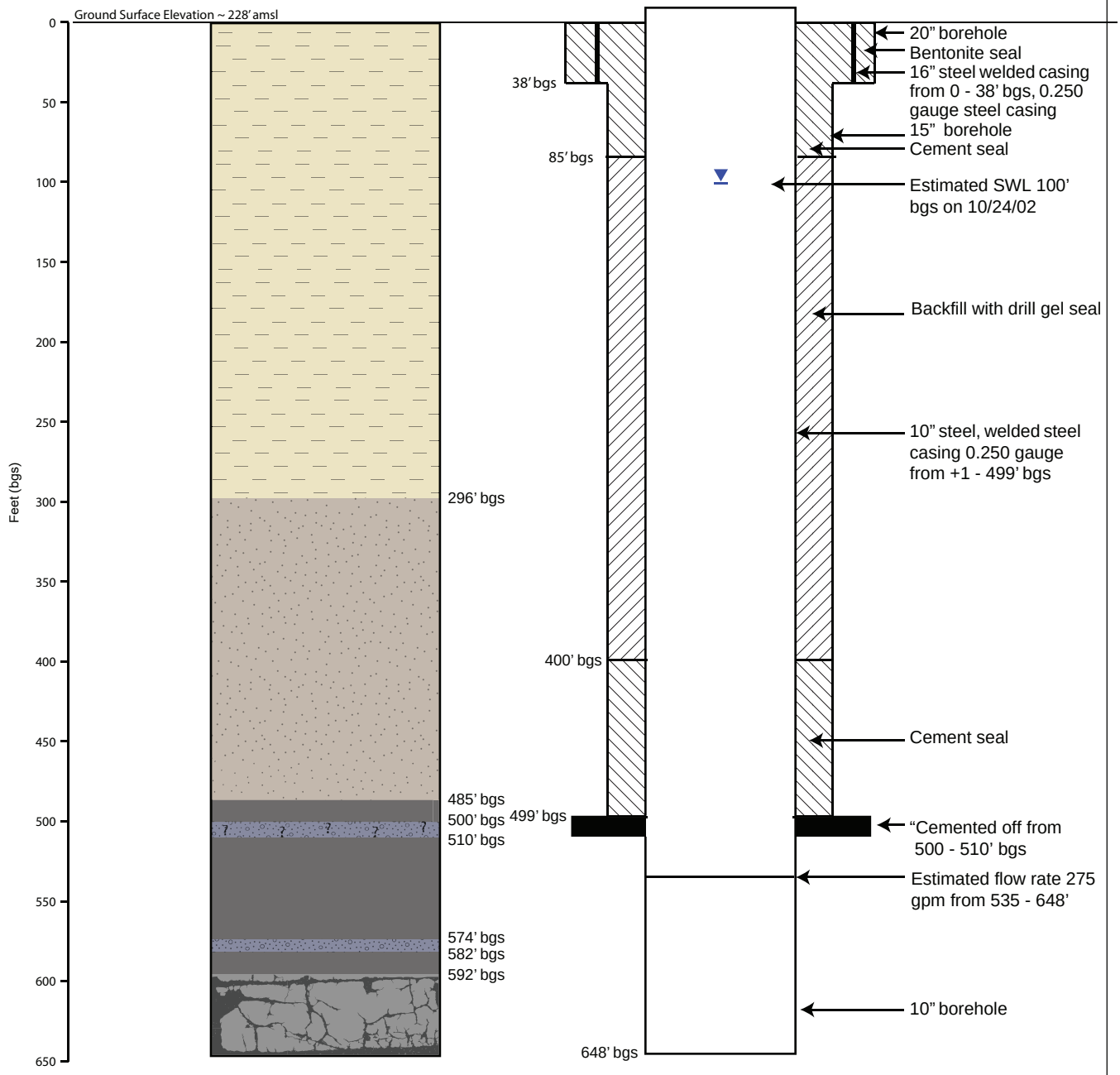
0 350 700 1,050
Feet

Date: April 30, 2018
Data Sources: OWRD, USGS, METRO
Aerial photo taken in the summer of 2015

GSI Water Solutions, Inc.

Document Path: P:\Portland\265 - Hillsboro School District\014 - LHS Cycle (2017-2018\project_gis\Project_mxds\Permit_Application\FigureC1_Site_Map.mxd

Liberty High School ASR Well
WASH 58925



LEGEND

- Clay or Silt
- Decomposing or Soft Brown Basalt
- Firm or Hard Gray-Black Basalt
- Interflow Zone
- Fractured Basalt

NOTES

SWL - static water level
bgs - below ground surface
gpm - gallons per minute
amsl - above mean sea level
* Air pressure was used to force cement into formation after hole had been backfilled with gravel.

FIGURE 2
As-Built and Lithology
Liberty High School
Aquifer Storage and Recovery
Permit Application and
Supplemental Information

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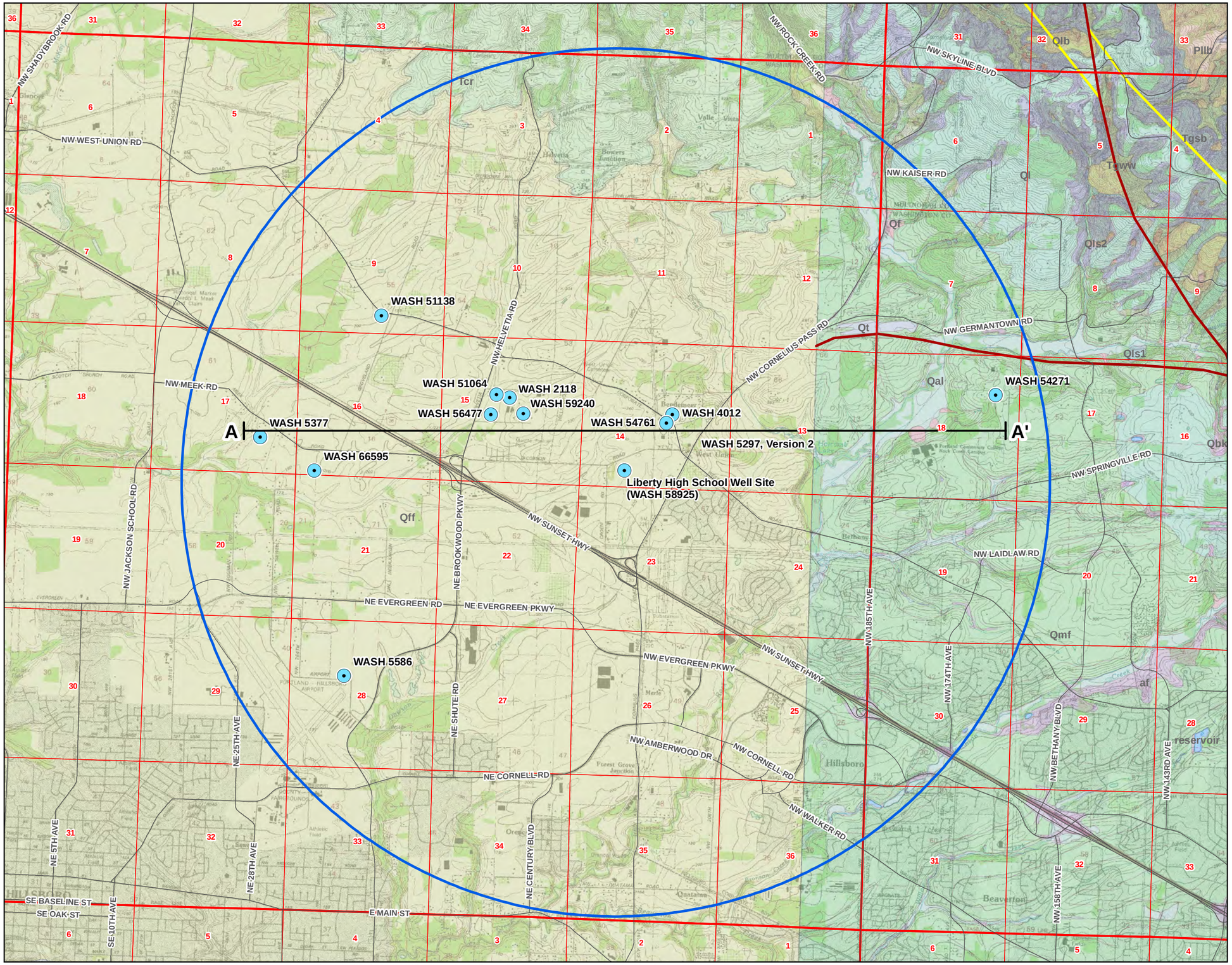

FIGURE 3

Geologic Map and Cross Section Line

Liberty High School
Aquifer Storage and Recovery
Permit Application and
Supplemental Information

LEGEND

- Well
- Cross Section A-A'
- 3 Mile Radius
- Fault
- Fold
- Major Road

Geology

- Pllb, Bedrock landslides, Pleistocene
- Qal, Alluvium
- Qbk, Basalt of Kaiser Road
- Qf, Flow and fan deposits
- Qff, Catastrophic flood deposits, fine grained facies
- Ql, Primary Loess
- Qlb, Bedrock landslides
- Qls1, Surficial landslides
- Qls2, Surficial landslides
- Qmf, Missoula Flood Deposits
- Qt, terrace deposits
- Tcr, Columbia River Basalt Group
- Tgsb, basalt of McCoy Creek
- Tgww, basalt of Winter Water
- af, Artificial fill
- reservoir

N

0 1,750 3,500 5,250
Feet

Date: April 30, 2018
Data Sources: OWRD, USGS, METRO
Aerial photo taken in the summer of 2015

GSI Water Solutions, Inc.

File Path: P:\Portland\265 - Hillsboro School District\004 - Liberty High School\Project_GIS\Project_MXDs\Figure4_LL_Cross_Section_A_Geology.mxd, Date: March 22, 2010 1:50:27 PM

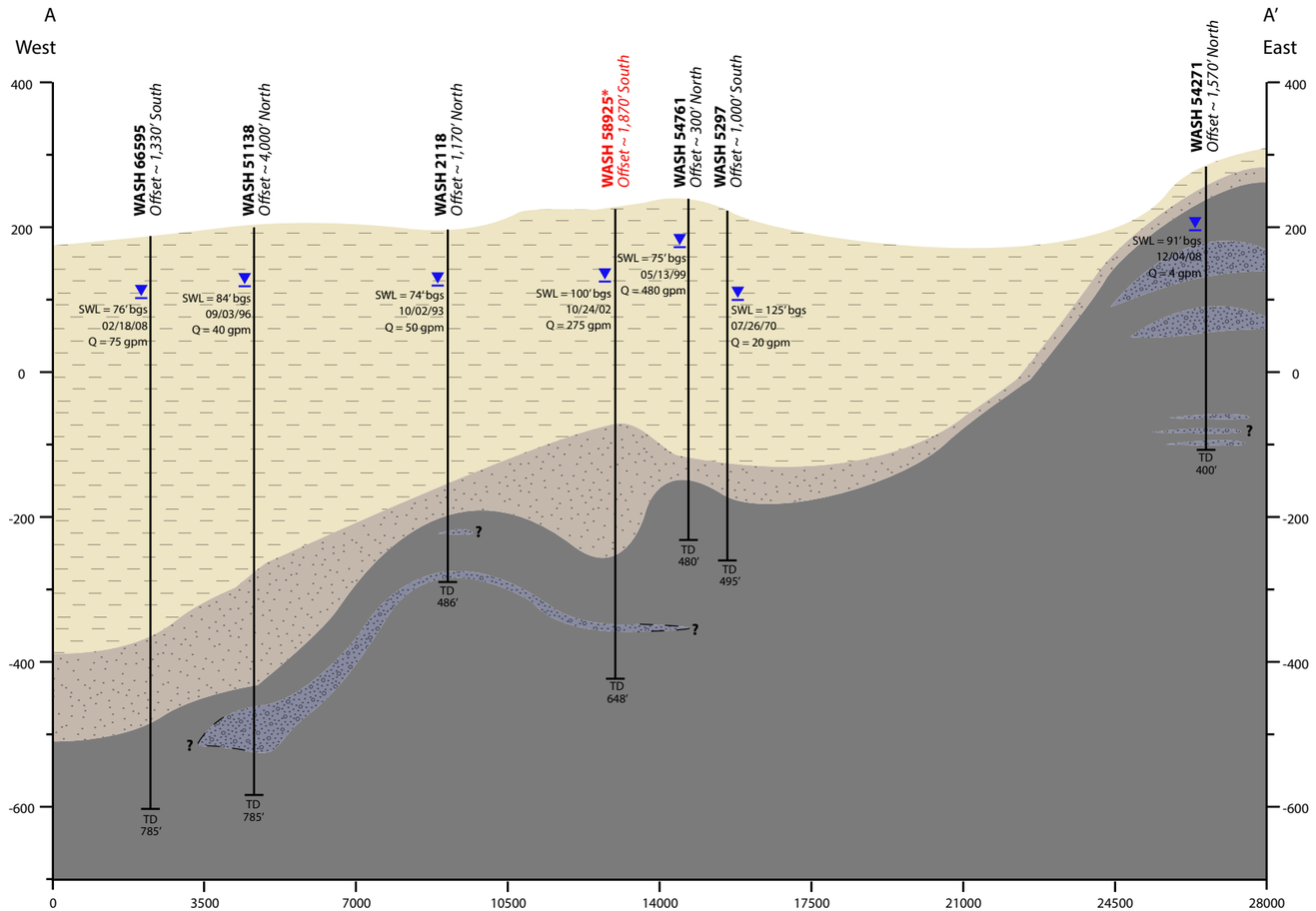

FIGURE 4

Cross Section A-A'

Liberty High School
Aquifer Storage and Recovery
Permit Application and
Supplemental Information

LEGEND

- Clay or Silt
- Decomposing or Soft Brown Basalt
- Firm or Hard Gray-Black Basalt
- Interflow Zone
- Static Water Level

NOTES

* Liberty High School Well
SWL - static water level
bgs - below ground surface
gpm - gallons per minute
TD - total depth

Scale

200 feet
3,500 feet
17.5x Vertical Exaggeration

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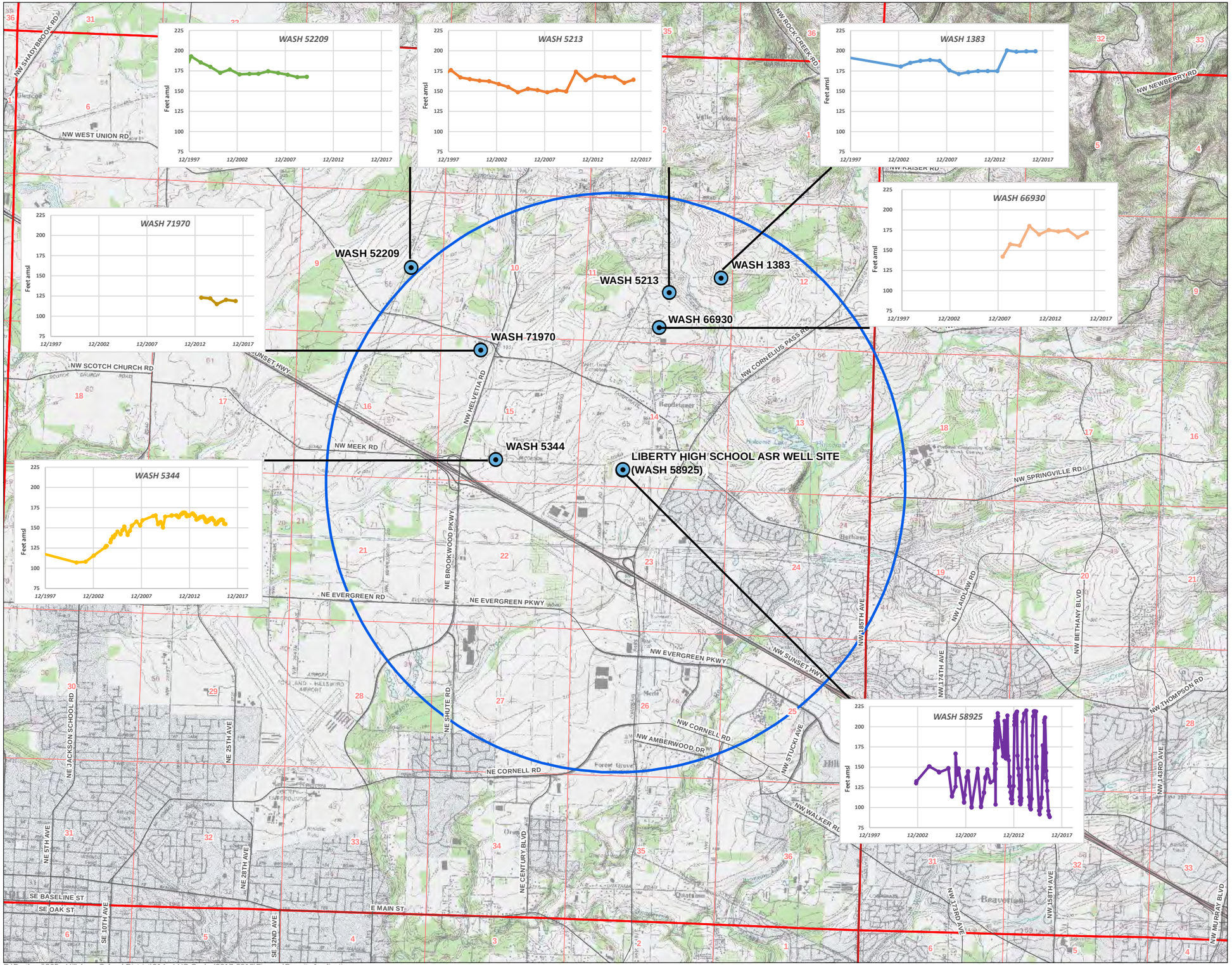

FIGURE 5

Groundwater Levels near Liberty High School

Liberty High School
Aquifer Storage and Recovery
Permit Application and
Supplemental Information

LEGEND

- Well
- 2 Mile Radius
- Major Road

NOTES:

amsl- above mean sea level

N

0 1,750 3,500 5,250
Feet

Date: April 30, 2018
Data Sources: OWRD, USGS

GSI Water Solutions, Inc.

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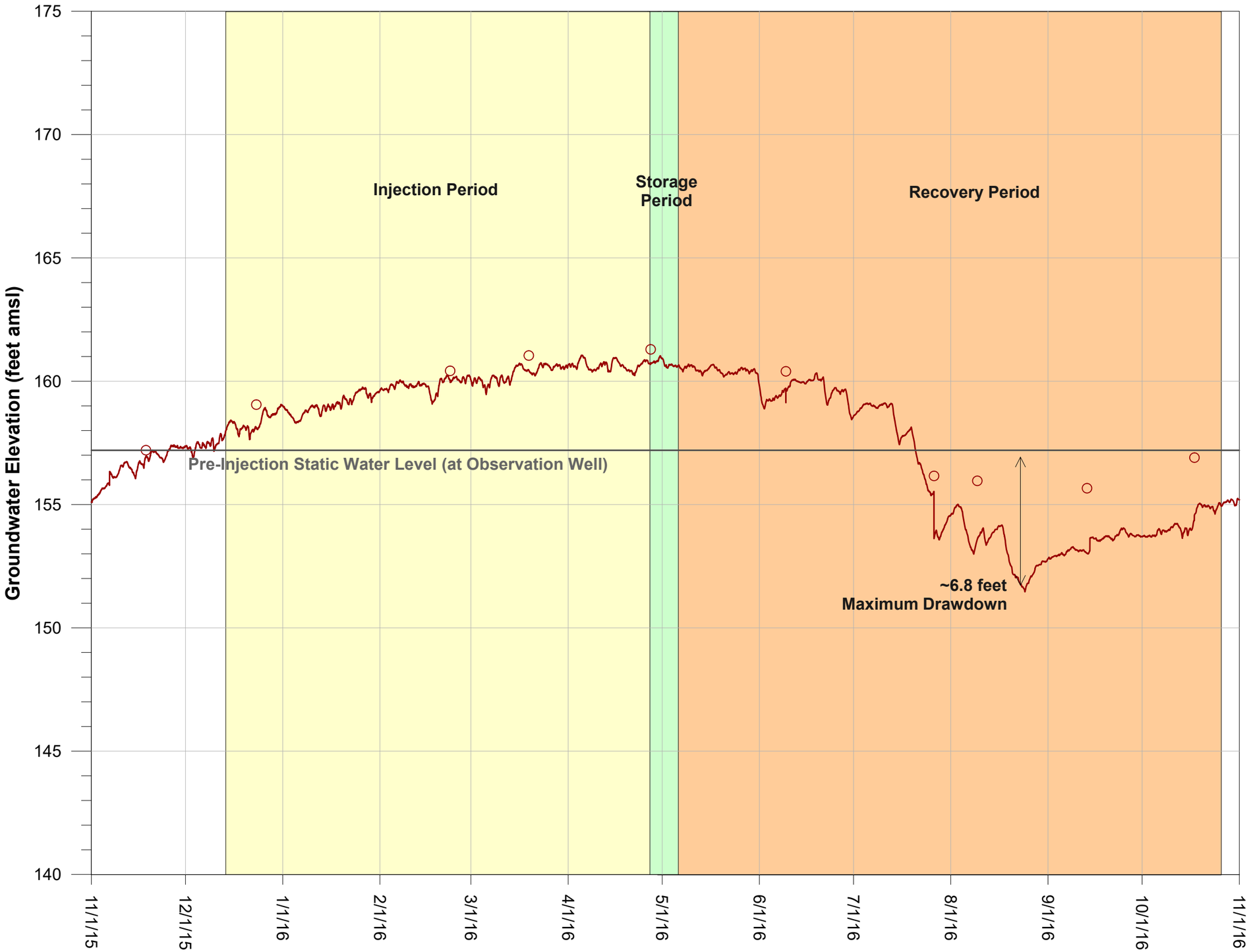

Figure 6
Observation Well Hydrograph during ASR Cycle 6

Liberty High School
Aquifer Storage and Recovery
Permit Application and
Supplemental Information

Observation Well (WASH 5344) Manual Measurement

Observation Well (WASH 5344) Transducer Measurement

Note:
Some of the transducer measurements were adjusted to match the manual measurements because of erroneous shifts in the data.

Water level measurements are collected by a transducer at a 30-minute interval.

amsl = above mean sea level

GSI Water Solutions, Inc.

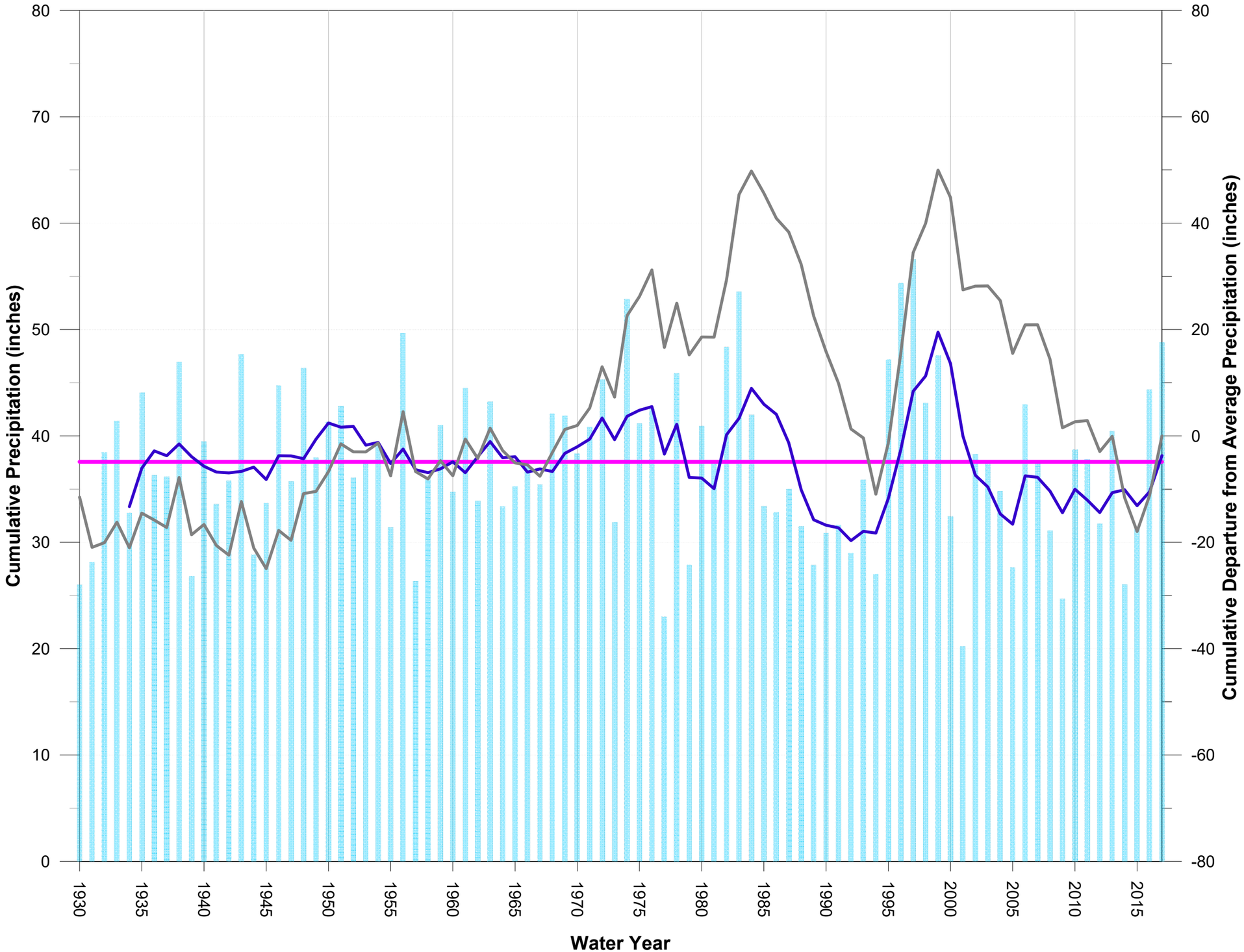

Figure 7
Cumulative Departure from the Average Precipitation at the Hillsboro Airport

Liberty High School
Aquifer Storage and Recovery
Permit Application and
Supplemental Information

- Cumulative Departure from Average Precipitation
- 5-Year Moving Average Precipitation
- Average Annual Precipitation (1930 - 2017)
- Annual Precipitation for Hillsboro

Note:
Two rain gauges provided the long-tem rain gauge data for this anlaysis:

USC00353908 Hillsboro (1930 - 2003)
USW00094261 Hillsboro Airport (1998 - Present)

The consistency of data between the two locations was evaluated through a comparison of slopes of the cumulative annual precipitation curves. Data from both gauges overlapped from 1998 - 2003. Annual data from each gauge were averaged for the period of overlap.

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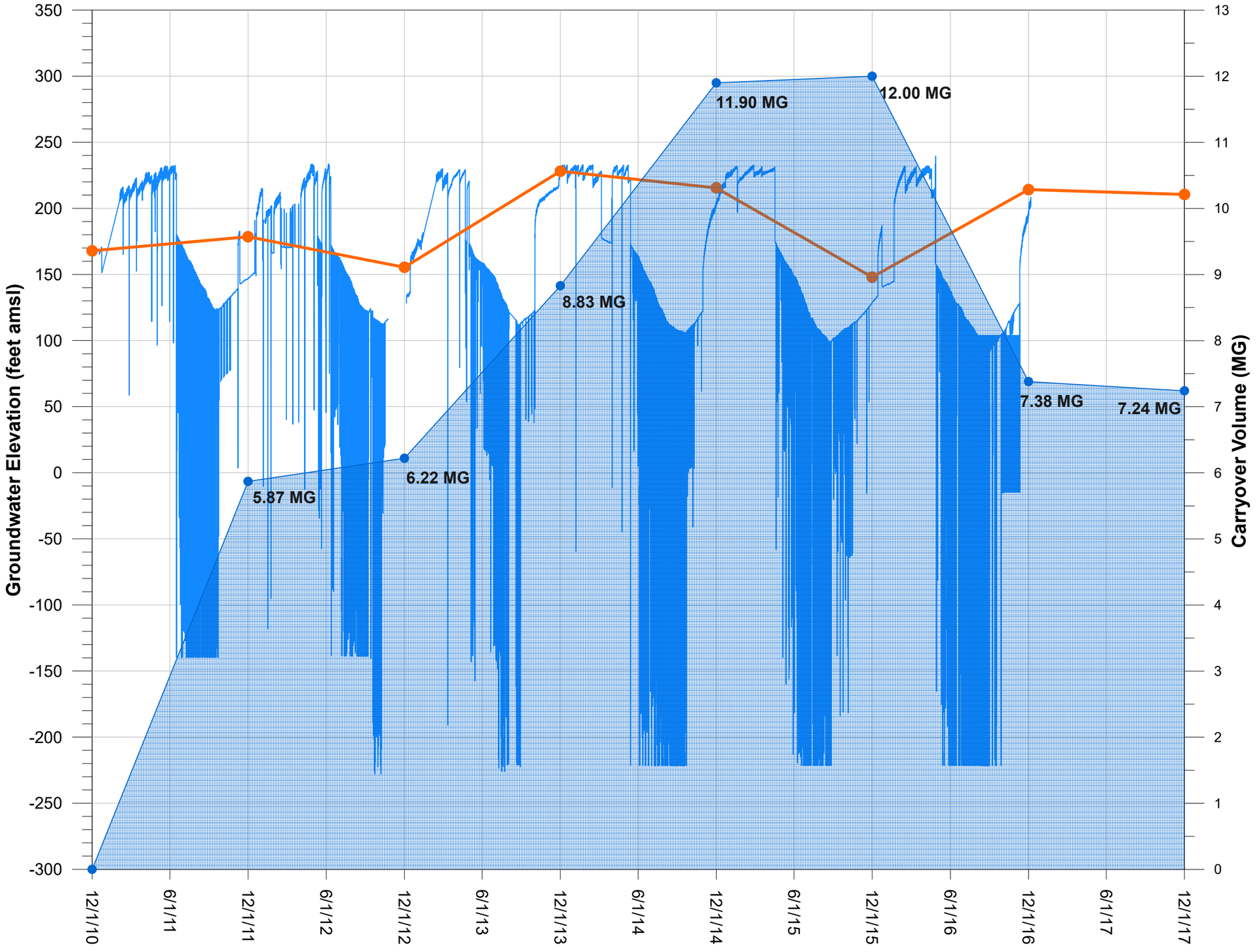
Figure 8
ASR Well Historical Hydrograph and ASR Carryover Volume

Liberty High School
Aquifer Storage and Recovery
Permit Application and
Supplemental Information



Carryover Volume
Transducer Recorded Groundwater Elevation
Average December Groundwater Elevation

Note:
Water level measurements were collected by a transducer at a 30-minute interval.

amsl = above mean sea level
MG = million gallons

GSI Water Solutions, Inc.

Appendix A

PERMIT APPLICATION FORM

ASR Permit No. _____
(ASSIGNED AFTER FILING)

STATE OF OREGON
WATER RESOURCES DEPARTMENT
APPLICATION FOR PERMANENT PERMIT
FOR
AQUIFER STORAGE AND RECOVERY (ASR)

Applicant(s): Hillsboro School District

Contact Person: Dave Peterson **E-mail:** Petersod@hsd.k12.or.us

Mailing Address: 4901 SE Witch Hazel

Hillsboro	OR	97123	503.844.1320
City	State	Zip	Phone #

1. **DATE(S) OF PRE-APPLICATION CONFERENCE(S):** August 31, 2017

2. **SOURCE OF INJECTION WATER for ASR:** Tualatin River, a tributary of the Willamette River, using municipal water right Certificates 67891 and 85913, Sain Creek, a tributary of Scoggins Creek or Scoggin Creek, a tributary of the Tualatin River, using water right Certificates 81026 and 81027, Bull Run Watershed appropriated by Oregon Revised Statute 538.420, and groundwater from the Columbia South Shore Well Field under permits G-10479, G-10124, G-8755, and G-10455

3. **MAXIMUM DIVERSION RATE:** 100 gpm

4. **MAXIMUM INJECTION RATE AT EACH WELL(S):** 65 gpm

5. **MAXIMUM STORAGE VOLUME:** 25 million gallons

6. **MAXIMUM STORAGE DURATION:** Ongoing, including carryover from pilot testing

7. **MAXIMUM WITHDRAWAL RATE AT EACH WELL(S):** 425 gpm

8. **ASR LIMITED LICENSE USED FOR TESTING:** #017

NOTE: The materials required by rule for an ASR permit are extensive. The items on this sheet consist of those outlined in OAR 690-350-030(4)(a)(A-C, E). Please consult the rule and provide as attachments to this form the other requirements in OAR 690-350-030(4)(a)(D, F-I) and (4)(b).

Signature of Applicant _____ **Date** 5/31/18

Title of Applicant Facilities Supervisor, Hillsboro School District

Appendix B

WATER RIGHT HOLDER AGREEMENT

Joint Water Commission

General Manager
Kevin Hanway
150 E. Main Street
Hillsboro, OR 97123
503-615-6585

May 3, 2018

Jenn Woody
Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem, OR 97301

Subject: Hillsboro School District's ASR Permit Application

Dear Ms. Woody;

I am aware that the Hillsboro School District has developed an aquifer storage and recovery (ASR) project at Liberty High School, and is applying for an ASR permit. As part of this project, the School District injects water purchased from Tualatin Valley Water District (TVWD) and provided by the Joint Water Commission (JWC) into its well. Injection occurs between November and June, provided that live flow is available. The School District recovers the water during the irrigation season for purposes of irrigating the school's playing fields.

The City of Hillsboro (City) is one of the JWC's member agencies and serves as the managing agency. The City is the holder of Certificates 67891, 81026, 81027 and 85913, which are used to provide water to TVWD during the winter months. (Copies of these certificates are attached.) As the holder of these water rights, the City gives the School District permission to use water under its water rights for ASR.

Sincerely,

Niki Iverson
Water Resources Manager

Enclosures:

City of Hillsboro Water Right Certificates 67891, 81026, 81027 and 85913

STATE OF OREGON

COUNTY OF WASHINGTON

CERTIFICATE OF WATER RIGHT

THIS CERTIFICATE ISSUED TO

CITY OF HILLSBORO
205 SE 2ND AVENUE
HILLSBORO, OREGON 97123

confirms the right to use the waters of THE TUALATIN RIVER, a tributary of THE WILLAMETTE RIVER, for MUNICIPAL USE.

This right was perfected under PERMIT 10408. The date of priority is AUGUST 15, 1930. This right is limited to 9.0 CUBIC FEET PER SECOND or its equivalent in case of rotation, measured at the point of diversion from the source. The quantity of water diverted at the new point of diversion shall not exceed the quantity of water available at the old point of diversion, and shall not exceed 9.0 cubic feet per second.

The points of diversion are located as follows:

HAINES FALLS INTAKE - SE 1/4 SE 1/4, SECTION 20, T 1 S, R 5 W, W.M.; 1100 FEET NORTH AND 200 FEET WEST FROM THE SOUTHEAST CORNER OF SECTION 20. SPRING HILL INTAKE - SW 1/4 SW 1/4, SECTION 8, T 1 S, R 3 W, W.M.; 500 FEET NORTH AND 410 FEET EAST FROM THE SOUTHWEST CORNER OF SECTION 8.

The use shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the place of use to which this right is appurtenant is as follows:

S 1/2
NW 1/4
SECTION 32
TOWNSHIP 1 NORTH, RANGE 2 WEST, W.M.

S 1/2
SECTION 33

S 1/2
SECTION 34

S 1/2
SECTION 35
TOWNSHIP 1 NORTH, RANGE 3 WEST, W.M.

ALL
SECTION 7

NE 1/4
SECTION 16

ALL
SECTION 17

ALL
SECTION 18

N 1/2
SECTION 19
TOWNSHIP 1 SOUTH, RANGE 1 WEST, W.M.

SEE NEXT PAGE

SE 1/4
SECTION 1

E 1/2
SECTION 4

ALL
SECTION 5

N 1/2
SE 1/4
SECTION 6

ALL
SECTION 9

N 1/2
SECTION 10

N 1/2
SECTION 11

ALL
SECTION 12

ALL
SECTION 13

W 1/2
SECTION 24
TOWNSHIP 1 SOUTH, RANGE 2 WEST, W.M.

N 1/2
SECTION 1

N 1/2
SECTION 2

N 1/2
SECTION 3

N 1/2
SECTION 4

N 1/2
SECTION 5

S 1/2
SECTION 6

NW 1/4
SECTION 7
TOWNSHIP 1 SOUTH, RANGE 3 WEST, W.M.

E 1/2
SECTION 12

N 1/2
SW 1/4
SECTION 13

SE 1/4
SECTION 14
TOWNSHIP 1 SOUTH, RANGE 4 WEST, W.M.

SEE NEXT PAGE

NE 1/4
SW 1/4
SECTION 23

W 1/2
SECTION 26

E 1/2
SECTION 27

N 1/2
SECTION 31

NW 1/4
SE 1/4
SECTION 32

NE 1/4
SW 1/4
SECTION 33

N 1/2
SECTION 34

ALL
SECTION 35
TOWNSHIP 1 SOUTH, RANGE 4 WEST, W.M.

S 1/2
SECTION 25

N 1/2
SECTION 36
TOWNSHIP 1 SOUTH, RANGE 5 WEST, W.M.

This certificate is issued to confirm an ADDITIONAL POINT OF DIVERSION approved by an order of the Water Resources Director entered MARCH 7, 1977, and supersedes Certificate 23540, State Record of Water Right Certificates.

The issuance of this superseding certificate does not confirm the status of the water right in regard to the provisions of ORS 540.610 pertaining to forfeiture or abandonment.

The right to the use of the water for the above purpose is restricted to beneficial use on the lands or place of use described. The use confirmed herein may be made only at times when sufficient water is available to satisfy all prior rights, including rights for maintaining instream flows.

WITNESS the signature of the Water Resources Director, affixed OCTOBER 12, 1992.

/s/ MARTHA O. PAGEL

Martha O. Pagel

Recorded in State Record of Water Right Certificates numbered 67891.

T-3130.JSR

STATE OF OREGON

COUNTY OF WASHINGTON

CERTIFICATE OF WATER RIGHT

THIS CERTIFICATE ISSUED TO

CITY OF HILLSBORO
123 WEST MAIN
HILLSBORO, OREGON 97123

confirms the right to use the waters of SAIN CREEK, a tributary of SCOGGINS CREEK, for MUNICIPAL SUPPLY.

This right was perfected under Permit 1136. The date of priority is JANUARY 22, 1912. The amount of water to which this right is entitled is limited to an amount actually beneficially used and shall not exceed 3.0 CUBIC FEET PER SECOND, or its equivalent in case of rotation, measured at the point of diversion from the source. The quantity of water diverted at the new point of diversion, shall not exceed the quantity of water available at the original point of diversion.

The points of diversion is located as follows:

SAIN CREEK (ORIGINAL POINT OF DIVERSION) - SW 1/4 SW 1/4, SECTION 14, TOWNSHIP 1 SOUTH, RANGE 5 WEST, W.M.; 1130 FEET NORTH FROM THE SW CORNER OF SECTION 14;

SCOGGINS CREEK (NEW POINT OF DIVERSION) - NE 1/4 NE 1/4, AS PROJECTED WITHIN MARTIN DLC 52, SECTION 20, TOWNSHIP 1 SOUTH, RANGE 4 WEST, W.M.; 707 FEET SOUTH AND 441 FEET WEST FROM THE NE CORNER OF SECTION 20;

TUALATIN RIVER REDIVERSION - SW 1/4 SW 1/4, SECTION 8, TOWNSHIP 1 SOUTH, RANGE 3 WEST, W.M.; 500 FEET NORTH AND 450 FEET EAST FROM THE SW CORNER OF SECTION 8.

The use shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the place of use to which this right is appurtenant is as follows:

THE CITY OF HILLSBORO
WASHINGTON COUNTY
OREGON

This is a final order in other than contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review of the order must be filed within the 60 days of the date of service.

T-6308A.SB

Certificate Number 81026

Water may be applied to lands which are not specifically described above, provided the holder of this right complies with ORS 540.510(3).

If loss of water is determined by the Watermaster, for example seepage or evaporation, the rate of diversion at the new point of diversion shall be reduced by an amount equal to the losses between the old and new points of diversion, or appropriated under another water right.

The City of Hillsboro shall install and maintain a staff gage, an in-line flow meter, weir, or other suitable device for measuring and/or recording the quantity of water diverted at both the old and new points of diversion. The type and plans of the staff gage, headgate, and /or measuring devices must be approved by the Department prior to beginning construction and shall be installed under the general supervision of the Department.

This certificate is issued to confirm a change in POINT OF DIVERSION approved by an order of the Water Resources Director entered MARCH 28, 1991, and supersedes Certificate 1882, State Record of Water Right Certificates.

The issuance of this superseding certificate does not confirm the status of the water right in regard to the provisions of ORS 540.610 pertaining to forfeiture or abandonment.

The use confirmed herein may be made only at times when sufficient water is available to satisfy all prior rights, including rights for maintaining instream flows.

Issued December 16, 2004.

Phillip C. Ward, Director
Water Resources Department

Recorded in State Record of Water Right Certificates Number 81026.

T-6308A.SB

STATE OF OREGON

COUNTY OF WASHINGTON

CERTIFICATE OF WATER RIGHT

THIS CERTIFICATE ISSUED TO

CITY OF HILLSBORO
123 WEST MAIN
HILLSBORO, OREGON 97123

confirms the right to use the waters of SAIN CREEK, a tributary of SCOGGINS CREEK, for MUNICIPAL SUPPLY.

This right was perfected under Permit 2443. The date of priority is May 1, 1915. The amount of water to which this right is entitled is limited to an amount actually beneficially used and shall not exceed 2.0 CUBIC FEET PER SECOND, or its equivalent in case of rotation, measured at the point of diversion from the source. The quantity of water diverted at the new point of diversion, shall not exceed the quantity of water available at the original point of diversion.

The points of diversion is located as follows:

SAIN CREEK (ORIGINAL POINT OF DIVERSION) - SW 1/4 SW 1/4, SECTION 14, TOWNSHIP 1 SOUTH, RANGE 5 WEST, W.M.; 1130 FEET NORTH FROM THE SW CORNER OF SECTION 14;

SCOGGINS CREEK (NEW POINT OF DIVERSION) - NE 1/4 NE 1/4, AS PROJECTED WITHIN MARTIN DLC 52, SECTION 20, TOWNSHIP 1 SOUTH, RANGE 4 WEST, W.M.; 707 FEET SOUTH AND 441 FEET WEST FROM THE NE CORNER OF SECTION 20; AND

TUALATIN RIVER REDIVERSION - SW 1/4 SW 1/4, SECTION 8, TOWNSHIP 1 SOUTH, RANGE 3 WEST, W.M.; 500 FEET NORTH AND 450 FEET EAST FROM THE SW CORNER OF SECTION 8.

The use shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the place of use to which this right is appurtenant is as follows:

THE TOWNS OF GASTON, DILLEY, SOUTH FOREST GROVE, CORNELIUS, HILLSBORO, BEAVERTON, AS WELL AS THE TERRITORY BETWEEN SAID TOWNS AND VILLAGES, IN WASHINGTON COUNTY, OREGON

This is a final order in other than contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review of the order must be filed within the 60 days of the date of service.

T-6308B.SB

Certificate Number 81027

Water may be applied to lands which are not specifically described above, provided the holder of this right complies with ORS 540.510(3).

If loss of water is determined by the Watermaster, for example seepage or evaporation, the rate of diversion at the new point of diversion shall be reduced by an amount equal to the losses between the old and new points of diversion, or appropriated under another water right.

The City of Hillsboro shall install and maintain a staff gage, an in-line flow meter, weir, or other suitable device for measuring and/or recording the quantity of water diverted at both the old and new point of diversion. The type and plans of the staff gage, headgate, and/or measuring devices must be approved by the Department prior to beginning construction and shall be installed under the general supervision of the Department.

This certificate is issued to confirm a change in POINT OF DIVERSION approved by an order of the Water Resources Director entered MARCH 28, 1991, and supersedes Certificate 3930, State Record of Water Right Certificates.

The issuance of this superseding certificate does not confirm the status of the water right in regard to the provisions of ORS 540.610 pertaining to forfeiture or abandonment.

The use confirmed herein may be made only at times when sufficient water is available to satisfy all prior rights, including rights for maintaining instream flows.

Issued December 16, 2004.

Phillip C. Ward, Director
Water Resources Department

Recorded in State Record of Water Right Certificates Number 81027.

T-6308B.SB

STATE OF OREGON

COUNTIES OF WASHINGTON AND YAMHILL

CERTIFICATE OF WATER RIGHT

THIS CERTIFICATE ISSUED TO

CITY OF HILLSBORO
150 MAIN STREET, THIRD FLOOR
HILLSBORO OR 97123

confirms the right to use the waters of TUALATIN RIVER, a tributary of the Willamette River, for MUNICIPAL USE.

This right was perfected under Permit 46423. The date of priority is FEBRUARY 6, 1974. The amount of water to which this right is entitled is limited to an amount actually used beneficially, and shall not exceed 43.0 CUBIC FEET PER SECOND or its equivalent in case of rotation, measured at the point of diversion.

The point of diversion is located as follows:

Twp	Rng	Mer	Sec	Q-Q	Measured Distances
1 S	3 W	WM	8	SW SW	500 FEET NORTH & 410 FEET EAST FROM SW CORNER, SECTION 8

The right to the use of the water for the above purpose is restricted to beneficial use on the lands or place of use described.

A description of the place of use to which this right is appurtenant is as follows:

Twp	Rng	Mer	Sec	Q-Q
1 N	2 W	WM	19	S 1/2 S 1/2
1 N	2 W	WM	20	S 1/2 S 1/2
1 N	2 W	WM	21	S 1/2 S 1/2
1 N	2 W	WM	22	S 1/2 S 1/2
1 N	2 W	WM	23	S 1/2 SW 1/4
1 N	2 W	WM	26	W 1/2
1 N	2 W	WM	27	ALL
1 N	2 W	WM	28	ALL
1 N	2 W	WM	29	ALL
1 N	2 W	WM	30	ALL
1 N	2 W	WM	31	ALL
1 N	2 W	WM	32	ALL

NOTICE OF RIGHT TO PETITION FOR RECONSIDERATION OR JUDICIAL REVIEW

This is an order in other than a contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60-day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080, you may either petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied. In addition, under ORS 537.260 any person with an application, permit or water right certificate subsequent in priority may jointly or severally contest the issuance of the certificate at any time before it has issued, and after the time has expired for the completion of the appropriation under the permit, or within three months after issuance of the certificate.

Twp	Rng	Mer	Sec	Q-Q
1 N	2 W	WM	33	ALL
1 N	2 W	WM	34	ALL
1 N	2 W	WM	35	W 1/2
1 N	3 W	WM	24	S 1/2 SE 1/4
1 N	3 W	WM	25	E 1/2
1 N	3 W	WM	25	N 1/2 NW 1/4
1 N	3 W	WM	25	SE 1/4 NW 1/4
1 N	3 W	WM	25	E 1/2 SW 1/4
1 N	3 W	WM	30	SW 1/4
1 N	3 W	WM	31	ALL
1 N	3 W	WM	32	S 1/2 NE 1/4
1 N	3 W	WM	32	S 1/2 NW 1/4
1 N	3 W	WM	32	S 1/2
1 N	3 W	WM	33	S 1/2 N 1/2
1 N	3 W	WM	33	S 1/2
1 N	3 W	WM	34	S 1/2 N 1/2
1 N	3 W	WM	34	S 1/2
1 N	3 W	WM	35	SW 1/4 NW 1/4
1 N	3 W	WM	35	S 1/2
1 N	3 W	WM	36	E 1/2
1 N	3 W	WM	36	E 1/2 NW 1/4
1 N	3 W	WM	36	SW 1/4
1 N	4 W	WM	25	NW 1/4 NW 1/4
1 N	4 W	WM	25	S 1/2 NW 1/4
1 N	4 W	WM	25	S 1/2
1 N	4 W	WM	26	NE 1/4 NE 1/4
1 N	4 W	WM	26	S 1/2 NE 1/4
1 N	4 W	WM	26	SE 1/4 NW 1/4
1 N	4 W	WM	26	S 1/2
1 N	4 W	WM	35	NE 1/4
1 N	4 W	WM	35	N 1/2 NW 1/4
1 N	4 W	WM	35	SE 1/4 NW 1/4
1 N	4 W	WM	35	N 1/2 SE 1/4
1 N	4 W	WM	35	SE 1/4 SE 1/4
1 N	4 W	WM	36	ALL
1 S	1 W	WM	5	S 1/2 S 1/2
1 S	1 W	WM	7	E 1/2 SW 1/4
1 S	1 W	WM	7	SW 1/4 SW1/4
1 S	1 W	WM	8	ALL
1 S	1 W	WM	9	E 1/2 NE 1/4
1 S	1W	WM	9	SW 1/4 NE 1/4
1 S	1 W	WM	9	W 1/2 SW 1/4
1 S	1 W	WM	9	SE 1/4 SW 1/4
1 S	1W	WM	9	SE 1/4
1 S	1 W	WM	10	N 1/2
1 S	1 W	WM	10	SW 1/4
1 S	1 W	WM	10	N 1/2 SE 1/4
1 S	1 W	WM	14	SW 1/4 NE 1/4
1 S	1 W	WM	14	NE 1/4 NW 1/4

Twp	Rng	Mer	Sec	Q-Q
1 S	1 W	WM	14	S 1/2 NW 1/4
1 S	1 W	WM	14	SW 1/4
1 S	1 W	WM	14	W 1/2 SE 1/4
1 S	1 W	WM	15	W 1/2 NE 1/4
1 S	1 W	WM	15	SE 1/4 NE 1/4
1 S	1 W	WM	15	W 1/2
1 S	1 W	WM	15	SE 1/4
1 S	1 W	WM	16	ALL
1 S	1 W	WM	17	ALL
1 S	1 W	WM	20	ALL
1 S	1 W	WM	21	ALL
1 S	1 W	WM	22	ALL
1 S	1 W	WM	23	W 1/2
1 S	1 W	WM	23	W 1/2 NE 1/4
1 S	1 W	WM	23	SE 1/4 NE 1/4
1 S	1 W	WM	26	W 1/2 NW 1/4
1 S	1 W	WM	26	W 1/2 SW 1/4
1 S	1 W	WM	27	ALL
1 S	1 W	WM	28	ALL
1 S	1 W	WM	29	ALL
1 S	1 W	WM	32	ALL
1 S	1 W	WM	33	NE 1/4
1 S	1 W	WM	33	NW 1/4
1 S	1 W	WM	33	N 1/2 SW 1/4
1 S	1 W	WM	33	SW 1/4 SW 1/4
1 S	2 W	WM	2	W 1/2
1 S	2 W	WM	3	ALL
1 S	2 W	WM	4	ALL
1 S	2 W	WM	5	ALL
1 S	2 W	WM	6	ALL
1 S	2 W	WM	7	E 1/2 NE 1/4
1 S	2 W	WM	7	NW 1/4
1 S	2 W	WM	7	N 1/2 SW 1/4
1 S	2 W	WM	7	NE 1/4 SE 1/4
1 S	2 W	WM	8	ALL
1 S	2 W	WM	9	N 1/2
1 S	2 W	WM	9	N 1/2 SW 1/4
1 S	2 W	WM	9	S 1/2 SW 1/4
1 S	2 W	WM	9	SE 1/4
1 S	2 W	WM	10	ALL
1 S	2 W	WM	11	NW 1/4
1 S	2 W	WM	11	N 1/2 SW 1/4
1 S	2 W	WM	11	N 1/2 SE 1/4
1 S	2 W	WM	11	SE 1/4 SE 1/4
1 S	2 W	WM	12	S 1/2
1 S	2 W	WM	14	E 1/2 NE 1/4
1 S	2 W	WM	14	SW 1/4 NE 1/4
1 S	2 W	WM	16	NW 1/4 NW 1/4
1 S	2 W	WM	17	N 1/2 NE 1/4

Twp	Rng	Mer	Sec	Q-Q
1 S	2 W	WM	17	NE 1/4 NW 1/4
1 S	3 W	WM	1	N 1/2
1 S	3 W	WM	1	NE 1/4 SW 1/4
1 S	3 W	WM	1	N 1/2 SE 1/4
1 S	3 W	WM	2	N 1/2 N 1/2
1 S	3 W	WM	3	NE 1/4 NE 1/4
1 S	3 W	WM	3	W 1/2 NE 1/4
1 S	3 W	WM	3	NW 1/4
1 S	3 W	WM	4	N 1/2
1 S	3 W	WM	4	N 1/2 SW 1/4
1 S	3 W	WM	4	SE 1/4 SW 1/4
1 S	3 W	WM	4	N 1/2 SE 1/4
1 S	3 W	WM	4	SW 1/4 SE 1/4
1 S	3 W	WM	5	N 1/2
1 S	3 W	WM	5	SW 1/4
1 S	3 W	WM	5	N 1/2 SE 1/4
1 S	3 W	WM	5	SW 1/4 SE 1/4
1 S	3 W	WM	6	N 1/2
1 S	3 W	WM	6	N 1/2 SW 1/4
1 S	3 W	WM	6	SE 1/4 SW 1/4
1 S	3 W	WM	6	SE 1/4
1 S	3 W	WM	7	NW 1/4 NE 1/4
1 S	3 W	WM	7	NE 1/4 NW 1/4
1 S	3 W	WM	8	N 1/2 NW 1/4
1 S	3 W	WM	31	NW 1/4
1 S	3 W	WM	31	S 1/2
1 S	3 W	WM	32	SW 1/4
1 S	4 W	WM	1	NE 1/4
1 S	4 W	WM	1	E 1/2 NW 1/4
1 S	4 W	WM	1	S 1/2 SW 1/4
1 S	4 W	WM	1	NE 1/4 SE 1/4
1 S	4 W	WM	1	S 1/2 SE 1/4
1 S	4 W	WM	2	SE 1/4 SE 1/4
1 S	4 W	WM	11	NE 1/4 NE 1/4
1 S	4 W	WM	12	ALL
1 S	4 W	WM	13	N 1/2 NE 1/4
1 S	4 W	WM	13	SW 1/4 NE 1/4
1 S	4 W	WM	13	NW 1/4
1 S	4 W	WM	13	N 1/2 SW
1 S	4 W	WM	13	S 1/2 SW 1/4
1 S	4 W	WM	13	NW 1/4 SE 1/4
1 S	4 W	WM	14	S 1/2 NE 1/4
1 S	4 W	WM	14	SE 1/4 NW 1/4
1 S	4 W	WM	14	E 1/2 SW 1/4
1 S	4 W	WM	14	SE 1/4
1 S	4 W	WM	20	E 1/2 NE 1/4
1 S	4 W	WM	20	NE 1/4 SE 1/4
1 S	4 W	WM	21	S 1/2 NE 1/4
1 S	4 W	WM	21	W 1/2 NW 1/4

Twp	Rng	Mer	Sec	Q-Q
1 S	4 W	WM	21	SE 1/4 SW 1/4
1 S	4 W	WM	21	N 1/2 SW 1/4
1 S	4 W	WM	21	SE 1/4 SW 1/4
1 S	4 W	WM	21	SE 1/4
1 S	4 W	WM	22	S 1/2 SE 1/4
1 S	4 W	WM	23	N 1/2
1 S	4 W	WM	23	SW 1/4
1 S	4 W	WM	23	W 1/2 SE 1/4
1 S	4 W	WM	23	SE 1/4 SE 1/4
1 S	4 W	WM	25	NW 1/4 NW 1/4
1 S	4 W	WM	26	N 1/2 NE 1/4
1 S	4 W	WM	26	W 1/2
1 S	4 W	WM	27	N 1/2
1 S	4 W	WM	27	S 1/2 SW 1/4
1 S	4 W	WM	27	NE 1/4 SE 1/4
1 S	4 W	WM	27	S 1/2 SE 1/4
1 S	4 W	WM	28	N 1/2 NE 1/4
1 S	4 W	WM	28	SE 1/4 NE 1/4
1 S	4 W	WM	28	S 1/2 SE 1/4
1 S	4 W	WM	30	S 1/2 SW 1/4
1 S	4 W	WM	30	S 1/2 SE 1/4
1 S	4 W	WM	31	NE 1/4
1 S	4 W	WM	31	N 1/2 NW 1/4
1 S	4 W	WM	32	S 1/2 NE 1/4
1 S	4 W	WM	32	NW 1/4
1 S	4 W	WM	32	N 1/2 SW 1/4
1 S	4 W	WM	32	SE 1/4
1 S	4 W	WM	33	NE 1/4
1 S	4 W	WM	33	NE 1/4 NW 1/4
1 S	4 W	WM	33	S 1/2 NW 1/4
1 S	4 W	WM	33	N 1/2 SW 1/4
1 S	4 W	WM	33	SW 1/4 SW 1/4
1 S	4 W	WM	34	NE 1/4
1 S	4 W	WM	34	N 1/2 NW 1/4
1 S	4 W	WM	34	SW 1/4 NW 1/4
1 S	4 W	WM	35	N 1/2 NW 1/4
1 S	4 W	WM	35	SW 1/4 NW 1/4
1 S	4 W	WM	35	NE 1/4 SW 1/4
1 S	4 W	WM	35	S 1/2 SW 1/4
1 S	4 W	WM	35	SE 1/4
1 S	4 W	WM	36	E 1/2 NE 1/4
1 S	4 W	WM	36	SE 1/4 NW 1/4
1 S	4 W	WM	36	E 1/2 SW 1/4
1 S	4 W	WM	36	SE 1/4
1 S	5 W	WM	25	NW 1/4 SW 1/4
1 S	5 W	WM	25	S 1/2 S 1/2
1 S	5 W	WM	36	N 1/2 N 1/2
2 S	1 W	WM	5	N 1/2
2 S	3 W	WM	2	E 1/2 SW 1/4

Twp	Rng	Mer	Sec	Q-Q
2 S	3 W	WM	2	SE 1/4
2 S	3 W	WM	3	S 1/2
2 S	3 W	WM	4	ALL
2 S	3 W	WM	5	ALL
2 S	3 W	WM	6	ALL
2 S	3 W	WM	7	E 1/2
2 S	3 W	WM	8	ALL
2 S	3 W	WM	9	ALL
2 S	3 W	WM	10	N 1/2 NE 1/4
2 S	3 W	WM	10	SE 1/4 NE 1/4
2 S	3 W	WM	10	NW 1/4
2 S	3 W	WM	10	SW 1/4
2 S	3 W	WM	11	NE 1/4
2 S	3 W	WM	11	E 1/2 NW 1/4
2 S	3 W	WM	15	S 1/2 NE 1/4
2 S	3 W	WM	15	NW 1/4
2 S	3 W	WM	15	S 1/2
2 S	3 W	WM	16	ALL
2 S	3 W	WM	17	ALL
2 S	3 W	WM	18	ALL
2 S	3 W	WM	19	ALL
2 S	3 W	WM	20	N 1/2
2 S	3 W	WM	20	SW 1/4
2 S	3 W	WM	20	N 1/2 SE 1/4
2 S	3 W	WM	20	SW 1/4 SE 1/4
2 S	3 W	WM	21	ALL
2 S	3 W	WM	22	N 1/2 NE 1/4
2 S	3 W	WM	22	SW 1/4 NE 1/4
2 S	3 W	WM	22	W 1/2
2 S	3 W	WM	22	W 1/2 SE 1/4
2 S	4 W	WM	1	E 1/2
2 S	4 W	WM	1	NE 1/4 NW 1/4
2 S	4 W	WM	2	NE 1/4 NE 1/4
2 S	4 W	WM	2	S 1/2 NE 1/4
2 S	4 W	WM	2	NW 1/4
2 S	4 W	WM	2	S 1/2
2 S	4 W	WM	3	ALL
2 S	4 W	WM	4	E 1/2
2 S	4 W	WM	9	NE 1/4
2 S	4 W	WM	9	E 1/2 SE 1/4
2 S	4 W	WM	10	N 1/2
2 S	4 W	WM	10	SW 1/4
2 S	4 W	WM	10	N 1/2 SE 1/4
2 S	4 W	WM	11	N 1/2
2 S	4 W	WM	11	N 1/2 SW 1/4
2 S	4 W	WM	11	SE 1/4 SW 1/4
2 S	4 W	WM	11	SE 1/4
2 S	4 W	WM	12	ALL
2 S	4 W	WM	13	ALL

Twp	Rng	Mer	Sec	Q-Q
2 S	4 W	WM	14	NE 1/4
2 S	4 W	WM	14	E 1/2 NW 1/4
2 S	4 W	WM	14	E 1/2 SE 1/4
2 S	4 W	WM	24	S 1/2 SE 1/4

Water may be applied to lands which are not specifically described above, provided the holder of this right complies with ORS 540.510(3).

The use of water allowed herein may be made only at times when sufficient water is available to satisfy all prior rights, including prior rights for maintaining instream flows.

Issued NOV 17 2009.

Phillip C. Ward, Director
Water Resources Department

PORTLAND WATER BUREAU
FROM FOREST TO FAUCET

Nick Fish, Commissioner
Michael Stuhr, P.E., Administrator

1120 SW 5th Avenue
Portland, Oregon 97204-1926
Information: 503-823-7404
www.portlandoregon.gov/water

May 4, 2018

Jenn Woody
Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem, OR 97301

Subject: Hillsboro School District's ASR Permit Application

Dear Ms. Woody;

The Portland Water Bureau (PWB) is aware that the Hillsboro School District has developed an aquifer storage and recovery (ASR) project at Liberty High School, and is applying for an ASR permit. As part of this project, the PWB understands the School District injects water purchased from Tualatin Valley Water District (TVWD) into its well outside of the summer months. The PWB is one of the entities that provides water to TVWD as a wholesale water customer. (The School District recovers the water during the summer months for purposes of irrigating the school's playing fields.)

The PWB appropriates water from the Bull Run Watershed, as authorized by Oregon Revised Statute (ORS) 538.420. The PWB also appropriates groundwater, as necessary, to serve as a secondary source for customers served by the Bull Run supply and to supplement supply during the summer high demand season. The PWB appropriates groundwater from its Columbia South Shore Well Field under Permits G-10479, G-10124, G-8755, and G-10455, and Certificates 89117 and 89115.

The PWB grants the School District permission to use water for ASR that was appropriated by PWB under ORS 538.420 and the above-described groundwater rights, and provided to TVWD.

Sincerely,

Michael Stuhr, P.E.
Water Bureau Administrator

STATE OF OREGON

County of MULTNOMAH

PERMIT TO APPROPRIATE THE PUBLIC WATERS

This is to certify that I have examined APPLICATION G-11354 and do hereby grant the same SUBJECT TO EXISTING RIGHTS and the following limitations and conditions:

This permit is issued to City of Portland, a municipal corporation of the State of Oregon of 1120 SW 5th Avenue, Portland, Oregon 97204, phone 796-7404, for use of the waters from Well 34,
for the PURPOSE of to provide an emergency and supplemental water supply for the Portland Municipal water system

that the PRIORITY OF THE RIGHT dates from March 1, 1985

and is limited to the amount of water which can be applied to beneficial use and shall not exceed 8.4 cubic foot per second

measured at the point of diversion from the well , or its equivalent in case of rotation with other water users.

The well is to be LOCATED: 1240 feet South and 2350 feet East from the Northwest Corner of Section 15, being within the NE 1/4 NW 1/4 of Section 15, Township 1 North, Range 2 East, WM, in the County of Multnomah.

A description of the PLACE OF USE under the permit, and to which such right is appurtenant, is as follows:

SEE NEXT PAGE

Township 1 South, Range 3 East, WM	Section 1	NW 1/4	NW 1/4
		SW 1/4	NW 1/4
		NW 1/4	SW 1/4
		SW 1/4	SW 1/4
	Section 2 through 11	ALL	
	Section 12	NW 1/4	NW 1/4
		SW 1/4	NW 1/4
		NW 1/4	SW 1/4
		SW 1/4	SW 1/4
	Section 14	NW 1/4	
		SW 1/4	
		NW 1/4	NE 1/4
		NE 1/4	NE 1/4
		NW 1/4	SE 1/4
		SW 1/4	SE 1/4
	Section 15, 16 and 17	ALL	
	Section 18	NW 1/4	NW 1/4
		SW 1/4	NW 1/4
		NW 1/4	SW 1/4
		SW 1/4	SW 1/4
		NE 1/4	NE 1/4
		SE 1/4	NE 1/4
		SW 1/4	NE 1/4
		NE 1/4	SE 1/4
		NW 1/4	SE 1/4
		SE 1/4	SE 1/4
	Section 19	NW 1/4	NW 1/4
		SW 1/4	NW 1/4
		NW 1/4	SW 1/4
		SW 1/4	SW 1/4
	Section 20	NE 1/4	
		NE 1/4	SE 1/4
	Section 21	NW 1/4	
		NE 1/4	
		N 1/2	SE 1/4
		SE 1/4	SE 1/4
		NW 1/4	SW 1/4
		NE 1/4	SW 1/4
	Section 22	NW 1/4	NE 1/4
		NW 1/4	
		SW 1/4	
Township 1 North, Range 3 East, WM	Section 19	ALL	
	Section 20	W 1/2	
	Section 28	SW 1/4	
	Section 29	ALL	
	Section 30	ALL	
	Section 31	All	
	Section 32	ALL	
	Section 33	S 1/2	
		NW 1/4	
		S 1/2	NE 1/4
	Section 34	SW 1/4	NW 1/4
		W 1/2	SW 1/4
		SE 1/4	SW 1/4
		S 1/2	SE 1/4
	Section 35	W 1/2	SW 1/4
Township 1 North, Range 2 East, WM	Section 4	SW 1/4	SW 1/4
	Section 5	NW 1/4	NW 1/4
		SW 1/4	NW 1/4
		SE 1/4	NW 1/4
		SW 1/4	
		NW 1/4	SE 1/4
		SW 1/4	SE 1/4
		SE 1/4	SE 1/4

	Section 6, 7 and 8	ALL	
	Section 9	NW 1/4	
		SW 1/4	
		SE 1/4	
		SW 1/4	NE 1/4
	Section 10	NW 1/4	SW 1/4
		SW 1/4	SW 1/4
		SE 1/4	SW 1/4
	Section 13	S 1/2	SW 1/4
		S 1/2	SE 1/4
	Section 14	SW 1/4	NW 1/4
		SW 1/4	
		SE 1/4	
	Section 15	W 1/2	
		SE 1/4	
		W 1/2	NE 1/4
		SE 1/4	NE 1/4
	Section 16 through 36	ALL	
Township 1 South, Range 2 East, WM	Section 1 through 24	ALL	
	Section 25	N 1/2	NW 1/4
		E 1/2	NE 1/4
		NE 1/4	SE 1/4
	Section 26	NW 1/4	
		N 1/2	NE 1/4
	Section 27	N 1/2	NE 1/4
		SE 1/4	NE 1/4
	Section 28	NW 1/4	NE 1/4
	Section 29	W 1/2	NW 1/4
		W 1/2	SW 1/4
	Section 30	NE 1/4	
		SE 1/4	
Township 1 North, Range 1 East, WM	Section 1	ALL	
	Section 2	S 1/2	
		S 1/2	NW 1/4
		S 1/2	NE 1/4
	Section 3 through 29	ALL	
	Section 30	S 1/2	
		NE 1/4	
		SW 1/4	NW 1/4
		SE 1/4	NW 1/4
		NE 1/4	NW 1/4
	Section 31	W 1/2	
		SE 1/4	
		S 1/2	NE 1/4
	Section 32	E 1/2	
		SW 1/4	
		E 1/2	NW 1/4
		SW 1/4	NW 1/4
	Section 33 through 36	ALL	
Township 1 South, Range 1 East, WM	Section 1 through 24	ALL	
	Section 25	NW 1/4	NW 1/4
		NE 1/4	NE 1/4
	Section 26	NE 1/4	
		NW 1/4	
		W 1/2	SW 1/4
	Section 27 through 31	ALL	
	Section 32	N 1/2	
		SE 1/4	

	Section 33	ALL	
	Section 34	ALL	
	Section 35	W 1/2	
		W 1/2	NE 1/4
		W 1/2	SE 1/4
Township 2 North, Range 1 East, WM	Section 19	SW 1/4	SW 1/4
	Section 29	S 1/2	SW 1/4
	Section 30	W 1/2	
		SE 1/4	
		SW 1/4	NE 1/4
	Section 31	ALL	
	Section 32	ALL	
	Section 33	SW 1/4	
		S 1/2	SE 1/4
	Section 34	SW 1/4	SW 1/4
Township 2 South, Range 1 East, WM	Section 6	W 1/2	NW 1/4
		W 1/2	SW 1/4
	Section 7	W 1/2	NW 1/4
		NW 1/4	SW 1/4
	Section 19	W 1/2	NW 1/4
		SE 1/4	NW 1/4
		SW 1/4	
		W 1/2	SE 1/4
Township 1 South, Range 1 West, WM	Section 1		
	through 16	ALL	
	Section 17	N 1/2	
		SE 1/4	
		N 1/2	SW 1/4
		SW 1/4	SW 1/4
	Section 18	ALL	
	Section 19	N 1/2	
		SW 1/4	
		N 1/2	SE 1/4
		SW 1/4	SE 1/4
	Section 20	NE 1/4	
		SE 1/4	
		SW 1/4	
		SW 1/4	NW 1/4
	Section 21		
	through 27	ALL	
	Section 28	E 1/2	
		E 1/2	NW 1/4
		E 1/2	SW 1/4
	Section 29	SW 1/4	
		SE 1/4	
		N 1/2	NE 1/4
		N 1/2	NW 1/4
	Section 30	ALL	
	Section 33	NE 1/4	NW 1/4
		N 1/2	NE 1/4
		SW 1/4	NE 1/4
		S 1/2	SE 1/4
	Section 34	N 1/2	NW 1/4
		NE 1/4	
		SE 1/4	
		E 1/2	SW 1/4
		SW 1/4	SW 1/4
	Section 35	ALL	
	Section 36	ALL	
Township 1 North, Range 1 West, WM	Section 1		
	through 3	ALL	
	Section 4	S 1/2	
		S 1/2	NW 1/4
		S 1/2	NE 1/4
		NW 1/4	NW 1/4
		NE 1/4	NE 1/4

	Section 5	NE 1/4	
		SE 1/4	
		N 1/2	SW 1/4
		SE 1/4	SW 1/4
	Section 6	E 1/2	SE 1/4
	Section 9	E 1/2	NE 1/4
	Section 10	E 1/2	
		NW 1/4	
	Section 11		
	through 14	ALL	
	Section 15	E 1/2	NE 1/4
		E 1/2	SE 1/4
	Section 18	SE 1/4	
		E 1/2	SW 1/4
		SE 1/4	NE 1/4
	Section 19	E 1/2	NW 1/4
		W 1/2	NE 1/4
		SE 1/4	NE 1/4
		SW 1/4	NW 1/4
		SW 1/4	
		SE 1/4	
	Section 20	SW 1/4	NW 1/4
		SW 1/4	
		W 1/2	SE 1/4
	Section 21	NW 1/4	SW 1/4
		SW 1/4	SW 1/4
	Section 23		
	through 25	ALL	
	Section 26	S 1/2	
		NE 1/4	
		W 1/2	NW 1/4
		SE 1/4	NW 1/4
	Section 27	E 1/2	
		E 1/2	NW 1/4
		E 1/2	SW 1/4
	Section 28	NW 1/4	
		SW 1/4	
		W 1/2	SE 1/4
		SE 1/4	SE 1/4
		SW 1/4	NE 1/4
	Section 29	ALL	
	Section 30	E 1/2	
		NW 1/4	
		E 1/2	SW 1/4
	Section 31	E 1/2	
		NW 1/4	
		E 1/2	SW 1/4
		NW 1/4	SW 1/4
	Section 32		
	through 36	ALL	
Township 1 North, Range 2 West, WM	Section 13	ALL	
	Section 14	ALL	
	Section 23	NW 1/4	
		S 1/2	NE 1/4
		NE 1/4	NE 1/4
		N 1/2	SE 1/4
	Section 24	NW 1/4	
		SW 1/4	
		S 1/2	NE 1/4
		SE 1/4	
	Section 25	N 1/2	NE 1/4
		SW 1/4	
		SE 1/4	
	Section 26	S 1/2	NE 1/4
		SE 1/4	
	Section 34	E 1/2	SE 1/4
		SE 1/4	NE 1/4
	Section 35	E 1/2	
		SW 1/4	
		S 1/2	NW 1/4

	Section 36	N 1/2	
		N 1/2	SW 1/4
		N 1/2	SE 1/4
		SW 1/4	SW 1/4
Township 1 South, Range 2 West, WM	Section 1	S 1/2	
		S 1/2	NW 1/4
		SW 1/4	NE 1/4
	Section 2	SE 1/4	
		NE 1/4	SW 1/4
	Section 10	N 1/2	NE 1/4
	Section 11	N 1/2	
	Section 12	ALL	
	Section 13	ALL	
	Section 14	E 1/2	SE 1/4
	Section 23	E 1/2	NE 1/4
		NE 1/4	SE 1/4
	Section 24	ALL	
	Section 25	N 1/2	
		NE 1/4	SW 1/4
		NE 1/4	SE 1/4
Township 2 North, Range 1 West, WM	Section 17	SE 1/4	NW 1/4
	Section 18	S 1/2	SE 1/4
		NE 1/4	SE 1/4
	Section 19	E 1/2	NE 1/4
		NW 1/4	NE 1/4
	Section 20	ALL	
	Section 21	SW 1/4	
		NW 1/4	
	Section 23	SE 1/4	SW 1/4
		SE 1/4	
	Section 24 through 26	ALL	
	Section 28	NW 1/4	
		SE 1/4	
		NE 1/4	SW 1/4
		W 1/2	NE 1/4
	Section 29	N 1/2	NW 1/4
		N 1/2	NE 1/4
	Section 32	SE 1/4	SE 1/4
		SW 1/4	SE 1/4
	Section 33	NE 1/4	NE 1/4
		E 1/2	SE 1/4
	Section 34 through 36	ALL	
Township 2 South, Range 1 West, WM	Section 1 through 3	ALL	
	Section 4	E 1/2	NW 1/4
		E 1/2	SW 1/4
		E 1/2	
	Section 9	E 1/2	NW 1/4
		E 1/2	
	Section 10 through 12	ALL	
	Section 13	W 1/2	NW 1/4
		NE 1/4	NW 1/4
		W 1/2	SW 1/4
		S 1/2	NE 1/4
		SE 1/4	
	Section 14	N 1/2	NW 1/4
		SE 1/4	NW 1/4
		E 1/2	SW 1/4
		E 1/2	
	Section 15	N 1/2	
		N 1/2	SW 1/4
	Section 16	NE 1/4	
		N 1/2	SE 1/4

Section 23	ALL	
Section 24	ALL	
Section 25	W 1/2	SW 1/4
	NW 1/4	
Section 26	E 1/2	NW 1/4
	NE 1/4	SW 1/4
	N 1/2	SE 1/4
	NE 1/4	
Section 36	NW 1/4	NW 1/4

The well shall be constructed in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon. The works constructed shall include an air line and pressure gauge or an access port for measuring line, adequate to determine water level elevation in the well at all times. The permittee shall install and maintain a weir, meter, or other suitable measuring device, and shall keep a complete record of the amount of ground water withdrawn.

Actual construction work shall begin on or before April 25, 1986, and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 1986. Extended to October 1, 1992, 10-1-97

Complete application of the water to the proposed use shall be made on or before October 1, 19 87. Extended to October 1, 1992, 10-1-97

Witness my hand this 25th day of April, 19 85.

/s/ WILLIAM H. YOUNG

WATER RESOURCES DIRECTOR

This permit is for the beneficial use of water. By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan. It is possible that the land use you propose may not be allowed if it is not in keeping with the goals and the acknowledged plan. Your city or county planning agency can advise you about the land-use plan in your area.

APPLICATION G-11354 PERMIT G10479

STATE OF OREGON

MULTNOMAH

PERMIT TO APPROPRIATE THE PUBLIC WATERS

This is to certify that I have examined APPLICATION G-10906 and do hereby grant the same SUBJECT TO EXISTING RIGHTS and the following limitations and conditions:

This permit is issued to City of Portland, a municipal corporation of the State of Oregon, 1220 Southwest Fifth Avenue, Portland, Oregon 97204, phone 248-4120, for use of the waters from three wells, being, 33 1/3 cubic foot per second each from Wells 17, 18 and 19
for the PURPOSE of municipal use

that the PRIORITY OF THE RIGHT dates from March 25, 1983

and is limited to the amount of water which can be applied to beneficial use and shall not exceed 100.0 cubic feet per second

measured at the point of diversion from the wells , or its equivalent in case of rotation with other water users.

The well is to be LOCATED: Well 17 - 1020 feet North and 230 feet East; Well 18 - 840 feet North and 1090 feet East, both from the Southwest corner of the NE 1/4; Well 19 - 920 feet North and 365 feet East, from the Southwest Corner of the NW 1/4, being within: Well 17 - SW 1/4 NE 1/4; Well 18 - SW 1/4 NE 1/4; Well 19 - SW 1/4 NW 1/4, all in Section 21, Township 1 North, Range 3*
A description of the PLACE OF USE under the permit, and to which such right is appurtenant, is as follows:

* East, WM, in the County of Multnomah.

SEE NEXT PAGE

Township 1 South, Range 3 East, WM	Section 1	NW 1/4	NW 1/4
		SW 1/4	NW 1/4
		NW 1/4	SW 1/4
		SW 1/4	SW 1/4
	Section 2	All	
	Section 3	All	
	Section 4	All	
	Section 5	All	
	Section 6	All	
	Section 7	All	
	Section 8	All	
	Section 9	All	
	Section 10	All	
	Section 11	All	
	Section 12	NW 1/4	NW 1/4
		SW 1/4	NW 1/4
		NW 1/4	SW 1/4
		SW 1/4	SW 1/4
	Section 14	NW 1/4	
		SW 1/4	
		NW 1/4	NE 1/4
		NE 1/4	NE 1/4
		NW 1/4	SE 1/4
		SW 1/4	SE 1/4
	Section 15	All	
	Section 16	All	
	Section 17	All	
	Section 18	NW 1/4	NW 1/4
		SW 1/4	NW 1/4
		NW 1/4	SW 1/4
		SW 1/4	SW 1/4
		NE 1/4	NE 1/4
		SE 1/4	NE 1/4
		SW 1/4	NE 1/4
		NE 1/4	SE 1/4
		NW 1/4	SE 1/4
		SE 1/4	SE 1/4
	Section 19	NW 1/4	NW 1/4
		SW 1/4	NW 1/4
		NW 1/4	SW 1/4
		SW 1/4	SW 1/4
	Section 20	NE 1/4	
		NE 1/4	SE 1/4
	Section 21	NW 1/4	
		NE 1/4	
		N 1/2	SE 1/4
		SE 1/4	SE 1/4
		NW 1/4	SW 1/4
		NE 1/4	SW 1/4
	Section 22	NW 1/4	NE 1/4
		NW 1/4	
		SW 1/4	

Township 1 North, Range 3 East, WM	Section 19	All	
	Section 20	W 1/2	
	Section 28	SW 1/4	
	Section 29	All	
	Section 30	All	
	Section 31	All	
	Section 32	All	
	Section 33	S 1/2	
		NW 1/4	
		S 1/2	NE 1/4
	Section 34	SW 1/4	NW 1/4
		W 1/2	SW 1/4
		SE 1/4	SW 1/4
		S 1/2	SE 1/4
	Section 35	W 1/2	SW 1/4
Township 1 North, Range 2 East, WM	Section 4	SW 1/4	SW 1/4
	Section 5	NW 1/4	NW 1/4
		SW 1/4	NW 1/4
		SE 1/4	NW 1/4
		SW 1/4	
		NW 1/4	SE 1/4
		SW 1/4	SE 1/4
		SE 1/4	SE 1/4
	Section 6	All	
	Section 7	All	
	Section 8	All	
	Section 9	NW 1/4	
		SW 1/4	
		SE 1/4	
		SW 1/4	NE 1/4
	Section 10	NW 1/4	SW 1/4
		SW 1/4	SW 1/4
		SE 1/4	SW 1/4
	Section 13	S 1/2	SW 1/4
		S 1/2	SE 1/4
	Section 14	SW 1/4	NW 1/4
		SW 1/4	
		SE 1/4	
	Section 15	W 1/2	
		SE 1/4	
		W 1/2	NE 1/4
		SE 1/4	NE 1/4
	Section 16	All	
	Section 17	All	
	Section 18	All	
	Section 19	All	
	Section 20	All	
	Section 21	All	
	Section 22	All	
	Section 23	All	

	Section 24	All	
	Section 25	All	
	Section 26	All	
	Section 27	All	
	Section 28	All	
	Section 29	All	
	Section 30	All	
	Section 31	All	
	Section 32	All	
	Section 33	All	
	Section 34	All	
	Section 35	All	
	Section 36	All	
Township 1 South, Range 2 East, WM	Section 1	All	
	Section 2	All	
	Section 3	All	
	Section 4	All	
	Section 5	All	
	Section 6	All	
	Section 7	All	
	Section 8	All	
	Section 9	All	
	Section 10	All	
	Section 11	All	
	Section 12	All	
	Section 13	All	
	Section 14	All	
	Section 15	All	
	Section 16	All	
	Section 17	All	
	Section 18	All	
	Section 19	All	
	Section 20	All	
	Section 21	All	
	Section 22	All	
	Section 23	All	
	Section 24	All	
	Section 25	N 1/2	NW 1/4
		E 1/2	NE 1/4
		NE 1/4	SE 1/4
	Section 26	NW 1/4	
		N 1/2	NE 1/4
	Section 27	N 1/2	NE 1/4
		SE 1/4	NE 1/4
	Section 28	NW 1/4	NE 1/4
	Section 29	W 1/2	NW 1/4
		W 1/2	SW 1/4
	Section 30	NE 1/4	
		SE 1/4	
Township 1 North, Range 1 East, WM	Section 1	All	
	Section 2	S 1/2	
		S 1/2	NW 1/4
		S /2	NE 1/4

	Section 3	All	
	Section 4	All	
	Section 5	All	
	Section 6	All	
	Section 7	All	
	Section 8	All	
	Section 9	All	
	Section 10	All	
	Section 11	All	
	Section 12	All	
	Section 13	All	
	Section 14	All	
	Section 15	All	
	Section 16	All	
	Section 17	All	
	Section 18	All	
	Section 19	All	
	Section 20	All	
	Section 21	All	
	Section 22	All	
	Section 23	All	
	Section 24	All	
	Section 25	All	
	Section 26	All	
	Section 27	All	
	Section 28	All	
	Section 29	All	
	Section 30	S 1/2	
		NE 1/4	
		SW 1/4	NW 1/4
		SE 1/4	NW 1/4
		NE 1/4	NW 1/4
	Section 31	W 1/2	
		SE 1/4	
		S 1/2	NE 1/4
	Section 32	E 1/2	
		SW 1/4	
		E 1/2	NW 1/4
		SW 1/4	NW 1/4
	Section 33	All	
	Section 34	All	
	Section 35	All	
	Section 36	All	
Township 1 South, Range 1 East, WM	Section 1	All	
	Section 2	All	
	Section 3	All	
	Section 4	All	
	Section 5	All	
	Section 6	All	
	Section 7	All	
	Section 8	All	
	Section 9	All	

	Section 10	All	
	Section 11	All	
	Section 12	All	
	Section 13	All	
	Section 14	All	
	Section 15	All	
	Section 16	All	
	Section 17	All	
	Section 18	All	
	Section 19	All	
	Section 20	All	
	Section 21	All	
	Section 22	All	
	Section 23	All	
	Section 24	All	
	Section 25	NW 1/4	NW 1/4
		NE 1/4	NE 1/4
	Section 26	NE 1/4	
		NW 1/4	
		W 1/2	SW 1/4
	Section 27	All	
	Section 28	All	
	Section 29	All	
	Section 30	All	
	Section 31	All	
	Section 32	N 1/2	
		SE 1/4	
	Section 33	All	
	Section 34	All	
	Section 35	W 1/2	
		W 1/2	NE 1/4
		W 1/2	SE 1/4
Township 2 North, Range 1 East, WM	Section 19	SW 1/4	SW 1/4
	Section 29	S 1/2	SW 1/4
	Section 30	W 1/2	
		SE 1/4	
		SW 1/4	NE 1/4
	Section 31	All	
	Section 32	All	
	Section 33	SW 1/4	
		S 1/2	SE 1/4
	Section 34	SW 1/4	SW 1/4
Township 2 South, Range 1 East, WM	Section 6	W 1/2	NW 1/4
		W 1/2	SW 1/4
	Section 7	W 1/2	NW 1/4
		NW 1/4	SW 1/4
	Section 19	W 1/2	NW 1/4
		SE 1/4	NW 1/4
		SW 1/4	
		W 1/2	SE 1/4

Township 1 South, Range 1 West, WM	Section 1	All	
	Section 2	All	
	Section 3	All	
	Section 4	All	
	Section 5	All	
	Section 6	All	
	Section 7	All	
	Section 8	All	
	Section 9	All	
	Section 10	All	
	Section 11	All	
	Section 12	All	
	Section 13	All	
	Section 14	All	
	Section 15	All	
	Section 16	All	
	Section 17	N 1/2	
		SE 1/4	
		N 1/2	SW 1/4
		SW 1/4	SW 1/4
	Section 18	All	
	Section 19	N 1/2	
		SW 1/4	
		N 1/2	SE 1/4
		SW 1/4	SE 1/4
	Section 20	NE 1/4	
		SE 1/4	
		SW 1/4	
		SW 1/4	NW 1/4
	Section 21	All	
	Section 22	All	
	Section 23	All	
	Section 24	All	
	Section 25	All	
	Section 26	All	
	Section 27	All	
	Section 28	E 1/2	
		E 1/2	NW 1/4
		E 1/2	SW 1/4
	Section 29	SW 1/4	
		SE 1/4	
		N 1/2	NE 1/4
		N 1/2	NW 1/4
	Section 30	All	
	Section 33	NE 1/4	NW 1/4
		N 1/2	NE 1/4
		SW 1/4	NE 1/4
		S 1/2	SE 1/4
	Section 34	N 1/2	NW 1/4
		NE 1/4	

		SE 1/4	
		E 1/2	SW 1/4
		SW 1/4	SW 1/4
	Section 35	All	
	Section 36	All	
Township 1 North, Range 1 West, WM	Section 1	All	
	Section 2	All	
	Section 3	All	
	Section 4	S 1/2	
		S 1/2	NW 1/4
		S 1/2	NE 1/4
		NW 1/4	NW 1/4
		NE 1/4	NE 1/4
	Section 5	NE 1/4	
		SE 1/4	
		N 1/2	SW 1/4
		SE 1/4	SW 1/4
	Section 6	E 1/2	SE 1/4
	Section 9	E 1/2	NE 1/4
	Section 10	E 1/2	
		NW 1/4	
	Section 11	All	
	Section 12	All	
	Section 13	All	
	Section 14	All	
	Section 15	E 1/2	NE 1/4
		E 1/2	SE 1/4
	Section 18	SE 1/4	
		E 1/2	SW 1/4
		SE 1/4	NE 1/4
	Section 19	E 1/2	NW 1/4
		W 1/2	NE 1/4
		SE 1/4	NE 1/4
		SW 1/4	NW 1/4
		SW 1/4	
		SE 1/4	
	Section 20	SW 1/4	NW 1/4
		SW 1/4	
		W 1/2	SE 1/4
	Section 21	NW 1/4	SW 1/4
		SW 1/4	SW 1/4
	Section 23	All	
	Section 24	All	
	Section 25	All	
	Section 26	S 1/2	
		NE 1/4	
		W 1/2	NW 1/4
		SE 1/4	NW 1/4
	Section 27	E 1/2	
		E 1/2	NW 1/4
		E 1/2	SW 1/4

	Section 28	NW 1/4	
		SW 1/4	
		W 1/2	SE 1/4
		SE 1/4	SE 1/4
		SW 1/4	NE 1/4
	Section 29	All	
	Section 30	E 1/2	
		NW 1/4	
		E 1/2	SW 1/4
	Section 31	E 1/2	
		NW 1/4	
		E 1/2	SW 1/4
		NW 1/4	SW 1/4
	Section 32	All	
	Section 33	All	
	Section 34	All	
	Section 35	All	
	Section 36	All	
Township 1 North, Range 2 West, WM	Section 13	All	
	Section 14	All	
	Section 23	NW 1/4	
		S 1/2	NE 1/4
		NE 1/4	NE 1/4
		N 1/2	SE 1/4
	Section 24	NW 1/4	
		SW 1/4	
		S 1/2	NE 1/4
		SE 1/4	
	Section 25	N 1/2	NE 1/4
		SW 1/4	
		SE 1/4	
	Section 26	S 1/2	NE 1/4
		SE 1/4	
	Section 34	E 1/2	SE 1/4
		SE 1/4	NE 1/4
	Section 35	E 1/2	
		SW 1/4	
		S 1/2	NW 1/4
	Section 36	N 1/2	
		N 1/2	SW 1/4
		N 1/2	SE 1/4
		SW 1/4	SW 1/4
Township 1 South, Range 2 West, WM	Section 1	S 1/2	
		S 1/2	NW 1/4
		SW 1/4	NE 1/4
	Section 2	SE 1/4	
		NE 1/4	SW 1/4
	Section 10	N 1/2	NE 1/4
	Section 11	N 1/2	
	Section 12	All	

	Section 13	All	
	Section 14	E 1/2	SE 1/4
	Section 23	E 1/2	NE 1/4
		NE 1/4	SE 1/4
	Section 24	All	
	Section 25	N 1/2	
		NE 1/4	SW 1/4
		NE 1/4	SE 1/4
Township 2 North, Range 1 West, WM	Section 17	SE 1/4	SW 1/4
	Section 18	S 1/2	SE 1/4
		NW 1/4	SE 1/4
	Section 19	E 1/2	NE 1/4
		NW 1/4	NE 1/4
	Section 20	All	
	Section 21	SW 1/4	
		NW 1/4	
	Section 23	SE 1/4	SW 1/4
		SE 1/4	
	Section 24	All	
	Section 25	All	
	Section 26	All	
	Section 28	NW 1/4	
		SE 1/4	
		NE 1/4	SW 1/4
		W 1/2	NE 1/4
	Section 29	N 1/2	NW 1/4
		N 1/2	NE 1/4
	Section 32	SE 1/4	SE 1/4
		SW 1/4	SE 1/4
	Section 33	NE 1/4	NE 1/4
		E 1/2	SE 1/4
	Section 34	All	
	Section 35	All	
	Section 36	All	
Township 2 South, Range 1 West, WM	Section 1	All	
	Section 2	All	
	Section 3	All	
	Section 4	E 1/2	NW 1/4
		E 1/2	SW 1/4
		E 1/2	
	Section 9	E 1/2	NW 1/4
		E 1/2	
	Section 10	All	
	Section 11	All	
	Section 12	All	
	Section 13	W 1/2	NW 1/4
		NE 1/4	NW 1/4
		W 1/2	SW 1/4
		S 1/2	NE 1/4
		SE 1/4	

Section 14	N 1/2	NW 1/4
	SE 1/4	NW 1/4
	E 1/2	SW 1/4
	E 1/2	
Section 15	N 1/2	
	N 1/2	SW 1/4
Section 16	NE 1/4	
	N 1/2	SE 1/4
Section 23	All	
Section 24	All	
Section 25	W 1/2	SW 1/4
	NW 1/4	
Section 26	E 1/2	NW 1/4
	NE 1/4	SW 1/4
	N 1/2	SE 1/4
	NE 1/4	
Section 36	NW 1/4	NW 1/4

The well shall be constructed in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon. The works constructed shall include an air line and pressure gauge or an access port for measuring line, adequate to determine water level elevation in the well at all times. The permittee shall install and maintain a weir, meter, or other suitable measuring device, and shall keep a complete record of the amount of ground water withdrawn.

Actual construction work shall begin on or before October 28, 1984 , and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 1985 . Extended to October 1, 1991, 10-1-96

Complete application of the water to the proposed use shall be made on or before October 1, 19 86 . Extended to October 1, 1991, 10-1-96

Witness my hand this 28th day of October , 19 83 . ext. BC01

/s/ WILLIAM H. YOUNG

WATER RESOURCES DIRECTOR

This permit is for the beneficial use of water. By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan. It is possible that the land use you propose may not be allowed if it is not in keeping with the goals and the acknowledged plan. Your city or county planning agency can advise you about the land-use plan in your area.

APPLICATION G-10906 PERMIT G10124

Application No. G-7578 Permit No. G 8755

STATE OF OREGON WATER RESOURCES DEPARTMENT

RECEIVED
DEC 21 1979
WATER RESOURCES
SALEM, OREGON

Application for a Permit to Appropriate Ground Water

I, City of Portland, Oregon, Commissioner of Public Utilities
(Name of Applicant)

of 1220 SW Fifth Avenue, Portland
(Mailing Address) (City)

State of Oregon, 97204 Phone No. 248-4151 do hereby
(Zip Code)

make application for a permit to appropriate the following described ground waters of the State of Oregon:

1. The development will consist of ~~approximately~~ Lt. Jan 17, 1980 28 30 production wells
(Give number of wells, tile lines, infiltration galleries, etc.)

having a diameter of 24 inches and an estimated depth of 80 to 550 feet.

2. The well or other source is to be located See Supplement No. 1 and maps of West and East Well Field ft. (N. or S.) and ft. (E. or W.)

from the corner of
(Public Land Survey Corner)

(If there is more than one well, each must be described)

being within the ¼ of the ¼ of

Sec. Tp. R., W. M., in the county of

3. Location of area to be irrigated, or place of use if use other than irrigation.
See Supplement No. 2 and map of Areas Benefited By Groundwater.

Township	Range	Section	List ¼ ¼ of Section	List use and/or number of acres to be irrigated

4. It is estimated that the entire/depth ~~feet~~ of the well will require steel (Kind) casing.

5. Depth to water table is estimated *1 (Feet) Well drilled by private contractors

6. The amount of water which the applicant intends to apply to beneficial use is 390 *cubic feet per second or* 175,000 *gallons per minute.* Refer to enclosure with letter from the City of Portland dated Dec. 28, 1979 for breakdown of this amount from each well.

7. The use to which the water is to be applied is to provide an emergency and supplemental wat supply for the Portland municipal water system.

8. If the flow to be utilized is artesian, the works to be used for the control and conservation of the supply when not in use must be described. Some wells will be capable of low pressure artesian flo (less than 10 psi) during periods of high water levels in the Columbia River. Any su flows will be restrained by valves.

9. If the location of the well, or other development work is less than one-fourth mile from a natural stream channel, give the distance to the channel and the difference in elevation between the stream bed and the ground surface at the source of development. Minimum difference in elevation between proposed facilities and stream bed of Columbia River (lies adjacent to the well field) or Columbia Sloughs (lies within boundary of well field) is 20 feet.

10. *DESCRIPTION OF WORKS*

Include length and dimensions of supply ditch or pipeline, size and type of pump and motor, type of irrigation system to adequately describe the proposed distribution system. The construction project will consi initially of installation of ~~approximately~~ 30 wells with a 100 mgd combined nominal ca acity and a 250 mgd combined maximum capacity. The wells will be located along the Columbia River at distances south of the river embankment varying from several hundred ~~feet to one mile.~~ These wells will be pumped through a network of collector pipelines to a three million gallon reservoir to be constructed near N.E. 158th Ave. and the fut N.E. Inverness Drive. These collector pipelines will vary in diameter from 8 to 54 in and have a total length of about 9 miles. From this reservoir a pump station will be structed to pump the water through a new transmission main in NE and SE 162nd Ave. to 50-million gallon reservoir now under construction on Powell Butte. This transmission main will vary in diameter from 60 to 90 inches and have a total length of about 5 mil The well pumps will be 1,000 to 5,000 gpm vertical turbine with 100 to 350 hp 3-phase motors. The transmission line pumps will be 500 to 1,000 gpm vertical turbine pumps with 500 to 1,000 hp 3-phase motors.

These proposed facilities will be constructed in 2 phases, each with a nominal capacity of 50 mgd. Phase I is scheduled for completion by June 30, 1984, and the water can be put to beneficial use at that time. Phase II is scheduled for completion by October 1, 1987.

11. Construction work will begin on or before August, 1979

12. Construction work will be completed on or before October 1, 1987

13. The water will be completely applied to the proposed use on or before October 1, 1987

14. If the ground water supply is supplemental to an existing supply, identify the supply and existing water right. City of Portland has water rights to full flow of the Bull Run River by water rights on file in the Clackamas County Courthouse in Oregon City.

Application No. G-7578 *Permit No.* G 8755

Ltr. Jan 17, 1980

Township	Range	Section	List ¼ ¼ of Section
1S	1E	32	N ½
1S	1E	32	SE ¼
1S	1E	33	All
1S	1E	34	All
1S	1E	35	W ½
1S	1E	35	W ½ NE ¼
1S	1E	35	W ½ SE ¼

Application No. G-7578
Permit No. G 8755

Township	Range	Section	List ¼ ¼ of Section
2N	1E	19	SW ¼ SW ¼
2N	1E	29	S ½ SW ¼
2N	1E	30	W ½
2N	1E	30	SE ¼
2N	1E	30	SW ¼ NE ¼
2N	1E	31	All
2N	1E	32	All
2N	1E	33	SW ¼
2N	1E	33	S ½ SE ¼
2N	1E	34	SW ¼ SW ¼
2S	1E	6	W ½ NW ¼
2S	1E	6	W ½ SW ¼
2S	1E	7	W ½ NW ¼
2S	1E	7	NW ¼ SW ¼
2S	1E	19	W ½ NW ¼
2S	1E	19	SE ¼ NW ¼
2S	1E	19	SW ¼
2S	1E	19	W ½ SE ¼
2S	1W	1	E ½
2S	1W	12	E ½ NW ¼ (See page 10)
2S	1W	12	NE ¼ SE ¼
1S	1W	1	All
1S	1W	2	All
1S	1W	3	All
1S	1W	4	All
1S	1W	5	All
1S	1W	6	All
1S	1W	7	All
1S	1W	8	All
1S	1W	9	All
1S	1W	10	All
1S	1W	11	All
1S	1W	12	All
1S	1W	13	All
1S	1W	14	All
1S	1W	15	All
1S	1W	16	All
1S	1W	17	N ½
1S	1W	17	SE ¼
1S	1W	17	N ½ SW ¼
1S	1W	17	SW ¼ SW ¼
1S	1W	18	All
1S	1W	19	N ½
1S	1W	19	SW ¼
1S	1W	19	N ½ SE ¼
1S	1W	19	SW ¼ SE ¼

Application No. G-7578
Permit No. G 8755

Township	Range	Section	List ¼ ¼ of Section
1S	3E	21	NW ¼
1S	3E	21	NE ¼
1S	3E	21	N ½ SE ¼
1S	3E	21	SE ¼ SE ¼
1S	3E	21	NW ¼ SW ¼
1S	3E	21	NE ¼ SW ¼
1S	3E	22	NW ¼ NE ¼
1S	3E	22	NW ¼
1S	3E	22	SW ¼
1N	3E	19	All
1N	3E	20	W ½
1N	3E	28	SW ¼
1N	3E	29	All
1N	3E	30	All
1N	3E	31	All
1N	3E	32	All
1N	3E	33	S ½
1N	3E	33	NW ¼
1N	3E	33	S ½ NE ¼
1N	3E	34	SW ¼ NW ¼
1N	3E	34	W ½ SW¼
1N	3E	34	SE ¼ SW ¼
1N	3E	34	S ½ SE ½
1N	3E	35	W ½ SW ¼
1N	2E	4	SW ¼ SW ¼
1N	2E	5	NW ¼ NW ¼
1N	2E	5	SW ¼ NW ¼
1N	2E	5	SE ¼ NW ¼
1N	2E	5	SW ¼
1N	2E	5	NW ¼ SE ¼
1N	2E	5	SW ¼ SE ¼
1N	2E	5	SE ¼ SE ¼
1N	2E	6	All
1N	2E	7	All
1N	2E	8	All
1N	2E	9	NW ¼
1N	2E	9	SW ¼
1N	2E	9	SE ½
1N	2E	9	SW ¼ NE ¼
1N	2E	10	NW ¼ SW ¼
1N	2E	10	SW ¼ SW ½
1N	2E	10	SE ¼ SW ¼
1N	2E	13	S ½ SW ¼
1N	2E	13	S ½ SE ½
1N	2E	14	SW ¼ NW ¼
1N	2E	14	SW ¼
1N	2E	14	SE ¼
1N	2E	15	W ½
1N	2E	15	SE ¼

Township	Range	Section	List ¼ ¼ of Section
1N	2E	15	W ½ NE ¼
1N	2E	15	SE ¼ NE ¼
1N	2E	16	All
1N	2E	17	All
1N	2E	18	All
1N	2E	19	All
1N	2E	20	All
1N	2E	21	All
1N	2E	22	All
1N	2E	23	All
1N	2E	24	All
1N	2E	25	All
1N	2E	26	All
1N	2E	27	All
1N	2E	28	All
1N	2E	29	All
1N	2E	30	All
1N	2E	31	All
1N	2E	32	All
1N	2E	33	All
1N	2E	34	All
1N	2E	35	All
1N	2E	36	All
1S	2E	1	All
1S	2E	2	All
1S	2E	3	All
1S	2E	4	All
1S	2E	5	All
1S	2E	6	All
1S	2E	7	All
1S	2E	8	All
1S	2E	9	All
1S	2E	10	All
1S	2E	11	All
1S	2E	12	All
1S	2E	13	All
1S	2E	14	All
1S	2E	15	All
1S	2E	16	All
1S	2E	17	All
1S	2E	18	All
1S	2E	19	All
1S	2E	20	All
1S	2E	21	All
1S	2E	22	All
1S	2E	23	All
1S	2E	24	All

Application No. G-7518
Permit No. G 8755

Township	Range	Section	List ¼ ¼ of Section
1S	2E	25	N ½ NW ¼
1S	2E	25	E ½ NE ¼
1S	2E	25	NE ¼ SE ¼
1S	2E	26	NW ¼
1S	2E	26	N ½ NE ¼
1S	2E	27	N ½ NE ¼
1S	2E	27	SE ¼ NE ¼
1S	2E	28	NW ¼ NE ¼
1S	2E	29	W ½ NW ¼
1S	2E	29	W ½ SW ¼
1S	2E	30	NE ¼
1S	2E	30	SE ¼
1N	1E	1	All
1N	1E	2	S ½
1N	1E	2	S½ NW¼
1N	1E	2	S ½ NE ¼
1N	1E	3	All
1N	1E	4	All
1N	1E	5	All
1N	1E	6	All
1N	1E	7	All
1N	1E	8	All
1N	1E	9	All
1N	1E	10	All
1N	1E	11	All
1N	1E	12	All
1N	1E	13	All
1N	1E	14	All
1N	1E	15	All
1N	1E	16	All
1N	1E	17	All
1N	1E	18	All
1N	1E	19	All
1N	1E	20	All
1N	1E	21	All
1N	1E	22	All
1N	1E	23	All
1N	1E	24	All
1N	1E	25	All
1N	1E	26	All
1N	1E	27	All
1N	1E	28	All
1N	1E	29	All
1N	1E	30	S ½
1N	1E	30	NE ¼
1N	1E	30	SW NW ¼
1N	1E	30	SE NW ¼
1N	1E	30	NE NW ¼

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Township	Range	Section	List ¼ ¼ of Section
1N	1E	31	W ½
1N	1E	31	SE ¼
1N	1E	31	S ½ NE ¼
1N	1E	32	E ½
1N	1E	32	SW ¼
1N	1E	32	E ½ NW ¼
1N	1E	32	SW ¼ NW ¼
1N	1E	33	All
1N	1E	34	All
1N	1E	35	All
1N	1E	36	All
1S	1E	1	All
1S	1E	2	All
1S	1E	3	All
1S	1E	4	All
1S	1E	5	All
1S	1E	6	All
1S	1E	7	All
1S	1E	8	All
1S	1E	9	All
1S	1E	10	All
1S	1E	11	All
1S	1E	12	All
1S	1E	13	All
1S	1E	14	All
1S	1E	15	All
1S	1E	16	All
1S	1E	17	All
1S	1E	18	All
1S	1E	19	All
1S	1E	20	All
1S	1E	21	All
1S	1E	22	All
1S	1E	23	All
1S	1E	24	All
1S	1E	25	NW ¼ NW ¼
1S	1E	25	NE ¼ NE ¼
1S	1E	26	NE ¼
1S	1E	26	NW ¼
1S	1E	26	W ½ SW ¼
1S	1E	27	All
1S	1E	28	All
1S	1E	29	All
1S	1E	30	All
1S	1E	31	All

Application No. G-7578
Permit No. G 8755

WELL LOCATIONS AND CAPACITIES

*W.M. County of Multnomah

WEST WELL FIELD

Well No.	Location	Water Source	Nominal Capacity (gpm)	Maximum Capacity (gpm)
1	T1N R2E Sec. 16 SW¼ of NE¼	TGA	5000	12,500
2	T1N R2E Sec. 16 NE¼ of SE¼	TGA	5000	12,500
3	T1N R2E Sec. 15 NW¼ of SW¼	TGA	5000	12,500
4	T1N R2E Sec. 15 NE¼ of SW¼	TGA	5000	12,500
5	T1N R2E Sec. 15 NW¼ of SE¼	TGA	5000	12,500
6	T1N R2E Sec. 10 SW¼ of SW¼	TSA	1000	2,500
7	T1N R2E Sec. 15 SE¼ of NE¼	TSA	1000	2,500
8	T1N R2E Sec. 16 SW¼ of NE¼	TSA	1000	2,500
9	T1N R2E Sec. 15 NW¼ of SW¼	TSA	1000	2,500
10	T1N R2E Sec. 15 SE¼ of SW¼	TSA	1000	2,500
11	T1N R2E Sec. 10 SW¼ of SW¼	UCRS	1000	2,500
12	T1N R2E Sec. 15 NE¼ of NW¼	UCRS	1000	2,500
13	T1N R2E Sec. 15 SE¼ of NE¼	UCRS	1000	2,500
14	T1N R2E Sec. 15 SW¼ of NW¼	LCRS	2000	5,000

EAST WELL FIELD

1	T1N R2E Sec. 14 SE¼ of SE¼	SRMA	3000	7,500
2	T1N R2E Sec. 13 SW¼ of SW¼	SRMA	3000	7,500
3	T1N R2E Sec. 24 SE¼ of NW¼	TSA	1500	3,750
4	T1N R2E Sec. 24 NW¼ of SW¼	SRMA	2500	6,250
5	T1N R2E Sec. 24 NE¼ of NE¼	SRMA	2500	6,250
6	T1N R2E Sec. 24 SE¼ of NE¼	SRMA	2500	6,250
7	T1N R3E Sec. 19 NW¼ of NW¼	TSA	1000	2,500
8	T1N R3E Sec. 19 SW¼ of NW¼	TSA	1000	2,500
9	T1N R3E Sec. 19 NE¼ of NW¼	SRMA	2500	6,250
10	T1N R3E Sec. 19 SE¼ of NW¼	SRMA	2500	6,250
11	T1N R3E Sec. 19 NW¼ of NE¼	TSA	1000	2,500
12	T1N R3E Sec. 20 SW¼ of SW¼	SRMA	1500	3,750
13	T1N R3E Sec. 20 NE¼ of NW¼	SRMA	1500	3,750
14	T1N R3E Sec. 20 SE¼ of NE¼	SRMA	2000	5,000
15	T1N R3E Sec. 21 NE¼ of NW¼	BLA	3500	8,750
16	T1N R3E Sec. 21 SW¼ of NE¼	BLA	3500	8,750
Totals 30	--	--	70,000 gpm	175,000 gpm

Application No. G-7578
Permit No. G-8255

SUPPLEMENT NO. 2 (REVISED 1/17/80)

LIST OF AREAS BENEFITED BY GROUNDWATER

Note: For use, see Item No. 7

Township	Range	Section	List ¼ ¼ of Section
1S	3E	1	NW ¼ NW ¼
1S	3E	1	SW ¼ NW ¼
1S	3E	1	NW ¼ SW ¼
1S	3E	1	SW ¼ SW ¼
1S	3E	2	All
1S	3E	3	All
1S	3E	4	All
1S	3E	5	All
1S	3E	6	All
1S	3E	7	All
1S	3E	8	All
1S	3E	9	All
1S	3E	10	All
1S	3E	11	All
1S	3E	12	NW ¼ NW ¼
1S	3E	12	SW ¼ NW ¼
1S	3E	12	NW ¼ SW ¼
1S	3E	12	SW ¼ SW ¼
1S	3E	14	NW ¼
1S	3E	14	SW ¼
1S	3E	14	NW ¼ NE ¼
1S	3E	14	NE ¼ NE ¼
1S	3E	14	NW ¼ SE ¼
1S	3E	14	SW ¼ SE ¼
1S	3E	15	All
1S	3E	16	All
1S	3E	17	All
1S	3E	18	NW ¼ NW ¼
1S	3E	18	SW ¼ NW ¼
1S	3E	18	NW ¼ SW ¼
1S	3E	18	SW ¼ SW ¼
1S	3E	18	NE ¼ NE ¼
1S	3E	18	SE ¼ NE ¼
1S	3E	18	SW ¼ NE ¼
1S	3E	18	NE ¼ SE ¼
1S	3E	18	NW ¼ SE ¼
1S	3E	18	SE ¼ SE ¼
1S	3E	19	NW ¼ NW ¼
1S	3E	19	SW ¼ NW ¼
1S	3E	19	NW ¼ SW ¼
1S	3E	19	SW ¼ SW ¼
1S	3E	20	NE ¼
1S	3E	20	NE ¼ SE ¼

Application No. G-7578
Permit No. G 8755

RECEIVED
JAN 17 1980
WATER RESOURCES DEPT
SALEM, OREGON

Township	Range	Section	List ¼ ¼ of Section
1S	1W	20	NE ¼
1S	1W	20	SE ¼
1S	1W	20	SW ¼
1S	1W	20	SW ¼ NW ¼
1S	1W	21	All
1S	1W	22	All
1S	1W	23	All
1S	1W	24	All
1S	1W	25	All
1S	1W	26	All
1S	1W	27	All
1S	1W	28	E ½
1S	1W	28	E ½ NW ¼
1S	1W	28	E ½ SW ¼
1S	1W	29	SW ¼
1S	1W	29	SE ¼
1S	1W	29	N ½ NE ¼
1S	1W	29	N ½ NW ¼
1S	1W	30	All
1S	1W	33	NE ¼ NW ¼
1S	1W	33	N ½ NE ¼
1S	1W	33	SW ¼ NE ¼
1S	1W	33	S ½ SE ¼
1S	1W	34	N ½ NW ¼
1S	1W	34	N ½ NW ¼
1S	1W	34	NE ¼
1S	1W	34	SE ¼
1S	1W	34	E ½ SW ¼
1S	1W	34	SW ¼ SW ¼
1S	1W	35	All
1S	1W	36	All
1N	1W	1	All
1N	1W	2	All
1N	1W	3	All
1N	1W	4	S ½
1N	1W	4	S ½ NW ¼
1N	1W	4	S ½ NE ¼
1N	1W	4	NW ¼ NW ¼
1N	1W	4	NE ¼ NE ¼
1N	1W	5	NE ¼
1N	1W	5	SE ¼
1N	1W	5	N ½ SW ¼
1N	1W	5	SE ¼ SW ¼
1N	1W	6	E ½ SE ¼
1N	1W	9	E ½ NE ¼
1N	1W	10	E ½
1N	1W	10	NW ¼
1N	1W	11	All
1N	1W	12	All
1N	1W	13	All
1N	1W	14	All

Township	Range	Section	List ¼ ¼ of Section
1N	1W	15	E ½ NE ¼
1N	1W	15	E ½ SE ¼
1N	1W	18	SE ¼
1N	1W	18	E ½ SW ¼
1N	1W	18	SE ¼ NE ¼
1N	1W	19	E ½ NW ¼
1N	1W	19	W ½ NE ¼
1N	1W	19	SE ¼ NE ¼
1N	1W	19	SW ¼ NW ¼
1N	1W	19	SW ¼
1N	1W	19	SE ¼
1N	1W	20	SW ¼ NW ¼
1N	1W	20	SW ¼
1N	1W	20	W ½ SE ¼
1N	1W	21	NW ¼ SW ¼
1N	1W	21	SW ¼ SW ¼
1N	1W	23	All
1N	1W	24	All
1N	1W	25	All
1N	1W	26	S ½
1N	1W	26	NE ¼
1N	1W	26	W ½ NW ¼
1N	1W	26	SE ¼ NW ¼
1N	1W	27	E ½
1N	1W	27	E ½ NW ¼
1N	1W	27	E ½ SW ¼
1N	1W	28	NW ¼
1N	1W	28	SW ¼
1N	1W	28	W ½ SE ¼
1N	1W	28	SE ¼ SE ¼
1N	1W	28	SW ¼ NE ¼
1N	1W	29	All
1N	1W	30	E ½
1N	1W	30	NW ¼
1N	1W	30	E ½ SW ¼
1N	1W	31	E ½
1N	1W	31	NW ¼
1N	1W	31	E ½ SW ¼
1N	1W	31	NW ¼ SW ¼
1N	1W	32	All
1N	1W	33	All
1N	1W	34	All
1N	1W	35	All
1N	1W	36	All
1N	2W	13	All
1N	2W	14	NE ¼ SE ¼
1N	2W	14	NE ¼ NE ¼

Application No. G-7578

Permit No. G 8755

Township	Range	Section	List ½ ¼ of Section
1N	2W	14	SE ¼ NE ¼
1N	2W	14	SW ¼ NE ¼
1N	2W	14	NW ¼
1N	2W	23	NW ¼
1N	2W	23	S ½ NE ¼
1N	2W	23	NE ¼ NE ¼
1N	2W	23	N ½ SE ¼
1N	2W	24	NW ¼
1N	2W	24	SW ¼
1N	2W	24	S ½ NE ¼
1N	2W	24	SE ¼
1N	2W	25	N ½ NE ¼
1N	2W	25	SW ¼
1N	2W	25	SE ¼
1N	2W	26	S ½ NE ¼
1N	2W	26	SE ¼
1N	2W	34	E ½ SE ¼
1N	2W	34	SE ¼ NE ¼
1N	2W	35	E ½
1N	2W	35	SW ¼
1N	2W	35	S ½ NW ¼
1N	2W	36	N ½
1N	2W	36	N ½ SW ¼
1N	2W	36	N ½ SE ¼
1N	2W	36	SW ¼ SW ¼
1S	2W	1	S ½
1S	2W	1	S ½ NW ¼
1S	2W	1	SW ¼ NE ¼
1S	2W	2	SE ¼
1S	2W	2	NE ¼ SW ¼
1S	2W	10	N ½ NE ¼
1S	2W	11	N ½
1S	2W	12	All
1S	2W	13	All
1S	2W	14	E ½ SE ¼
1S	2W	23	E ½ NE ¼
1S	2W	23	NE ¼ SE ¼
1S	2W	24	All
1S	2W	25	N ½
1S	2W	25	NE ¼ SW ¼
1S	2W	25	NE ¼ SE ¼
2N	1W	17	SE ¼ SW ¼
2N	1W	18	S ½ SE ¼
2N	1W	18	NW ¼ SE ¼
2N	1W	19	E ½ NE ¼
2N	1W	19	NW ¼ NE ¼
2N	1W	20	All
2N	1W	21	SW ¼
2N	1W	21	NW ¼

Township	Range	Section	List ¼ ¼ of Section
2N	1W	24	All
2N	1W	25	All
2N	1W	26	All
2N	1W	28	NW ¼
2N	1W	28	SE ¼
2N	1W	28	NE ¼ SW ¼
2N	1W	28	W ½ NE ¼
2N	1W	29	N ½ NW ¼
2N	1W	29	N ½ NE ¼
2N	1W	32	SE ¼ SE ¼
2N	1W	32	SW ¼ SE ¼
2N	1W	34	All
2N	1W	35	All
2N	1W	36	All
2S	1W	1	All
2S	1W	2	All
2S	1W	3	All
2S	1W	4	E ½ NW ¼
2S	1W	4	E ½ SW ¼
2S	1W	4	E ½
2S	1W	9	E ½ NW ¼
2S	1W	9	E ½
2S	1W	10	All
2S	1W	11	All
2S	1W	12	All
2S	1W	13	W ½ NW ¼
2S	1W	13	NE ¼ NW ¼
2S	1W	13	NW ¼ SE ¼
2S	1W	13	S ½ SE ¼
2S	1W	13	S ½ NE ¼
2S	1W	13	SE ¼
2S	1W	14	N ½ NW ¼
2S	1W	14	SE ¼ NW ¼
2S	1W	14	E ½ SW ¼
2S	1W	14	E ½
2S	1W	23	All
2S	1W	24	All
2S	1W	25	W ½ SW ¼
2S	1W	25	NW ¼
2S	1W	26	E ½ NW ¼
2S	1W	26	NE ¼ SW ¼
2S	1W	26	N ½ SE ¼
2S	1W	26	NE ¼
2S	1W	36	NW ¼ NW ¼
2S	1E	6	W ½ NW ¼
2S	1E	6	W ½ SW ¼
2S	1E	7	W ½ NW ¼
2S	1E	7	NW ¼ SW ¼

Application No. 6-7578
Permit No. G 8755

SUPPLEMENT NO. 3

The City of Portland water system serves approximately 700,000 people living in or adjacent to the City. The customers are supplied by a single water source, the Bull Run River, through three pipelines running 26 miles from the headworks facility to terminal storage facilities in the City.

The Bull Run River's water quality occasionally does not meet the current U. S. Environmental Protection Agencies' requirements for drinking water. In addition, the pipelines conveying the water supply to the City are susceptible to destruction and/or damage by landslides and by sabotage where the pipes cross several bridges. Due to the potential for a loss of the Bull Run River supply and the effect such a loss would have on the economic livelihood of the Portland Metropolitan Area, an emergency water supply system is considered a necessary requirement for continued development of the Portland Metropolitan Area.

The quantity of appropriation requested is based upon a need to provide a minimal water supply of 100 mgd for the system, if the Bull Run River supply were not available for a ninety-day period. A 100 mgd supply coupled with water conservation measures is sufficient to prevent the closures of most businesses due to lack of water. The 250 mgd maximum, short term capacity is requested to provide suffient capacity to meet the demands on the water system without special conservation measures by the customers if the Bull Run supply is unavailable for a period of less than three days.

The demand for water placed on the Portland Water System by water districts serviced by the Portland System have been increasing and are projected to continue this increase. Several of these customers with very large potential water use, such as Wolf Creek Water District, have signed twenty-five-year agreements with Portland for water service. The total system demands are projected to exceed the system's water supply capability prior to the completion of the groundwater supply system proposed herein. The groundwater system is, therefore, required to supplement the existing system in an ever-increasing capacity, limited to 100 mgd, during periods of high demand for water.

Application No. G-7578
Permit No. G 8755

SUPPLEMENT NO. 1

*W. M. COUNTY OF MULTNOMAH

WELL NO.	REFERENCE POINT *	LOCATION IN FT.			
		N	S	E	W
WEST WELL FIELD					
1 & 8	N. E. COR. SEC. 16 TIN R2E		2250		1650
2	S. E. COR. SEC. 16 TIN R2E	2100			650
3 & 9	S.W. COR. SEC. 15 TIN R2E	2050		550	
4	N.W. COR. SEC. 15 TIN R2E		3150	2050	
5	N. E. COR. SEC. 15 TIN R2E		3400		1650
6 & 11	S.W. COR. SEC. 10 TIN R2E	650		150	
7 & 13	N. E. COR. SEC. 15 TIN R2E		2550		850
10	S. E. COR. SEC. 15 TIN R2E	1150			2700
12	N.W. COR. SEC. 15 TIN R2E		450	1500	
14	" "		1650	700	
EAST WELL FIELD					
1	S. E. COR. SEC. 13 TIN R2E	400			6000
2	" "	150			4000
3	N. E. COR. SEC. 24 TIN R2E		1750		3550
4	" "		3300		4500
5	" "		500		1350
6	" "		2200		1250
7	N.W. COR. SEC. 19 TIN R3E		700	150	
8	" "		2500	200	
9	" "		850	1650	
10	" "		2450	1650	
11	N. E. COR. SEC. 19 TIN R3E		1300		1450
12	N.W. COR. SEC. 20 TIN R3E		4050	850	
13	" "		1300	1550	
14	N. E. COR. SEC. 20 TIN R3E		1700		1100
15	N.W. COR. SEC. 21 TIN R3E		1000	2300	
16	" "		1400	3300	

Application No. G-7578

Permit No. G 8755

Remarks: The proposed wells will withdraw water from aquifers directly or indirectly in hydraulic communication with the waters of the Columbia River, assuring a lasting source of recharge for the aquifers utilized. The Bureau's Groundwater Study has identified four such aquifers within the area selected for the Portland Well Field. Few recorded existing wells presently use the aquifers proposed for development and placement of the wells is structured to prevent undue interference with the existing wells.

For further remarks, see Supplement No. 3.

Signature of Applicant

This is to certify that I have examined the foregoing application, together with the accompanying maps and data, and return the same for

In order to retain its priority, this application must be returned to the Water Resources Director with corrections on or before, 19

WITNESS my hand this day of, 19

Water Resources Director

By

This instrument was first received in the office of the Water Resources Director at Salem, Oregon, on the 12th day of November, 19 76, at 3:18 o'clock P.M.

Application No. G-7578 *Permit No.* G 8755

Application No. G-7578 *Permit No.* G 8755

Permit to Appropriate the Public Waters of the State of Oregon

This is to certify that I have examined the foregoing application and do hereby grant the same, SUBJECT TO EXISTING RIGHTS INCLUDING THE EXISTING MINIMUM FLOW POLICIES ESTABLISHED BY THE WATER POLICY REVIEW BOARD and the following limitations and conditions:

The right herein granted is limited to the amount of water which can be applied to beneficial use and shall not exceed 390 *cubic feet per second measured at the point of diversion from the well or source of appropriation, or its equivalent in case of rotation with other water users, from* 30 wells being (from West Well Field) 27.8 cfs #1, 27.8 cfs #2, 27.8 cfs #3, 27.8 cfs #4, 27.9 cfs #5, 5.5 cfs #6, 56. cfs #7, 5.6 cfs #8, 5.6 cfs #9, 5.6 cfs #10, 5.6 cfs #11, 5.6 cfs #12, 5.6 cfs #13, 11.1 cfs #14, and (from East Well Field) 16.7 cfs ***

The use to which this water is to be applied is to provide an emergency and supplemental water supply for the Portland Municipal water system.

If for irrigation, this appropriation shall be limited to ..... of one cubic foot per second or its equivalent for each acre irrigated and shall be further limited to a diversion of not to exceed ..... acre feet per acre for each acre irrigated during the irrigation season of each year;

***
#1, 16.7 cfs #2, 8.4 cfs #3, 13.9 cfs #4, 13.9 cfs #5, 13.9 cfs #6, 5.6 cfs #7, 5.6 cfs #8, 13.9 cfs #9, 13.9 cfs #10, 5.6 cfs #11, 8.4 cfs #12, 8.4 cfs #13, 11.1 cfs #14, 19.5 cfs #15, 19.5 cfs #16.

and shall be subject to such reasonable rotation system as may be ordered by the proper state officer.

The well shall be constructed in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon.

The works constructed shall include an air line and pressure gauge or an access port for measuring line, adequate to determine water level elevation in the well at all times.

The permittee shall install and maintain a weir, meter, or other suitable measuring device, and shall keep a complete record of the amount of ground water withdrawn.

The priority date of this permit is November 12, 1976

Actual construction work shall begin on or before August, 1979 *and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 19*81

Extended to Oct. 1, 1986 Extended to October 1, 1991, 10-1-96, ext. BC01

*Complete application of the water to the proposed use shall be made on or before October 1, 19*82

Extended to Oct. 1, 1986 Extended to October 1, 1991, 10-1-96

WITNESS my hand this 25th *day of* February, *19*80

James E. Sexson

Water Resources Director

690-10-PC

STATE OF OREGON

County of MULTNOMAH

PERMIT TO APPROPRIATE THE PUBLIC WATERS

This is to certify that I have examined APPLICATION G-11306 and do hereby grant the same SUBJECT TO EXISTING RIGHTS and the following limitations and conditions:

This permit is issued to City of Portland, a municipal corporation of the State of Oregon of 1120 SW 5th Avenue, Portland, Oregon 97204, phone 796-7404, for use of the waters from two wells, being 2.8 cubic foot per second for Well 16 (City 12) and 13.9 cfs * for the PURPOSE of municipal

that the PRIORITY OF THE RIGHT dates from August 17, 1984

and is limited to the amount of water which can be applied to beneficial use and shall not exceed 16.7 cfs

measured at the point of diversion from the wells , or its equivalent in case of rotation with other water users.

The well is to be LOCATED: Well 15 - North 60 degrees 30 minutes 48 seconds; Well 16 - North 82 degrees 27 minutes 12 seconds, both from the meander corner common to Sections 20 and 21, being within the (Well 15) NE 1/4 NW 1/4, (Well 16) SW 1/4 NE 1/4 of Section 21, Township 1 North, Range 3 East, WM, in the County of **

A description of the PLACE OF USE under the permit, and to which such right is appurtenant, is as follows:

* for Well 15 (City 13),

** Multnomah.

SEE NEXT PAGE

wnship 1 South, Range 3 East, WM	Section 1	NW 1/4	NW 1/4
		SW 1/4	NW 1/4
		NW 1/4	SW 1/4
		SW 1/4	SW 1/4
	Section 2		
	through 11	ALL	
	Section 12	NW 1/4	NW 1/4
		SW 1/4	NW 1/4
		NW 1/4	SW 1/4
		SW 1/4	SW 1/4
	Section 14	NW 1/4	
		SW 1/4	
		NW 1/4	NE 1/4
		NE 1/4	NE 1/4
		NW 1/4	SE 1/4
		SW 1/4	SE 1/4
	Section 15,		
	16 and 17	ALL	
	Section 18	NW 1/4	NW 1/4
		SW 1/4	NW 1/4
		NW 1/4	SW 1/4
		SW 1/4	SW 1/4
		NE 1/4	NE 1/4
		SE 1/4	NE 1/4
		SW 1/4	NE 1/4
		NE 1/4	SE 1/4
		NW 1/4	SE 1/4
		SE 1/4	SE 1/4
	Section 19	NW 1/4	NW 1/4
		SW 1/4	NW 1/4
		NW 1/4	SW 1/4
		SW 1/4	SW 1/4
	Section 20	NE 1/4	
		NE 1/4	SE 1/4
	Section 21	NW 1/4	
		NE 1/4	
		N 1/2	SE 1/4
		SE 1/4	SE 1/4
		NW 1/4	SW 1/4
		NE 1/4	SW 1/4
	Section 22	NW 1/4	NE 1/4
		NW 1/4	
		SW 1/4	
Township 1 North, Range 3 East, WM	Section 19	ALL	
	Section 20	W 1/2	
	Section 28	SW 1/4	
	Section 29	ALL	
	Section 30	ALL	
	Section 31	All	
	Section 32	ALL	
	Section 33	S 1/2	
		NW 1/4	
		S 1/2	NE 1/4
	Section 34	SW 1/4	NW 1/4
		W 1/2	SW 1/4
		SE 1/4	SW 1/4
		S 1/2	SE 1/4
	Section 35	W 1/2	SW 1/4
Township 1 North, Range 2 East, WM	Section 4	SW 1/4	SW 1/4
	Section 5	NW 1/4	NW 1/4
		SW 1/4	NW 1/4
		SE 1/4	NW 1/4
		SW 1/4	
		NW 1/4	SE 1/4
		SW 1/4	SE 1/4
		SE 1/4	SE 1/4

	Section 6, 7 and 8	ALL	
	Section 9	NW 1/4	
		SW 1/4	
		SE 1/4	
		SW 1/4	NE 1/4
	Section 10	NW 1/4	SW 1/4
		SW 1/4	SW 1/4
		SE 1/4	SW 1/4
	Section 13	S 1/2	SW 1/4
		S 1/2	SE 1/4
	Section 14	SW 1/4	NW 1/4
		SW 1/4	
		SE 1/4	
	Section 15	W 1/2	
		SE 1/4	
		W 1/2	NE 1/4
		SE 1/4	NE 1/4
	Section 16 through 36	ALL	
Township 1 South, Range 2 East, WM	Section 1 through 24	ALL	
	Section 25	N 1/2	NW 1/4
		E 1/2	NE 1/4
		NE 1/4	SE 1/4
	Section 26	NW 1/4	
		N 1/2	NE 1/4
	Section 27	N 1/2	NE 1/4
		SE 1/4	NE 1/4
	Section 28	NW 1/4	NE 1/4
	Section 29	W 1/2	NW 1/4
		W 1/2	SW 1/4
	Section 30	NE 1/4	
		SE 1/4	
Township 1 North, Range 1 East, WM	Section 1	ALL	
	Section 2	S 1/2	
		S 1/2	NW 1/4
		S 1/2	NE 1/4
	Section 3 through 29	ALL	
	Section 30	S 1/2	
		NE 1/4	
		SW 1/4	NW 1/4
		SE 1/4	NW 1/4
		NE 1/4	NW 1/4
	Section 31	W 1/2	
		SE 1/4	
		S 1/2	NE 1/4
	Section 32	E 1/2	
		SW 1/4	
		E 1/2	NW 1/4
		SW 1/4	NW 1/4
	Section 33 through 36	ALL	
Township 1 South, Range 1 East, WM	Section 1 through 24	ALL	
	Section 25	NW 1/4	NW 1/4
		NE 1/4	NE 1/4
	Section 26	NE 1/4	
		NW 1/4	
		W 1/2	SW 1/4
	Section 27 through 31	ALL	
	Section 32	N 1/2	
		SE 1/4	

	Section 33	ALL	
	Section 34	ALL	
	Section 35	W 1/2	
		W 1/2	NE 1/4
		W 1/2	SE 1/4
Township 2 North, Range 1 East, WM	Section 19	SW 1/4	SW 1/4
	Section 29	S 1/2	SW 1/4
	Section 30	W 1/2	
		SE 1/4	
		SW 1/4	NE 1/4
	Section 31	ALL	
	Section 32	ALL	
	Section 33	SW 1/4	
		S 1/2	SE 1/4
	Section 34	SW 1/4	SW 1/4
Township 2 South, Range 1 East, WM	Section 6	W 1/2	NW 1/4
		W 1/2	SW 1/4
	Section 7	W 1/2	NW 1/4
		NW 1/4	SW 1/4
	Section 19	W 1/2	NW 1/4
		SE 1/4	NW 1/4
		SW 1/4	
		W 1/2	SE 1/4
Township 1 South, Range 1 West, WM	Section 1		
	through 16	ALL	
	Section 17	N 1/2	
		SE 1/4	
		N 1/2	SW 1/4
		SW 1/4	SW 1/4
	Section 18	ALL	
	Section 19	N 1/2	
		SW 1/4	
		N 1/2	SE 1/4
		SW 1/4	SE 1/4
	Section 20	NE 1/4	
		SE 1/4	
		SW 1/4	
		SW 1/4	NW 1/4
	Section 21		
	through 27	ALL	
	Section 28	E 1/2	
		E 1/2	NW 1/4
		E 1/2	SW 1/4
	Section 29	SW 1/4	
		SE 1/4	
		N 1/2	NE 1/4
		N 1/2	NW 1/4
	Section 30	ALL	
	Section 33	NE 1/4	NW 1/4
		N 1/2	NE 1/4
		SW 1/4	NE 1/4
		S 1/2	SE 1/4
	Section 34	N 1/2	NW 1/4
		NE 1/4	
		SE 1/4	
		E 1/2	SW 1/4
		SW 1/4	SW 1/4
	Section 35	ALL	
	Section 36	ALL	
Township 1 North, Range 1 West, WM	Section 1		
	through 3	ALL	
	Section 4	S 1/2	
		S 1/2	NW 1/4
		S 1/2	NE 1/4
		NW 1/4	NW 1/4
		NE 1/4	NE 1/4

	Section 5	NE 1/4	
		SE 1/4	
		N 1/2	SW 1/4
		SE 1/4	SW 1/4
	Section 6	E 1/2	SE 1/4
	Section 9	E 1/2	NE 1/4
	Section 10	E 1/2	
		NW 1/4	
	Section 11		
	through 14	ALL	
	Section 15	E 1/2	NE 1/4
		E 1/2	SE 1/4
	Section 18	SE 1/4	
		E 1/2	SW 1/4
		SE 1/4	NE 1/4
	Section 19	E 1/2	NW 1/4
		W 1/2	NE 1/4
		SE 1/4	NE 1/4
		SW 1/4	NW 1/4
		SW 1/4	
		SE 1/4	
	Section 20	SW 1/4	NW 1/4
		SW 1/4	
		W 1/2	SE 1/4
	Section 21	NW 1/4	SW 1/4
		SW 1/4	SW 1/4
	Section 23		
	through 25	ALL	
	Section 26	S 1/2	
		NE 1/4	
		W 1/2	NW 1/4
		SE 1/4	NW 1/4
	Section 27	E 1/2	
		E 1/2	NW 1/4
		E 1/2	SW 1/4
	Section 28	NW 1/4	
		SW 1/4	
		W 1/2	SE 1/4
		SE 1/4	SE 1/4
		SW 1/4	NE 1/4
	Section 29	ALL	
	Section 30	E 1/2	
		NW 1/4	
		E 1/2	SW 1/4
	Section 31	E 1/2	
		NW 1/4	
		E 1/2	SW 1/4
		NW 1/4	SW 1/4
	Section 32		
	through 36	ALL	
Township 1 North, Range 2 West, WM	Section 13	ALL	
	Section 14	ALL	
	Section 23	NW 1/4	
		S 1/2	NE 1/4
		NE 1/4	NE 1/4
		N 1/2	SE 1/4
	Section 24	NW 1/4	
		SW 1/4	
		S 1/2	NE 1/4
		SE 1/4	
	Section 25	N 1/2	NE 1/4
		SW 1/4	
		SE 1/4	

	Section 26	S 1/2	NE 1/4
		SE 1/4	
	Section 34	E 1/2	SE 1/4
		SE 1/4	NE 1/4
	Section 35	E 1/2	
		SW 1/4	
		S 1/2	NW 1/4
	Section 36	N 1/2	
		N 1/2	SW 1/4
		N 1/2	SE 1/4
		SW 1/4	SW 1/4
Township 1 South, Range 2 West, WM	Section 1	S 1/2	
		S 1/2	NW 1/4
		SW 1/4	NE 1/4
	Section 2	SE 1/4	
		NE 1/4	SW 1/4
	Section 10	N 1/2	NE 1/4
	Section 11	N 1/2	
	Section 12	ALL	
	Section 13	ALL	
	Section 14	E 1/2	SE 1/4
	Section 23	E 1/2	NE 1/4
		NE 1/4	SE 1/4
	Section 24	ALL	
	Section 25	N 1/2	
		NE 1/4	SW 1/4
		NE 1/4	SE 1/4
Township 2 North, Range 1 West, WM	Section 17	SE 1/4	NW 1/4
	Section 18	S 1/2	SE 1/4
		NE 1/4	SE 1/4
	Section 19	E 1/2	NE 1/4
		NW 1/4	NE 1/4
	Section 20	ALL	
	Section 21	SW 1/4	
		NW 1/4	
	Section 23	SE 1/4	SW 1/4
		SE 1/4	
	Section 24		
	through 26	ALL	
	Section 28	NW 1/4	
		SE 1/4	
		NE 1/4	SW 1/4
		W 1/2	NE 1/4
	Section 29	N 1/2	NW 1/4
		N 1/2	NE 1/4
	Section 32	SE 1/4	SE 1/4
		SW 1/4	SE 1/4
	Section 33	NE 1/4	NE 1/4
		E 1/2	SE 1/4
	Section 34		
	through 36	ALL	
Township 2 South, Range 1 West, WM	Section 1		
	through 3	ALL	
	Section 4	E 1/2	NW 1/4
		E 1/2	SW 1/4
		E 1/2	
	Section 9	E 1/2	NW 1/4
		E 1/2	
	Section 10		
	through 12	ALL	
	Section 13	W 1/2	NW 1/4
		NE 1/4	NW 1/4
		W 1/2	SW 1/4
		S 1/2	NE 1/4
		SE 1/4	

Section 14	N 1/2	NW 1/4
	SE 1/4	NW 1/4
	E 1/2	SW 1/4
	E 1/2	
Section 15	N 1/2	
	N 1/2	SW 1/4
Section 16	NE 1/4	
	N 1/2	SE 1/4
Section 23	ALL	
Section 24	ALL	
Section 25	W 1/2	SW 1/4
	NW 1/4	
Section 26	E 1/2	NW 1/4
	NE 1/4	SW 1/4
	N 1/2	SE 1/4
	NE 1/4	
Section 36	NW 1/4	NW 1/4

The well shall be constructed in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon. The works constructed shall include an air line and pressure gauge or an access port for measuring line, adequate to determine water level elevation in the well at all times. The permittee shall install and maintain a weir, meter, or other suitable measuring device, and shall keep a complete record of the amount of ground water withdrawn.

Actual construction work shall begin on or before February 8, 1986 , and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 19 86 . Extended to October 1, 1991, 10-1-96

Complete application of the water to the proposed use shall be made on or before October 1, 19 87 . Extended to October 1, 1991, 10-1-96

Witness my hand this 8th day of February , 19 85 . Ext. BC01

/s/ WILLIAM H. YOUNG

WATER RESOURCES DIRECTOR

This permit is for the beneficial use of water. By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan. It is possible that the land use you propose may not be allowed if it is not in keeping with the goals and the acknowledged plan. Your city or county planning agency can advise you about the land-use plan in your area.

APPLICATION G-11306 PERMIT G10455

STATE OF OREGON

COUNTY OF CLACKAMAS, MULTNOMAH, WASHINGTON

CERTIFICATE OF WATER RIGHT

THIS CERTIFICATE ISSUED TO

CITY OF PORTLAND; PORTLAND WATER BUREAU
1120 SW 5TH AVE
PORTLAND OR 97206

confirms the right to use the waters of WELL 34 in the Willamette Basin to provide an EMERGENCY and SUPPLEMENTAL WATER SUPPLY for the Portland Municipal Water System.

This right was perfected under Permit G-10479. The date of priority is MARCH 1, 1985. The amount of water to which this right is entitled is limited to an amount actually used beneficially, and shall not exceed 7.3 CUBIC FEET PER SECOND or its equivalent measured at the well.

The well is located as follows:

Twp	Rng	Mer	Sec	Q-Q	DLC	Measured Distances
1 N	2 E	WM	15	NE NW	56	WELL 34 – 80 FEET NORTH & 1070 FEET EAST FROM THE WITNESS CORNER TO THE NE CORNER OF THE E.L. QUIMBY DLC 41.

A description of the place of use is as follows:

Twp	Rng	Mer	Sec	Q-Q
1 N	1 E	WM	1	ALL
1 N	1 E	WM	2	S 1/2
1 N	1 E	WM	2	S ½ N ½
1 N	1 E	WM	3	ALL
1 N	1 E	WM	4	ALL
1 N	1 E	WM	5	ALL
1 N	1 E	WM	6	ALL
1 N	1 E	WM	7	ALL
1 N	1 E	WM	8	ALL
1 N	1 E	WM	9	ALL
1 N	1 E	WM	10	ALL
1 N	1 E	WM	11	ALL
1 N	1 E	WM	12	ALL
1 N	1 E	WM	13	ALL
1 N	1 E	WM	14	ALL

NOTICE OF RIGHT TO PETITION FOR RECONSIDERATION OR JUDICIAL REVIEW

This is an order in other than a contested case. This order is subject to judicial review under ORS 183.484 and ORS 536.075. Any petition for judicial review must be filed within the 60-day time period specified by ORS 183.484(2). Pursuant to ORS 183.484, ORS 536.075 and OAR 137-004-0080, you may petition for judicial review and petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied. In addition, under ORS 537.260 any person with an application, permit or water right certificate subsequent in priority may jointly or severally contest the issuance of the certificate within three months after issuance of the certificate.

Twp	Rng	Mer	Sec	Q-Q
1 N	1 E	WM	15	ALL
1 N	1 E	WM	16	ALL
1 N	1 E	WM	17	ALL
1 N	1 E	WM	18	ALL
1 N	1 E	WM	19	ALL
1 N	1 E	WM	20	ALL
1 N	1 E	WM	21	ALL
1 N	1 E	WM	22	ALL
1 N	1 E	WM	23	ALL
1 N	1 E	WM	24	ALL
1 N	1 E	WM	25	ALL
1 N	1 E	WM	26	ALL
1 N	1 E	WM	27	ALL
1 N	1 E	WM	28	ALL
1 N	1 E	WM	29	ALL
1 N	1 E	WM	30	S ½
1 N	1 E	WM	30	NE ¼
1 N	1 E	WM	30	SW ¼ NW ¼
1 N	1 E	WM	30	SE ¼ NW ¼
1 N	1 E	WM	30	NE ¼ NW ¼
1 N	1 E	WM	31	W ½
1 N	1 E	WM	31	SE ¼
1 N	1 E	WM	31	S ½ NE ¼
1 N	1 E	WM	32	E ½
1 N	1 E	WM	32	SW ¼
1 N	1 E	WM	32	E ½ NW ¼
1 N	1 E	WM	32	SW ¼ NW ¼
1 N	1 E	WM	33	ALL
1 N	1 E	WM	34	ALL
1 N	1 E	WM	35	ALL
1 N	1 E	WM	36	ALL
1 N	1 W	WM	1	ALL
1 N	1 W	WM	2	ALL
1 N	1 W	WM	3	ALL
1 N	1 W	WM	4	S 1/2
1 N	1 W	WM	4	S ½ NW ¼
1 N	1 W	WM	4	S ½ NE ¼
1 N	1 W	WM	4	NW ¼ NW ¼
1 N	1 W	WM	4	NE ¼ NE ¼
1 N	1 W	WM	5	NE ¼
1 N	1 W	WM	5	SE ¼
1 N	1 W	WM	5	N ½ SW ¼
1 N	1 W	WM	5	SE ¼ SW ¼
1 N	1 W	WM	9	E ½ NE ¼
1 N	1 W	WM	10	E ½
1 N	1 W	WM	10	NW ¼
1 N	1 W	WM	11	ALL
1 N	1 W	WM	12	ALL
1 N	1 W	WM	13	ALL
1 N	1 W	WM	14	ALL
1 N	1 W	WM	15	E ½ NE ¼
1 N	1 W	WM	15	E ½ SE ¼

Twp	Rng	Mer	Sec	Q-Q
1 N	1 W	WM	18	W ½ SE ¼
1 N	1 W	WM	18	E ½ SW ¼
1 N	1 W	WM	19	E ½ NW ¼
1 N	1 W	WM	19	W ½ NE ¼
1 N	1 W	WM	19	SE ¼ NE ¼
1 N	1 W	WM	19	SW ¼ NW ¼
1 N	1 W	WM	19	SW ¼
1 N	1 W	WM	19	SE ¼
1 N	1 W	WM	20	SW ¼ NW ¼
1 N	1 W	WM	20	SW ¼
1 N	1 W	WM	20	W ½ SE ¼
1 N	1 W	WM	21	NW ¼ SW ¼
1 N	1 W	WM	21	SW ¼ SW ¼
1 N	1 W	WM	23	ALL
1 N	1 W	WM	24	ALL
1 N	1 W	WM	25	ALL
1 N	1 W	WM	26	S ½
1 N	1 W	WM	26	NE ¼
1 N	1 W	WM	26	W ½ NW ¼
1 N	1 W	WM	26	SE ¼ NW ¼
1 N	1 W	WM	27	E ½
1 N	1 W	WM	27	E ½ NW ¼
1 N	1 W	WM	27	E ½ SW ¼
1 N	1 W	WM	28	NW ¼
1 N	1 W	WM	28	SW ¼
1 N	1 W	WM	28	W ½ SE ¼
1 N	1 W	WM	28	SE ¼ SE ¼
1 N	1 W	WM	28	SW ¼ NE ¼
1 N	1 W	WM	29	ALL
1 N	1 W	WM	30	E ½
1 N	1 W	WM	30	NW ¼
1 N	1 W	WM	30	E ½ SW ¼
1 N	1 W	WM	31	E ½
1 N	1 W	WM	31	NW ¼
1 N	1 W	WM	31	E ½ SW ¼
1 N	1 W	WM	31	NW ¼ SW ¼
1 N	1 W	WM	32	ALL
1 N	1 W	WM	33	ALL
1 N	1 W	WM	34	ALL
1 N	1 W	WM	35	ALL
1 N	1 W	WM	36	ALL
1 N	2 W	WM	14	S ½ NW ¼
1 N	2 W	WM	14	SW ¼
1 N	2 W	WM	14	NW ¼ SE ¼
1 N	2 W	WM	14	S ½ SE ¼
1 N	2 W	WM	23	NE ¼ NE ¼
1 N	2 W	WM	23	NW ¼
1 N	2 W	WM	23	N ½ SE ¼
1 N	2 W	WM	23	S ½ NE ¼
1 N	2 W	WM	24	NW ¼
1 N	2 W	WM	24	SW ¼
1 N	2 W	WM	24	S ½ NE ¼

Twp	Rng	Mer	Sec	Q-Q
1 N	2 W	WM	24	SE ¼
1 N	2 W	WM	25	N ½ NE ¼
1 N	2 W	WM	25	SW ¼
1 N	2 W	WM	25	SE ¼
1 N	2 W	WM	26	S ½ NE 1/4
1 N	2 W	WM	26	SE ¼
1 N	2 W	WM	35	E ½
1 N	2 W	WM	35	NE ¼ SW ¼
1 N	2 W	WM	35	SE ¼ SW ¼
1 N	2 W	WM	35	SE ¼ NW ¼
1 N	2 W	WM	36	N ½
1 N	2 W	WM	36	N ½ SW ¼
1 N	2 W	WM	36	N ½ SE ¼
1 N	2 W	WM	36	SW ¼ SW ¼
1N	2E	WM	5	SW ¼
1N	2E	WM	5	NW ¼ SE ¼
1N	2E	WM	5	SW ¼ SE ¼
1N	2E	WM	5	SE ¼ SE ¼
1N	2E	WM	6	ALL
1N	2E	WM	7	ALL
1N	2E	WM	8	ALL
1N	2E	WM	9	SW ¼ NE ¼
1N	2E	WM	9	NW ¼
1N	2E	WM	9	SW ¼
1N	2E	WM	9	SE ¼
1N	2E	WM	10	NW ¼ SW ¼
1N	2E	WM	10	SW ¼ SW ¼
1N	2E	WM	10	SE ¼ SW ¼
1N	2E	WM	13	S ½ SW ¼
1N	2E	WM	13	S ½ SE ¼
1N	2E	WM	14	SW ¼ NW ¼
1N	2E	WM	14	SW ¼
1N	2E	WM	14	SE ¼
1N	2E	WM	15	W ½ NE ¼
1N	2E	WM	15	SE ¼ NE ¼
1N	2E	WM	15	W ½
1N	2E	WM	15	SE ¼
1N	2E	WM	16	ALL
1N	2E	WM	17	ALL
1N	2E	WM	18	ALL
1N	2E	WM	19	ALL
1N	2E	WM	20	ALL
1N	2E	WM	21	ALL
1N	2E	WM	22	ALL
1N	2E	WM	23	ALL
1N	2E	WM	24	ALL
1N	2E	WM	25	ALL
1N	2E	WM	26	ALL
1N	2E	WM	27	ALL
1N	2E	WM	28	ALL
1N	2E	WM	29	ALL
1N	2E	WM	30	ALL

Twp	Rng	Mer	Sec	Q-Q
1N	2E	WM	31	ALL
1N	2E	WM	32	ALL
1N	2E	WM	33	ALL
1N	2E	WM	34	ALL
1N	2E	WM	35	ALL
1N	2E	WM	36	ALL
1 N	3 E	WM	19	ALL
1 N	3 E	WM	20	W ½
1 N	3 E	WM	28	SW ¼
1 N	3 E	WM	29	NE ¼
1 N	3 E	WM	29	E ½ NW ¼
1 N	3 E	WM	29	SW ¼ NW ¼
1 N	3 E	WM	29	S ½
1 N	3 E	WM	30	ALL
1 N	3 E	WM	31	ALL
1 N	3 E	WM	32	ALL
1 N	3 E	WM	33	S ½
1 N	3 E	WM	33	NW ¼
1 N	3 E	WM	33	S ½ NE ¼
1 N	3 E	WM	34	SW ¼ NW ¼
1 N	3 E	WM	34	W ½ SW ¼
1 N	3 E	WM	34	SE ¼ SW ¼
1 N	3 E	WM	34	S ½ SE ¼
1 N	3 E	WM	35	W ½ SW ¼
1 S	1 E	WM	1	ALL
1 S	1 E	WM	2	ALL
1 S	1 E	WM	3	ALL
1 S	1 E	WM	4	ALL
1 S	1 E	WM	5	ALL
1 S	1 E	WM	6	ALL
1 S	1 E	WM	7	ALL
1 S	1 E	WM	8	ALL
1 S	1 E	WM	9	ALL
1 S	1 E	WM	10	ALL
1 S	1 E	WM	11	ALL
1 S	1 E	WM	12	ALL
1 S	1 E	WM	13	ALL
1 S	1 E	WM	14	ALL
1 S	1 E	WM	15	ALL
1 S	1 E	WM	16	ALL
1 S	1 E	WM	17	ALL
1 S	1 E	WM	18	ALL
1 S	1 E	WM	19	ALL
1 S	1 E	WM	20	ALL
1 S	1 E	WM	21	ALL
1 S	1 E	WM	22	ALL
1 S	1 E	WM	23	ALL
1 S	1 E	WM	24	ALL
1 S	1 E	WM	25	NW ¼ NW ¼
1 S	1 E	WM	25	NE ¼ NE ¼
1 S	1 E	WM	26	NE ¼
1 S	1 E	WM	26	NW ¼

Twp	Rng	Mer	Sec	Q-Q
1 S	1 E	WM	26	W ½ SW ¼
1 S	1 E	WM	27	ALL
1 S	1 E	WM	28	ALL
1 S	1 E	WM	29	ALL
1 S	1 E	WM	30	ALL
1 S	1 E	WM	31	ALL
1 S	1 E	WM	32	N ½
1 S	1 E	WM	32	SE ¼
1 S	1 E	WM	33	ALL
1 S	1 E	WM	34	ALL
1 S	1 E	WM	35	W ½
1 S	1 E	WM	35	W ½ NE ¼
1 S	1 E	WM	35	W ½ SE ¼
1S	2E	WM	1	ALL
1S	2E	WM	2	ALL
1S	2E	WM	3	ALL
1S	2E	WM	4	ALL
1S	2E	WM	5	ALL
1S	2E	WM	6	ALL
1S	2E	WM	7	ALL
1S	2E	WM	8	ALL
1S	2E	WM	9	ALL
1S	2E	WM	10	ALL
1S	2E	WM	11	ALL
1S	2E	WM	12	ALL
1S	2E	WM	13	ALL
1S	2E	WM	14	ALL
1S	2E	WM	15	ALL
1S	2E	WM	16	ALL
1S	2E	WM	17	ALL
1S	2E	WM	18	ALL
1S	2E	WM	19	ALL
1S	2E	WM	20	ALL
1S	2E	WM	21	ALL
1S	2E	WM	22	ALL
1S	2E	WM	23	ALL
1S	2E	WM	24	ALL
1S	2E	WM	25	N ½ NE ¼
1S	2E	WM	25	N ½ NW ¼
1S	2E	WM	26	N ½ NE ¼
1S	2E	WM	26	NW ¼
1S	2E	WM	27	N ½ NE ¼
1S	2E	WM	27	SE ¼ NE ¼
1S	2E	WM	28	NW ¼ NE ¼
1S	2E	WM	29	W ½ NW ¼
1S	2E	WM	30	NE ¼
1S	3E	WM	1	W ½ W ½
1S	3E	WM	2	ALL
1S	3E	WM	3	ALL
1S	3E	WM	4	ALL
1S	3E	WM	5	ALL
1S	3E	WM	6	ALL

Twp	Rng	Mer	Sec	Q-Q
1S	3E	WM	7	ALL
1S	3E	WM	8	ALL
1S	3E	WM	9	ALL
1S	3E	WM	10	ALL
1S	3E	WM	11	ALL
1S	3E	WM	12	W ½ W ½
1S	3E	WM	14	N ½ NE ¼
1S	3E	WM	14	NW ¼
1S	3E	WM	14	SW ¼
1S	3E	WM	14	W ½ SE ¼
1S	3E	WM	15	ALL
1S	3E	WM	16	ALL
1S	3E	WM	17	ALL
1S	3E	WM	18	E ½ NE ¼
1S	3E	WM	18	SW ¼ NE ¼
1S	3E	WM	18	W ½ NW ¼
1S	3E	WM	18	W ½ SW ¼
1S	3E	WM	18	N ½ SE ¼
1S	3E	WM	18	SE ¼ SE ¼
1S	3E	WM	19	W ½ NW ¼
1S	3E	WM	19	W ½ SW ¼
1S	3E	WM	20	NE ¼
1S	3E	WM	20	NE ¼ SE ¼
1S	3E	WM	21	N ½
1S	3E	WM	21	NE ½ SW ¼
1S	3E	WM	21	N ½ SE ¼
1S	3E	WM	21	SE ¼ SE ¼
1S	3E	WM	22	W ½
1S	1W	WM	1	ALL
1S	1W	WM	2	ALL
1S	1W	WM	3	ALL
1S	1W	WM	4	ALL
1S	1W	WM	5	ALL
1S	1W	WM	6	ALL
1S	1W	WM	7	ALL
1S	1W	WM	8	E ½ NE ¼
1S	1W	WM	8	N ½ NW ¼
1S	1W	WM	8	W ½ SW ¼
1S	1W	WM	8	NE ¼ SE ¼
1S	1W	WM	9	NE ¼
1S	1W	WM	9	NW ¼
1S	1W	WM	9	SW ¼
1S	1W	WM	9	NE ¼ SE ¼
1S	1W	WM	9	NW ¼ SE ¼
1S	1W	WM	9	SW ¼ SE ¼
1S	1W	WM	10	ALL
1S	1W	WM	11	ALL
1S	1W	WM	12	ALL
1S	1W	WM	13	ALL
1S	1W	WM	14	SE ¼ NE ¼
1S	1W	WM	14	N ½ NE ¼
1S	1W	WM	14	SE ¼

Twp	Rng	Mer	Sec	Q-Q
1S	1W	WM	15	NE ¼ NE ¼
1S	1W	WM	15	NE ¼ NW ¼
1S	1W	WM	17	N ½
1S	1W	WM	17	N ½ SW ¼
1S	1W	WM	17	SW ¼ SW ¼
1S	1W	WM	17	SE ¼
1S	1W	WM	18	ALL
1S	1W	WM	19	N ½
1S	1W	WM	19	SW ¼
1S	1W	WM	19	N ½ SE ¼
1S	1W	WM	19	SW ¼ SE ¼
1S	1W	WM	20	NE ¼
1S	1W	WM	20	SW ¼ NW ¼
1S	1W	WM	20	SW ¼
1S	1W	WM	20	SW ¼ SE ¼
1S	1W	WM	22	SE ¼ NE ¼
1S	1W	WM	22	E ½ SE ¼
1S	1W	WM	23	NE ¼
1S	1W	WM	23	SE ¼ NW ¼
1S	1W	WM	23	SW ¼
1S	1W	WM	23	SE ¼
1S	1W	WM	24	ALL
1S	1W	WM	25	ALL
1S	1W	WM	26	ALL
1S	1W	WM	27	E ½ NE ¼
1S	1W	WM	27	E ½ SE ¼
1S	1W	WM	29	N ½ NW ¼
1S	1W	WM	29	W ½ SW ¼
1S	1W	WM	30	N ½ NE ¼
1S	1W	WM	30	SW ¼ NE ¼
1S	1W	WM	30	NW ¼
1S	1W	WM	30	SW ¼
1S	1W	WM	30	SE ¼
1S	1W	WM	33	SW ¼ NE ¼
1S	1W	WM	33	S ½ SE ¼
1S	1W	WM	33	E ½ SW ¼
1S	1W	WM	33	E ½ SE ¼
1S	1W	WM	34	NE ¼
1S	1W	WM	34	NE ¼ NW ¼
1S	1W	WM	34	S ½
1S	1W	WM	35	ALL
1S	1W	WM	36	ALL
1S	2W	WM	1	SW ¼ NE ¼
1S	2W	WM	1	S ½
1S	2W	WM	1	S ½ NW ¼
1S	2W	WM	2	SW ¼
1S	2W	WM	2	SE ¼
1S	2W	WM	11	NE ¼
1S	2W	WM	11	E ½ NW ¼
1S	2W	WM	12	ALL
1S	2W	WM	13	ALL
1S	2W	WM	14	E ½ SE ¼

Twp	Rng	Mer	Sec	Q-Q
1S	2W	WM	23	E ½ NE ¼
1S	2W	WM	23	NE ¼ SE ¼
1S	2W	WM	24	ALL
1S	2W	WM	25	N ½
1S	2W	WM	25	NE ¼ SE ¼
1S	2W	WM	25	NE ¼ SW ¼
2S	1E	WM	6	W ½ NW ¼
2S	1E	WM	7	W ½ NW ¼
2S	1E	WM	7	NW ¼ SW ¼
2S	1E	WM	19	S ½ NW ¼
2S	1E	WM	19	SW ¼
2S	1W	WM	1	ALL
2S	1W	WM	2	ALL
2S	1W	WM	3	ALL
2S	1W	WM	4	E ½ NW ¼
2S	1W	WM	4	E ½ SW ¼
2S	1W	WM	4	E ½
2S	1W	WM	9	E ½ NW ¼
2S	1W	WM	9	E ½
2S	1W	WM	10	ALL
2S	1W	WM	11	ALL
2S	1W	WM	12	ALL
2S	1W	WM	13	S ½ NE ¼
2S	1W	WM	13	NE ¼ NW ¼
2S	1W	WM	13	W ½ NW ¼
2S	1W	WM	13	W ½ SW ¼
2S	1W	WM	13	SE ¼
2S	1W	WM	14	N ½ NW ¼
2S	1W	WM	14	SE ¼ NW ¼
2S	1W	WM	14	E ½ SW ¼
2S	1W	WM	14	E ½
2S	1W	WM	15	N ½
2S	1W	WM	15	N ½ SW ¼
2S	1W	WM	16	NE ¼
2S	1W	WM	16	N ½ SE ¼
2S	1W	WM	23	ALL
2S	1W	WM	24	ALL
2S	1W	WM	25	W ½ SW ¼
2S	1W	WM	25	NW ¼
2S	1W	WM	26	E ½ NW ¼
2S	1W	WM	26	NE ¼ SW ¼
2S	1W	WM	26	N ½ SE ¼
2S	1W	WM	26	NE ¼
2S	1W	WM	36	NW ¼ NW ¼
2N	1E	WM	30	SE ¼
2N	1E	WM	30	W ½
2N	1E	WM	31	ALL
2N	1E	WM	32	ALL
2N	1E	WM	33	SW ¼
2N	1E	WM	33	S ½ SE ¼
2N	1E	WM	34	SW ¼ SW ¼
2N	1W	WM	18	S ½ SE ¼

Twp	Rng	Mer	Sec	Q-Q
2N	1W	WM	18	NW ¼ SE ¼
2N	1W	WM	19	E ½ NE ¼
2N	1W	WM	19	NW ¼ NE ¼
2N	1W	WM	20	ALL
2N	1W	WM	21	SW 1/4
2N	1W	WM	21	NW 1/4
2N	1W	WM	23	SE ¼ SW 1/4
2N	1W	WM	23	SE 1/4
2N	1W	WM	24	SW ¼
2N	1W	WM	24	SE 1/4
2N	1W	WM	25	ALL
2N	1W	WM	26	ALL
2N	1W	WM	28	NW ¼
2N	1W	WM	28	SE ¼
2N	1W	WM	28	NE ¼ SW ¼
2N	1W	WM	29	N ¼ NE ¼
2N	1W	WM	32	SE ¼ SE ¼
2N	1W	WM	32	SW ¼ SE ¼
2N	1W	WM	33	NE ¼ NE ¼
2N	1W	WM	33	E ½ SE ¼
2N	1W	WM	34	ALL
2N	1W	WM	35	ALL
2N	1W	WM	36	ALL

The well shall be maintained in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon. The works shall be equipped with a usable access port, and may also include an air line and pressure gauge to determine the water level elevation in the well at all times.

The water user shall install and maintain a weir, meter, or other suitable measuring device and keep a complete record of the amount of ground water withdrawn.

By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan.

The right to the use of the water for the above purpose is restricted to beneficial use on the lands or place of use described; however water may be applied to lands which are not specifically described above, provided the holder of this right complies with ORS 540.510(3)

This certificate is issued for a partial perfection of Permit G-10479 as described in OAR 690-320-0040 and by an order of the Water Resources Director entered March 27, 2014, at Volume 91, Page 890.

Issued MAR 27 2014

Dwight W. French
Water Right Services Administrator, for
Phillip C. Ward, Director
Water Resources Department

STATE OF OREGON

COUNTY OF CLACKAMAS, MULTNOMAH, WASHINGTON

CERTIFICATE OF WATER RIGHT

THIS CERTIFICATE ISSUED TO

CITY OF PORTLAND; PORTLAND WATER BUREAU
1120 SW 5TH AVE
PORTLAND OR 97206

confirms the right to use the waters of WELL 17, WELL 18, AND WELL 19 in the Willamette Basin for MUNICIPAL USES.

This right was perfected under Permit G-10124. The date of priority is MARCH 25, 1983. The amount of water to which this right is entitled is limited to an amount actually used beneficially, and shall not exceed 39.96 CUBIC FEET PER SECOND (CFS) or its equivalent in case of rotation, measured at the wells. WELL 17 shall provide 5.7 CFS, WELL 18 shall provide 14.80 CFS, and WELL 19 shall provide 19.46 CFS.

The wells are located as follows:

Twp	Rng	Mer	Sec	Q-Q	DLC	Measured Distances
1 N	3 E	WM	21	SW NE	40	WELL 17 - 140 FEET SOUTH & 1390 FEET EAST FROM THE WITNESS CORNER TO THE NW CORNER OF THE JOHN CROSBY DLC 40
1 N	3 E	WM	21	SW NE	40	WELL 18 - 400 FEET SOUTH & 2450 FEET EAST FROM THE WITNESS CORNER TO THE NW CORNER OF THE JOHN CROSBY DLC 40
1 N	3 E	WM	21	SW NW	40	WELL 19 - 320 FEET SOUTH & 990 FEET WEST FROM WITNESS CORNER TO THE NW CORNER OF THE JOHN CROSBY DLC 40

A description of the place of use is as follows:

Twp	Rng	Mer	Sec	Q-Q
1 N	1 E	WM	1	ALL
1 N	1 E	WM	2	S 1/2
1 N	1 E	WM	2	S ½ N ½
1 N	1 E	WM	3	ALL
1 N	1 E	WM	4	ALL
1 N	1 E	WM	5	ALL
1 N	1 E	WM	6	ALL

NOTICE OF RIGHT TO PETITION FOR RECONSIDERATION OR JUDICIAL REVIEW

This is an order in other than a contested case. This order is subject to judicial review under ORS 183.484 and ORS 536.075. Any petition for judicial review must be filed within the 60-day time period specified by ORS 183.484(2). Pursuant to ORS 183.484, ORS 536.075 and OAR 137-004-0080, you may petition for judicial review and petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied. In addition, under ORS 537.260 any person with an application, permit or water right certificate subsequent in priority may jointly or severally contest the issuance of the certificate within three months after issuance of the certificate.

Twp	Rng	Mer	Sec	Q-Q
1 N	1 E	WM	7	ALL
1 N	1 E	WM	8	ALL
1 N	1 E	WM	9	ALL
1 N	1 E	WM	10	ALL
1 N	1 E	WM	11	ALL
1 N	1 E	WM	12	ALL
1 N	1 E	WM	13	ALL
1 N	1 E	WM	14	ALL
1 N	1 E	WM	15	ALL
1 N	1 E	WM	16	ALL
1 N	1 E	WM	17	ALL
1 N	1 E	WM	18	ALL
1 N	1 E	WM	19	ALL
1 N	1 E	WM	20	ALL
1 N	1 E	WM	21	ALL
1 N	1 E	WM	22	ALL
1 N	1 E	WM	23	ALL
1 N	1 E	WM	24	ALL
1 N	1 E	WM	25	ALL
1 N	1 E	WM	26	ALL
1 N	1 E	WM	27	ALL
1 N	1 E	WM	28	ALL
1 N	1 E	WM	29	ALL
1 N	1 E	WM	30	S ½
1 N	1 E	WM	30	NE ¼
1 N	1 E	WM	30	S ½ NW ¼
1 N	1 E	WM	30	NE ¼ NW ¼
1 N	1 E	WM	31	W ½
1 N	1 E	WM	31	SE ¼
1 N	1 E	WM	31	S ½ NE ¼
1 N	1 E	WM	32	E ½
1 N	1 E	WM	32	SW ¼
1 N	1 E	WM	32	E ½ NW ¼
1 N	1 E	WM	32	SW ¼ NW ¼
1 N	1 E	WM	33	ALL
1 N	1 E	WM	34	ALL
1 N	1 E	WM	35	ALL
1 N	1 E	WM	36	ALL
1 N	1 W	WM	1	ALL
1 N	1 W	WM	2	ALL
1 N	1 W	WM	3	ALL
1 N	1 W	WM	4	S 1/2
1 N	1 W	WM	4	S ½ NW ¼
1 N	1 W	WM	4	S ½ NE ¼
1 N	1 W	WM	4	NW ¼ NW ¼
1 N	1 W	WM	4	NE ¼ NE ¼
1 N	1 W	WM	5	NE ¼
1 N	1 W	WM	5	SE ¼
1 N	1 W	WM	5	N ½ SW ¼
1 N	1 W	WM	5	SE ¼ SW ¼
1 N	1 W	WM	9	E ½ NE ¼

Twp	Rng	Mer	Sec	Q-Q
1 N	1 W	WM	10	E ½
1 N	1 W	WM	10	NW ¼
1 N	1 W	WM	11	ALL
1 N	1 W	WM	12	ALL
1 N	1 W	WM	13	ALL
1 N	1 W	WM	14	ALL
1 N	1 W	WM	15	E ½ NE ¼
1 N	1 W	WM	15	E ½ SE ¼
1 N	1 W	WM	18	W ½ SE ¼
1 N	1 W	WM	18	E ½ SW ¼
1 N	1 W	WM	19	E ½ NW ¼
1 N	1 W	WM	19	W ½ NE ¼
1 N	1 W	WM	19	SE ¼ NE ¼
1 N	1 W	WM	19	SW ¼ NW ¼
1 N	1 W	WM	19	SW ¼
1 N	1 W	WM	19	SE ¼
1 N	1 W	WM	20	SW ¼ NW ¼
1 N	1 W	WM	20	SW ¼
1 N	1 W	WM	20	W ½ SE ¼
1 N	1 W	WM	21	NW ¼ SW ¼
1 N	1 W	WM	21	SW ¼ SW ¼
1 N	1 W	WM	23	ALL
1 N	1 W	WM	24	ALL
1 N	1 W	WM	25	ALL
1 N	1 W	WM	26	S ½
1 N	1 W	WM	26	NE ¼
1 N	1 W	WM	26	W ½ NW ¼
1 N	1 W	WM	26	SE ¼ NW ¼
1 N	1 W	WM	27	E ½
1 N	1 W	WM	27	E ½ NW ¼
1 N	1 W	WM	27	E ½ SW ¼
1 N	1 W	WM	28	NW ¼
1 N	1 W	WM	28	SW ¼
1 N	1 W	WM	28	W ½ SE ¼
1 N	1 W	WM	28	SE ¼ SE ¼
1 N	1 W	WM	28	SW ¼ NE ¼
1 N	1 W	WM	29	ALL
1 N	1 W	WM	30	E ½
1 N	1 W	WM	30	NW ¼
1 N	1 W	WM	30	E ½ SW ¼
1 N	1 W	WM	31	E ½
1 N	1 W	WM	31	NW ¼
1 N	1 W	WM	31	E ½ SW ¼
1 N	1 W	WM	31	NW ¼ SW ¼
1 N	1 W	WM	32	ALL
1 N	1 W	WM	33	ALL
1 N	1 W	WM	34	ALL
1 N	1 W	WM	35	ALL
1 N	1 W	WM	36	ALL
1 N	2 W	WM	14	S ½ NW ¼
1 N	2 W	WM	14	SW ¼

Twp	Rng	Mer	Sec	Q-Q
1 N	2 W	WM	14	NW ¼ SE ¼
1 N	2 W	WM	14	S ½ SE ¼
1 N	2 W	WM	23	NE ¼ NE ¼
1 N	2 W	WM	23	NW ¼
1 N	2 W	WM	23	N ½ SE ¼
1 N	2 W	WM	23	S ½ NE ¼
1 N	2 W	WM	24	NW ¼
1 N	2 W	WM	24	SW ¼
1 N	2 W	WM	24	S ½ NE ¼
1 N	2 W	WM	24	SE ¼
1 N	2 W	WM	25	N ½ NE ¼
1 N	2 W	WM	25	SW ¼
1 N	2 W	WM	25	SE ¼
1 N	2 W	WM	26	S ½ NE 1/4
1 N	2 W	WM	26	SE ¼
1 N	2 W	WM	35	E ½
1 N	2 W	WM	35	NE ¼ SW ¼
1 N	2 W	WM	35	SE ¼ SW ¼
1 N	2 W	WM	35	SE ¼ NW ¼
1 N	2 W	WM	36	N ½
1 N	2 W	WM	36	N ½ SW ¼
1 N	2 W	WM	36	N ½ SE ¼
1 N	2 W	WM	36	SW ¼ SW ¼
1N	2E	WM	5	SW ¼
1N	2E	WM	5	NW ¼ SE ¼
1N	2E	WM	5	SW ¼ SE ¼
1N	2E	WM	5	SE ¼ SE ¼
1N	2E	WM	6	ALL
1N	2E	WM	7	ALL
1N	2E	WM	8	ALL
1N	2E	WM	9	SW ¼ NE ¼
1N	2E	WM	9	NW ¼
1N	2E	WM	9	SW ¼
1N	2E	WM	9	SE ¼
1N	2E	WM	10	W ½ SW ¼
1N	2E	WM	10	SE ¼ SW ¼
1N	2E	WM	13	S ½ SW ¼
1N	2E	WM	13	S ½ SE ¼
1N	2E	WM	14	SW ¼ NW ¼
1N	2E	WM	14	S ½
1N	2E	WM	15	W ½ NE ¼
1N	2E	WM	15	SE ¼ NE ¼
1N	2E	WM	15	W ½
1N	2E	WM	15	SE ¼
1N	2E	WM	16	ALL
1N	2E	WM	17	ALL
1N	2E	WM	18	ALL
1N	2E	WM	19	ALL
1N	2E	WM	20	ALL
1N	2E	WM	21	ALL
1N	2E	WM	22	ALL

Twp	Rng	Mer	Sec	Q-Q
1N	2E	WM	23	ALL
1N	2E	WM	24	ALL
1N	2E	WM	25	ALL
1N	2E	WM	26	ALL
1N	2E	WM	27	ALL
1N	2E	WM	28	ALL
1N	2E	WM	29	ALL
1N	2E	WM	30	ALL
1N	2E	WM	31	ALL
1N	2E	WM	32	ALL
1N	2E	WM	33	ALL
1N	2E	WM	34	ALL
1N	2E	WM	35	ALL
1N	2E	WM	36	ALL
1 N	3 E	WM	19	ALL
1 N	3 E	WM	20	W ½
1 N	3 E	WM	28	SW ¼
1 N	3 E	WM	29	NE ¼
1 N	3 E	WM	29	NE ¼ NW ¼
1 N	3 E	WM	29	S ½ NW ¼
1 N	3 E	WM	29	S ½
1 N	3 E	WM	30	ALL
1 N	3 E	WM	31	ALL
1 N	3 E	WM	32	ALL
1 N	3 E	WM	33	S ½
1 N	3 E	WM	33	NW ¼
1 N	3 E	WM	33	S ½ NE ¼
1 N	3 E	WM	34	SW ¼ NW ¼
1 N	3 E	WM	34	W ½ SW ¼
1 N	3 E	WM	34	SE ¼ SW ¼
1 N	3 E	WM	34	S ½ SE ¼
1 N	3 E	WM	35	W ½ SW ¼
1 S	1 E	WM	1	ALL
1 S	1 E	WM	2	ALL
1 S	1 E	WM	3	ALL
1 S	1 E	WM	4	ALL
1 S	1 E	WM	5	ALL
1 S	1 E	WM	6	ALL
1 S	1 E	WM	7	ALL
1 S	1 E	WM	8	ALL
1 S	1 E	WM	9	ALL
1 S	1 E	WM	10	ALL
1 S	1 E	WM	11	ALL
1 S	1 E	WM	12	ALL
1 S	1 E	WM	13	ALL
1 S	1 E	WM	14	ALL
1 S	1 E	WM	15	ALL
1 S	1 E	WM	16	ALL
1 S	1 E	WM	17	ALL
1 S	1 E	WM	18	ALL
1 S	1 E	WM	19	ALL

Twp	Rng	Mer	Sec	Q-Q
1 S	1 E	WM	20	ALL
1 S	1 E	WM	21	ALL
1 S	1 E	WM	22	ALL
1 S	1 E	WM	23	ALL
1 S	1 E	WM	24	ALL
1 S	1 E	WM	25	NW ¼ NW ¼
1 S	1 E	WM	25	NE ¼ NE ¼
1 S	1 E	WM	26	N ½
1 S	1 E	WM	26	W ½ SW ¼
1 S	1 E	WM	27	ALL
1 S	1 E	WM	28	ALL
1 S	1 E	WM	29	ALL
1 S	1 E	WM	30	ALL
1 S	1 E	WM	31	ALL
1 S	1 E	WM	32	N ½
1 S	1 E	WM	32	SE ¼
1 S	1 E	WM	33	ALL
1 S	1 E	WM	34	ALL
1 S	1 E	WM	35	W ½
1 S	1 E	WM	35	W ½ NE ¼
1 S	1 E	WM	35	W ½ SE ¼
1S	2E	WM	1	ALL
1S	2E	WM	2	ALL
1S	2E	WM	3	ALL
1S	2E	WM	4	ALL
1S	2E	WM	5	ALL
1S	2E	WM	6	ALL
1S	2E	WM	7	ALL
1S	2E	WM	8	ALL
1S	2E	WM	9	ALL
1S	2E	WM	10	ALL
1S	2E	WM	11	ALL
1S	2E	WM	12	ALL
1S	2E	WM	13	ALL
1S	2E	WM	14	ALL
1S	2E	WM	15	ALL
1S	2E	WM	16	ALL
1S	2E	WM	17	ALL
1S	2E	WM	18	ALL
1S	2E	WM	19	ALL
1S	2E	WM	20	ALL
1S	2E	WM	21	ALL
1S	2E	WM	22	ALL
1S	2E	WM	23	ALL
1S	2E	WM	24	ALL
1S	2E	WM	25	N ½ NE ¼
1S	2E	WM	25	N ½ NW ¼
1S	2E	WM	26	N ½ NE ¼
1S	2E	WM	26	NW ¼
1S	2E	WM	27	N ½ NE ¼
1S	2E	WM	27	SE ¼ NE ¼

Twp	Rng	Mer	Sec	Q-Q
1S	2E	WM	28	NW ¼ NE ¼
1S	2E	WM	29	W ½ NW ¼
1S	2E	WM	30	NE ¼
1S	3E	WM	1	W ½ W ½
1S	3E	WM	2	ALL
1S	3E	WM	3	ALL
1S	3E	WM	4	ALL
1S	3E	WM	5	ALL
1S	3E	WM	6	ALL
1S	3E	WM	7	ALL
1S	3E	WM	8	ALL
1S	3E	WM	9	ALL
1S	3E	WM	10	ALL
1S	3E	WM	11	ALL
1S	3E	WM	12	W ½ W ½
1S	3E	WM	14	N ½ NE ¼
1S	3E	WM	14	NW ¼
1S	3E	WM	14	SW ¼
1S	3E	WM	14	W ½ SE ¼
1S	3E	WM	15	ALL
1S	3E	WM	16	ALL
1S	3E	WM	17	ALL
1S	3E	WM	18	E ½ NE ¼
1S	3E	WM	18	SW ¼ NE ¼
1S	3E	WM	18	W ½ W ½
1S	3E	WM	18	N ½ SE ¼
1S	3E	WM	18	SE ¼ SE ¼
1S	3E	WM	19	W ½ W ½
1S	3E	WM	20	NE ¼ SE ¼
1S	3E	WM	21	N ½
1S	3E	WM	21	N ½ SW ¼
1S	3E	WM	21	N ½ SE ¼
1S	3E	WM	21	SE ¼ SE ¼
1S	3E	WM	22	W ½
1S	1W	WM	1	ALL
1S	1W	WM	2	ALL
1S	1W	WM	3	ALL
1S	1W	WM	4	ALL
1S	1W	WM	5	ALL
1S	1W	WM	6	ALL
1S	1W	WM	7	ALL
1S	1W	WM	8	E ½ NE ¼
1S	1W	WM	8	N ½ NW ¼
1S	1W	WM	8	W ½ SW ¼
1S	1W	WM	8	NE ¼ SE ¼
1S	1W	WM	9	NE ¼
1S	1W	WM	9	NW ¼
1S	1W	WM	9	SW ¼
1S	1W	WM	9	NE ¼ SE ¼
1S	1W	WM	9	NW ¼ SE ¼
1S	1W	WM	9	SW ¼ SE ¼

Twp	Rng	Mer	Sec	Q-Q
1S	1W	WM	10	ALL
1S	1W	WM	11	ALL
1S	1W	WM	12	ALL
1S	1W	WM	13	ALL
1S	1W	WM	14	N ½ NE ¼
1S	1W	WM	14	SE ¼ NE ¼
1S	1W	WM	14	SE ¼
1S	1W	WM	15	NE ½ NE ¼
1S	1W	WM	15	NE ¼ NW ¼
1S	1W	WM	17	N ½
1S	1W	WM	17	N ½ SW ¼
1S	1W	WM	17	SW ¼ SW ¼
1S	1W	WM	17	SE ¼
1S	1W	WM	18	ALL
1S	1W	WM	19	N ½
1S	1W	WM	19	SW ¼
1S	1W	WM	19	N ½ SE ¼
1S	1W	WM	19	SW ¼ SE ¼
1S	1W	WM	20	NE ¼
1S	1W	WM	20	SW ¼ NW ¼
1S	1W	WM	20	SW ¼
1S	1W	WM	20	SW ¼ SE ¼
1S	1W	WM	22	SE ¼ NE ¼
1S	1W	WM	22	E ½ SE ¼
1S	1W	WM	23	NE ¼
1S	1W	WM	23	SE ¼ NW ¼
1S	1W	WM	23	SW ¼
1S	1W	WM	23	SE ¼
1S	1W	WM	24	ALL
1S	1W	WM	25	ALL
1S	1W	WM	26	ALL
1S	1W	WM	27	E ½ E ½
1S	1W	WM	29	N ½ NW ¼
1S	1W	WM	29	W ½ SW ¼
1S	1W	WM	30	N ½ NE ¼
1S	1W	WM	30	SW ¼ NE ¼
1S	1W	WM	30	NW ¼
1S	1W	WM	30	SW ¼
1S	1W	WM	30	SE ¼
1S	1W	WM	33	SW ¼ NE ¼
1S	1W	WM	33	NE ¼ SE ¼
1S	1W	WM	33	S ½ SE ¼
1S	1W	WM	34	NE ¼
1S	1W	WM	34	NE ¼ NW ¼
1S	1W	WM	34	S ½
1S	1W	WM	35	ALL
1S	1W	WM	36	ALL
1S	2W	WM	1	SW ¼ NE ¼
1S	2W	WM	1	S ½
1S	2W	WM	1	S ½ NW ¼
1S	2W	WM	2	S ½

Twp	Rng	Mer	Sec	Q-Q
1S	2W	WM	11	NE ¼
1S	2W	WM	11	E ½ NW ¼
1S	2W	WM	12	ALL
1S	2W	WM	13	ALL
1S	2W	WM	14	E ½ SE ¼
1S	2W	WM	23	E ½ NE ¼
1S	2W	WM	23	NE ¼ SE ¼
1S	2W	WM	24	ALL
1S	2W	WM	25	N ½
1S	2W	WM	25	NE ¼ SE ¼
1S	2W	WM	25	NE ¼ SW ¼
2S	1E	WM	6	W ½ NW ¼
2S	1E	WM	7	W ½ NW ¼
2S	1E	WM	7	NW ¼ SW ¼
2S	1E	WM	19	S ½ NW ¼
2S	1E	WM	19	SW ¼
2S	1W	WM	1	ALL
2S	1W	WM	2	ALL
2S	1W	WM	3	ALL
2S	1W	WM	4	E ½ NW ¼
2S	1W	WM	4	E ½ SW ¼
2S	1W	WM	4	E ½
2S	1W	WM	9	E ½ NW ¼
2S	1W	WM	9	E ½
2S	1W	WM	10	ALL
2S	1W	WM	11	ALL
2S	1W	WM	12	ALL
2S	1W	WM	13	S ½ NE ¼
2S	1W	WM	13	NE ¼ NW ¼
2S	1W	WM	13	W ½ NW ¼
2S	1W	WM	13	W ½ SW ¼
2S	1W	WM	13	SE ¼
2S	1W	WM	14	N ½ NW ¼
2S	1W	WM	14	SE ¼ NW ¼
2S	1W	WM	14	E ½ SW ¼
2S	1W	WM	14	E ½
2S	1W	WM	15	N ½
2S	1W	WM	15	N ½ SW ¼
2S	1W	WM	16	NE ¼
2S	1W	WM	16	N ½ SE ¼
2S	1W	WM	23	ALL
2S	1W	WM	24	ALL
2S	1W	WM	25	W ½ SW ¼
2S	1W	WM	25	NW ¼
2S	1W	WM	26	E ½ NW ¼
2S	1W	WM	26	NE ¼ SW ¼
2S	1W	WM	26	N ½ SE ¼
2S	1W	WM	26	NE ¼
2S	1W	WM	36	NW ¼ NW ¼
2N	1E	WM	30	SE ¼
2N	1E	WM	30	W ½

Twp	Rng	Mer	Sec	Q-Q
2N	1E	WM	31	ALL
2N	1E	WM	32	ALL
2N	1E	WM	33	SW ¼
2N	1E	WM	33	S ½ SE ¼
2N	1E	WM	34	SW ¼ SW ¼
2N	1W	WM	18	S ½ SE ¼
2N	1W	WM	18	NW ¼ SE ¼
2N	1W	WM	19	E ½ NE ¼
2N	1W	WM	19	NW ¼ NE ¼
2N	1W	WM	20	ALL
2N	1W	WM	21	SW 1/4
2N	1W	WM	21	NW 1/4
2N	1W	WM	23	SE ¼ SW 1/4
2N	1W	WM	23	SE 1/4
2N	1W	WM	24	S ½
2N	1W	WM	25	ALL
2N	1W	WM	26	ALL
2N	1W	WM	28	NW ¼
2N	1W	WM	28	SE ¼
2N	1W	WM	28	NE ¼ SW ¼
2N	1W	WM	29	N ½ NE ¼
2N	1W	WM	32	S ½ SE ¼
2N	1W	WM	33	NE ¼ NE ¼
2N	1W	WM	33	E ½ SE ¼
2N	1W	WM	34	ALL
2N	1W	WM	35	ALL
2N	1W	WM	36	ALL

The well shall be maintained in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon. The works shall be equipped with a usable access port, and may also include an air line and pressure gauge to determine the water level elevation in the well at all times.

The water user shall install and maintain a weir, meter, or other suitable measuring device and keep a complete record of the amount of ground water withdrawn.

By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan.

The right to the use of the water for the above purpose is restricted to beneficial use on the lands or place of use described; however water may be applied to lands which are not specifically described above, provided the holder of this right complies with ORS 540.510(3)

This certificate is issued for a partial perfection of Permit G-10124 as described in OAR 690-320-0040 and by an order of the Water Resources Director entered March 27, 2014, at Volume 91, Page 888.

Issued MAR 27 2014

Dwight W. French
Water Right Services Administrator, for
Phillip C. Ward, Director
Water Resources Department

APPENDIX C
LIMITED LICENSE

BEFORE THE WATER RESOURCES DEPARTMENT
OF THE STATE OF OREGON

In the Matter of Aquifer Storage and Recovery (ASR) Limited License Application #017, Washington County	))	FINAL ORDER APPROVING ASR TESTING

AUTHORITY

Oregon Revised Statute (ORS) 537.534 and Oregon Administrative Rule (OAR) 690-350-0020 establish the process by which an application for ASR testing under an ASR limited license may be submitted and approved.

FINDINGS OF FACT

1. On MAY 4, 2010, the Hillsboro School District submitted an application for an ASR Limited License for ASR testing pursuant to ORS 537.534 and OAR 690-350-0020.
2. With assistance from Oregon Department of Human Services, the Department determined that the application was complete on August 27, 2010.
3. The Department provided public notice of the application in the Department's weekly public notice on August 31, 2010. A 30-day comment period followed.
4. ASR Limited License Application #017 referenced Certificates 67891, 85913, 81026, and 81027 as source water for the proposed ASR testing.
5. The Department received no adverse comments related to the possible issuance of an ASR limited license.

DISCUSSION

The Department has evaluated the application and finds that, as conditioned, the proposed ASR testing satisfies the rule requirements of OAR 690-350-0020(4)(d): it will not impair or be detrimental to the public interest, it will produce information that will adequately describe the water quality and quantity response in the aquifer and at nearby wells and springs due to ASR activities, and it will not expand the use under existing water rights.

CONCLUSIONS OF LAW

The application for and language in ASR Limited License #017 are consistent with the requirements of ORS 537.534 and OAR 690-350-0020.

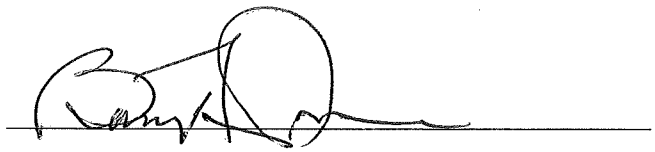
APPEAL RIGHTS

This is an order in other than a contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60-day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080, you may either petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

ORDER

Now, THEREFORE, IT is Ordered, ASR Limited License Application #017 is approved pursuant to ORS 537.534 and OAR 690-350-0020, and ASR Limited License #017 is issued as limited by the conditions contained therein.

Dated at Salem, Oregon on October 25 2010.



for Phillip C. Ward, Director

Water Resources Department

This order was produced by Donn Miller and Jen Woody.

If you have other questions about the Department or any of its programs please contact our Customer Service Group at 503-986-0801. Address all other correspondence to: Ground Water Section, Oregon Water Resources Department, 725 Summer St NE, Suite A, Salem OR 97301-1266, Fax: 503-986-0902.

AQUIFER STORAGE and RECOVERY (ASR) LIMITED LICENSE #017

The Oregon Water Resources Commission issues this limited license for ASR TESTING to:

Hillsboro School District
c/o Loren Rogers
3083 NE 49th Place
Hillsboro, OR 97124

Telephone: 503.844.1500

The licensee may divert up to 100 gallons per minute (gpm) from the Tualatin River, a tributary of the Willamette River, using municipal use authorization of Certificates 67891, 85913, 81026, and 81027 or from Sain Creek, a tributary of Scoggins Creek or Scoggins Creek, a tributary of the Tualatin River, using authorization of Certificates 81026 and 81027.

The points of diversion are located at: T1S, R3W, Section 8 SW ¼ SW 1/4; T1S, R4W, Section 20 NE 1/4 NE 1/4; T1S, R5W, Section 14 SW ¼ SW ¼; and T1S, R5W, Section 20 SE 1/4 SE 1/4.

The licensee may store up to 30 million gallons in a basalt aquifer using one well. The maximum injection rate at the well is 100 gpm. The maximum recovery rate of stored water is 320 gpm through the same well. The maximum storage duration is the five-year duration of this limited license.

The licensee may use the recovered municipal use water to irrigate 21.26 acres of athletics fields at Liberty High School in the Hillsboro School District. The amount of water used for irrigation is limited to 2.5 acre-feet for each acre irrigated during the irrigation season of each year.

The place of use is located as follows:

SW1/4 SW1/4 1.0 ACRE
SE1/4 SW1/4 4.2 ACRES
SECTION 14
NE1/4 NW1/4 12.98 ACRES
NW1/4 NW1/4 1.47 ACRES
SE1/4 NW1/4 1.61 ACRES
SECTION 23
TOWNSHIP 1 NORTH, RANGE 2 WEST, W.M.

The ASR well (WASH 58925) is located as follows: SE1/4 SW1/4, SECTION 14, T1N, R2W, W.M.; 670 FEET NORTH & 1450 FEET EAST FROM SW CORNER, SECTION 14

The duration of this limited license is five years, expiring on the fifth anniversary of issuance.

This is a final order in other than contested case. Pursuant to ORS 536.075 and OAR 137-004-080 and OAR 690-01-005 you may either petition the Director for reconsideration of this order or petition for judicial review of this order. As provided in ORS 536.075, this order is subject to judicial review under ORS 183.484. Any petition for judicial review of the order must be filed within the 60 day time period specified by ORS 183.484(2)

Except as modified by other provisions of this limited license, the licensee is authorized to pursue the project schedule, monitoring, and other features noted in the ASR test plan and the ASR pilot testing objectives for the Liberty H.S. Well. That plan may be amended and approved pursuant to condition (4)(A)(iii). The project schedule in the ASR test plan may be reasonably adjusted by the licensee to reflect the license issuance date or other delays. Features of that ASR test plan are provided in the application document and completeness response letter entitled:

Hillsboro School District: 1J
Liberty High School
Aquifer Storage and Recovery
Limited License Application and
Pilot Test Work Plan
April 2010
Prepared By GSI Water Solutions, Inc.

RE: Response to OWRD Second Completeness Review for
Hillsboro School District ASR Limited License Application
July 13, 2010 (sic)
Prepared by GSI Water Solutions, Inc.

The features of ASR testing shall strive to provide data that address the following: the appropriate target storage volume; loss of stored ASR water and natural water by virtue of ASR activities; water quality changes due to ASR activities; well construction sufficiency for ASR purposes; water level response in the ASR well, aquifer, springs and nearby wells; accounting of ASR inputs, withdrawals, and storage; water quality testing needs; and well hydraulics at the ASR well.

This limited license is issued with the following conditions:

1) License Renewal. The limited license may be renewed if the licensee demonstrates to the Director's satisfaction that further testing is necessary and that the licensee complied with the terms of the limited license.

2) Notice Prior to Injection and Recovery. The licensee shall give notice, in writing, to the watermaster not less than 15 days in advance of either initiating any injection under the limited license or recovering stored water. The injection notice shall include the limited license number, the location(s) of the injection source water diversion(s), the quantity of water to be diverted from the source(s), the time of injection, and the place of injection. The recovery notice shall include the limited license number, the location of the recovery well(s), the time of recovery, and the quantity of water to be recovered.

3) Record of Use. The permittee shall maintain a record of injection and recovery, including the total number of hours of injection and recovery and the total metered quantity injected and recovered. The record of use may be reviewed by Department staff upon request.

4) Modification/Revocation. The Department shall notify the licensee in writing and allow the licensee to respond when considering the following actions:

(A) The Director may modify the ASR limited license for any of the following reasons:
(i) to reflect changes in Oregon Department of Human Services (ODHS) and Oregon Department of Environmental Quality (DEQ) water quality or treatment standards;
(ii) to address needed technological changes as requested by DEQ or ODHS to minimize constituents regulated under OAR 333-61-030 (ORS 448.131 and .273) or OAR 340-40 (ORS 468B.165);
(iii) upon written request from the applicant for minor adjustments to the authorization in the limited license. (For purposes of this license, a well location change to an adjacent 1/4 1/4 section is a minor adjustment.)

(B) The Director may revoke or modify the ASR limited license for any of the following reasons:
(i) to prevent or mitigate injury to other water rights, minimum perennial streamflows or aquifer water quality;
(ii) to address any other unintended, injurious effects of the ASR activity; or
(iii) failure to maintain compliance with all conditions of this limited license.

(C) The Department may offer an additional public comment opportunity consistent with the notice and comment provisions of OAR 690-350-020 prior to modifying the limited license.

5) Priority/Protection. This limited license does not receive a priority date and is not protected under ORS 540.045.

6) Compliance with Other Laws. The injection of acceptable water into the aquifer as well as its storage and recovery under this limited license shall comply with all applicable local, state or federal laws. This shall include but not be limited to compliance with the Oregon Department of Environmental Quality's (DEQ's) Underground Injection Control registration program as authorized under the Safe Drinking Water Act (40 CFR 144.26) before any injection activity begins. Also, all pilot test discharges to waterways must be covered by a DEQ National Pollution Discharge Elimination System (NPDES) permit.

7) Water Quality Conditions and Limits:

(A) The licensee shall minimize, to the extent technically feasible, practical and cost-effective, the concentration of constituents in the injection source water that are not naturally present in the aquifer;

(B) Except as otherwise provided in (C) of this condition, if the injection source water contains constituents regulated under OAR 333-61-030 (ORS 448.131 and .273) or OAR 340-40 (ORS 468B.165) that are detected at greater than 50 percent of the established levels (MCLs or MMLs in the cited rules), the licensee shall employ technically feasible, practical and cost-effective methods to minimize concentrations of such constituents in the injection source water;

(C) Constituents that have a secondary contaminant level or constituents that are associated with disinfection of the injection source water may be injected into the aquifer up to the standards established under OAR 333-61-030 (ORS 448.131 and .273);

(D) The Department may, based upon valid scientific data, further limit certain constituents in the injection source water if the Department finds that those constituents will interfere with or pose a threat to the maintenance of the water resources of the state for present or future beneficial uses;

(E) If, during the course of ASR testing, a constituent which is regulated under OAR 333-61-030 (ORS 448.131 and .273) or OAR 340-40 (ORS 468B.165) is detected above the 50% level prescribed in condition (8)(B) or the 100% level prescribed in condition (8)(C), the licensee shall immediately stop injection activities upon receipt of lab data and notify the Department within five days.

8) Water Quality Sampling.

(A) Injection Water. The licensee shall sample and analyze injection water for the constituents described in the test plan dated April 2010.

(B) Receiving Aquifer Water. The licensee shall sample and analyze receiving aquifer water at the ASR well for the constituents described in the test plan dated April 2010.

(C) Withdrawal of Stored Water. The licensee shall sample and analyze water withdrawn from storage for the constituents described in the test plan dated April 2010.

9) Recovery. The availability of stored water for recovery is based on the following factors:

(A) Available stored water is determined on a well-by-well basis. The licensee may recover up to 95% of the quantity injected under this limited license during the water year that the water was injected. After that water year, the availability of stored water shall be further diminished each water year such that the licensee may only recover up to 95% of any water year-to-water year storage carryover. (For example, water year 2011 lasts from October 1, 2010 through September 30, 2011.) (Data collected by the licensee may be useful in consideration of modifications to this recovery provision under the limited license.)

(B) Any irrigation water withdrawn from the ASR well identified in this limited license shall first be debited against the quantity available in the aquifer by virtue of ASR storage. When the ASR storage is depleted at the ASR well, any water withdrawn from the ASR well shall be considered a draft of natural ground water, requiring separate or additional authorization. This limited license does not authorize withdrawal of more water than is available in the storage account.

(C) The availability of stored water is a running account that is subject to determination at any time.

10) Annual Reporting.

(A) Except as otherwise noted, the licensee shall provide the Department a written report of the results of ASR testing for each water year by February 15th of the following water year. The first report shall be due in 2012 and include results from water year 2011. The report shall detail the several kinds of data collected during the water year (including the water quality results in condition 9), analyze those data to show the ASR project impacts on the aquifer, indicate the testing/development progress made under the terms of the limited license, and account for the injection of stored water, withdrawals of stored and natural water, and the new-year carryover storage at each well. The report shall include the amount of water diverted under each of the water rights available for ASR and how those diversions have occurred within the limits of the authorized rights.

(B) As pertinent, annual reporting shall include the formatting and additional information cited in Condition 11 below.

11) Special Reporting Condition. The licensee shall provide the following information to the Department:

(A) Submission of any and all hydrogeologic data collected and reports developed for the project, including but not limited to cuttings analysis, video logs, geophysical logs, aquifer tests and step tests.

(B) Submission of digital water level data for all ASR wells and any other wells measured in conjunction with the project (in a Department specified format), including annual report data.

(C) Submission of annual reports with locations and elevations for all project wells (actual locations of built wells and proposed locations for proposed locations) and locations and elevations for all non-project wells that have been used for collecting water levels or other data pertinent to the project (in a Department specified format).

(D) Notification in the annual report of any changes in well construction to the ASR limited license file.

(E) Associating all project well data with the Department Well Identification Number (Well ID Number), the Department Well Log ID, if available, and the project Well Name.

12) Protection for Existing Users. In the event of conflicts with existing appropriators, the licensee shall conduct all testing so as to mitigate the injurious effects. In addition, the licensee shall cooperate with the efforts of the Department to protect existing water rights and the water quality of existing users that rely upon the receiving aquifer and the injection source water.

13) Use of Recovered Water. The licensee shall use any recovered water for the purposes described in the base water rights that authorize diversion.

14) Additional Conditions on an Informal Basis. The Department may suggest additional conditions to the licensee. Provided that those conditions are agreed to and undertaken by the licensee, the Department may forego formal changes to this license. This informal process does not extend to condition reductions. These additional conditions may be part of any license renewal or permit.

15) Publicity. The licensee shall maintain a public information program about the ASR project, which may include press releases, neighborhood meetings, brochures, or other features. This program shall include information on potential project impacts and how to report possible impacts to the licensee. The licensee shall share such reports with the watermaster within five days of receipt.

16) Other Measures. The licensee shall take any additional measures, as appropriate, to address ASR-related issues such as landslide activation, seepage, streamflow increases, interference with nearby wells, aquifer storage limitations, and water quality protection. The licensee shall resolve these issues prior to submittal of an ASR permit application.

17) Carryover Storage. At the end of testing under this limited license, the licensee shall provide an accounting to the Department of the residual stored water based on the methods of determination given in this license. The Department shall consider this residual for carryover to a permanent ASR permit based on information which discloses the aquifer's ability to retain stored water.

This license is issued with proper conditions upon finding that:

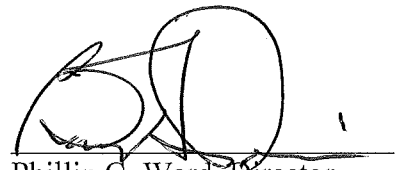
i) The proposed ASR testing will not impair or be detrimental to the public interest;

ii) The proposed ASR testing will produce information that will adequately describe the water quality and quantity response in the aquifer and at nearby wells and springs due to ASR activities; and

iii) The proposed use will not expand use under an existing water right.

This license shall be in effect beginning October 25, 2010, and shall expire October 25, 2015.

WITNESS my hand this 25th day of October, 2010.



for Phillip C. Ward, Director
Water Resources Department

BEFORE THE WATER RESOURCES DEPARTMENT
OF THE STATE OF OREGON

In the Matter of Aquifer Storage and Recovery (ASR) Limited License Application #017, Washington County	))	ORDER APPROVING RENEWED ASR TESTING

AUTHORITY

Oregon Revised Statute (ORS) 537.534 and Oregon Administrative Rule (OAR) 690-350-0020 establish the process by which an application for ASR testing under an ASR limited license may be submitted and approved. Oregon Administrative Rule (OAR) 690-350-0010 describes general provisions for ASR under Oregon law.

BACKGROUND

Hillsboro School District began ASR testing under ASR LL #017 in 2010. Condition 1 of ASR Limited License #017 provides for renewal pursuant to OAR 690-350-0020(5)(c), and describes the following terms for renewal: The license may be renewed if the licensee demonstrates to the Director's satisfaction that further testing is necessary and that the licensee complied with the terms of the license. On August 17, 2015 the Department received application for renewal of ASR Limited License #017. The Department determined the renewal request was complete on August 19, 2015.

FINDINGS OF FACT

1. On August 17, 2015, Hillsboro School District submitted a request for renewal of ASR Limited License #017. The Department determined it was complete on August 19, 2015.
2. The Department provided public notice of the application in the Department's weekly public notice on August 25, 2015. A 30-day comment period followed.
3. The Department received no adverse comments related to the possible renewal of ASR Limited License #017.
4. The Department sought comments and recommendations from Oregon Department of Environmental Quality (DEQ) and Oregon Health Authority Drinking Water Program (OHA) related to the possible renewal. Comments were received from DEQ and OHA supporting the renewal of ASR LL #017.
5. The Department evaluated the renewal request and comments and determined the proposed renewal is consistent with Condition 1 of the ASR Limited License and OAR 690-350-0020(5)(c). The licensee has demonstrated to the Director's satisfaction that further testing is necessary and that the licensee complied with the terms of the license. The renewal request presented reasons for the renewal, and also provided specific details that addressed compliance with the ASR limited license.

NOTICE OF RIGHT TO PETITION FOR RECONSIDERATION OR JUDICIAL REVIEW

This is an order in other than a contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60-day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080, you may petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

CONCLUSIONS OF LAW

The request to renew ASR Limited License #017 for five years is consistent with the requirements of OAR 690-350-0020(5)(c) and Condition 1 of ASR Limited License #017.

ORDER

Now, THEREFORE, it is ORDERED, ASR Limited License #017 shall be valid through the fifth anniversary of its renewal, pursuant to ORS 537.534 and OAR 690-350-0020(5)(c), and Condition 1 of the original ASR limited license.

Except as modified by other provisions of this license, the licensee is authorized to pursue the project schedule, monitoring, and other features noted in the original and subsequent ASR pilot test plans. That plan may be amended and approved pursuant to condition (4)(A)(iii). The project schedule in the ASR test plan may be reasonably adjusted by the licensee to reflect the license issuance date or other delays. Features of that ASR testing plan are provided in the application documents entitled:

Hillsboro School District: 1J
Liberty High School
Aquifer Storage and Recovery
Limited License Application and
Pilot Test Work Plan
April 2010
Prepared By GSI Water Solutions, Inc.

RE: Response to OWRD Second Completeness Review for
Hillsboro School District ASR Limited License Application
July 13, 2010 (sic)
Prepared by GSI Water Solutions, Inc.

ASR testing must provide data and analysis that address the following: the appropriate target storage volume; loss of stored ASR water and natural water by virtue of ASR activities; water-quality changes due to ASR activities; well construction sufficiency for ASR purposes; water-level response in the ASR wells, aquifer, springs and nearby wells; accounting of ASR inputs, withdrawals, and storage; water-quality testing needs; and well hydraulics at the ASR wells.

The licensee may divert up to 100 gallons per minute (gpm) from the Tualatin River, a tributary of the Willamette River, using municipal use authorization of Certificates 67891, 85913, 81026, and 81027 or from Sain Creek, a tributary of Scoggins Creek or Scoggins Creek, a tributary of the Tualatin River, using authorization of Certificates 81026 and 81027.

The points of diversion are located at: T1S, R3W, Section 8 SW ¼ SW ¼ ; T1S, R4W, Section 20 NE ¼ NE ¼ ; T1S, R5W, Section 14 SW ¼ SW ¼; and T1S, R5W, Section 20 SE ¼ SE ¼ .

The licensee may store up to 30 million gallons in a basalt aquifer using one injection well. The maximum injection rate is 100 gpm. The licensee may recover up to 320 gpm through the same well. The maximum storage duration is the five-year duration of this limited license.

The licensee may use the recovered municipal use water to irrigate 21.26 acres of athletics fields at Liberty High School in the Hillsboro School District. The amount of water used for irrigation is limited to 2.5 acre-feet for each acre irrigated during the irrigation season of each year.

The place of use is located as follows:

SW1/4 SW1/4 1.0 ACRE
SE1/4 SW1/4 4.2 ACRES
SECTION 14
NE1/4 NW1/4 12.98 ACRES
NW1/4 NW1/4 1.47 ACRES
SE1/4 NW1/4 1.61 ACRES
SECTION 23
TOWNSHIP 1 NORTH, RANGE 2 WEST, W.M.

The ASR well is located as follows:

Well Name	Well Log	Well Location in T1N, R2W W.M.
ASR Well	WASH 58925	670 feet North & 1450 feet east from SW corner, Section 14

Other Conditions:

1) **License Renewal**. The license may be renewed if the licensee demonstrates to the Director's satisfaction that further testing is necessary and that the licensee complied with the terms of the license.

2) **Notice Prior to Injection and Recovery.** The licensee shall give notice, in writing, to the watermaster not less than 15 days in advance of either initiating any injection under the license or recovering stored water. The injection notice shall include the license number, the location of the injection source water diversion, the quantity of water to be diverted from that source, the time of injection, and the place of injection. The recovery notice shall include the license number, the location of the recovery well(s), the time of recovery, and the quantity of water to be recovered.

3) **Record of Use.** The licensee shall maintain a record of injection and recovery, including the total number of hours of injection and recovery and the total metered quantity injected and recovered. The record of use may be reviewed by Department staff upon request.

4) **Modification/Revocation**. The Department shall notify the licensee in writing and allow the licensee to respond when considering the following actions:

   (A) The Director may modify the ASR limited license for any of the following reasons:

      (i) to reflect changes in Oregon Health Authority Drinking Water Program (OHA) and Oregon Department of Environmental Quality (DEQ) water quality or treatment standards;

      (ii) to address needed technological changes as requested by DEQ or OHA to minimize constituents regulated under OAR 333-61-030 (ORS 448.131 and .273) or OAR 340-40 (ORS 468B.165);

      (iii) upon written request from the applicant for minor adjustments to the authorization in the limited license.

(B) The Director may revoke, suspend or modify the ASR limited license for any of the following reasons:

(i) to prevent or mitigate injury to other water rights, instream water rights, minimum perennial streamflows or aquifer water quality;

(ii) to address any other unintended, injurious effects of the ASR activity; or

(iii) failure to maintain compliance with all conditions of this license.

(C) The Department may offer an additional public comment opportunity consistent with the notice and comment provisions of OAR 690-350-020 prior to modifying the license.

5) **Priority/Protection**. This license does not receive a priority date and is not protected under ORS 540.045.

6) **Compliance with Other Laws**. The injection of acceptable water into the aquifer as well as its storage and recovery under this license shall comply with all applicable local, state or federal laws. This shall include but not be limited to compliance with the Oregon Department of Environmental Quality's (DEQ's) Underground Injection Control registration program as authorized under the Safe Drinking Water Act (40 CFR 144.26). Also, all pilot test discharges to waterways must be covered by a DEQ National Pollution Discharge Elimination System (NPDES) Permit.

7) **Water Quality Conditions and Limits**.

(A) The licensee shall minimize, to the extent technically feasible, practical and cost-effective, the concentration of constituents in the injection source water that are not naturally present in the aquifer;

(B) Except as otherwise provided in (C) of this condition, if the injection source water contains constituents regulated under OAR 333-61-030 (ORS 448.131 and 448.273) or OAR 340-40 (ORS 468B.165) that are detected at greater than 50 percent of the established levels (MCLs or MMLs in the cited rules), the licensee shall employ technically feasible, practical and cost-effective methods to minimize concentrations of such constituents in the injection source water;

(C) Constituents that have a secondary contaminant level or constituents that are associated with disinfection of the injection source water may be injected into the aquifer up to the standards established under OAR 333-61-030 (ORS 448.131 and 448.273);

(D) The Department may, based upon valid scientific data, further limit certain constituents in the injection source water if the Department finds that those constituents will interfere with or pose a threat to the maintenance of the water resources of the state for present or future beneficial uses;

(E) If during the course of ASR testing, a constituent which is regulated under OAR 333-61-030 (ORS 448.131 and .273) or OAR 340-40 (ORS 468B.165) is detected above the 50% level prescribed in condition (7)(B) or the 100% level prescribed in condition (7)(C), the licensee shall immediately stop injection activities upon receipt of lab data and notify the Department within five days.

8) **Water Quality Sampling.**

(A) Injection Water. The licensee shall sample and analyze injection water as described in the current approved monitoring and test plans.

(B) Wells. The licensee shall sample receiving aquifer water at the ASR well as described for wells in the current approved monitoring and test plans.

(C) Withdrawal of Stored Water. The licensee shall analyze water withdrawn from storage as described in the current approved monitoring and test plans.

9) **Recovery.** The availability of stored water for recovery is based on the following factors:

(A) Available stored water is determined on a well-by-well basis. The licensee may recover up to 95% of the quantity injected under this license during the water year that the water was injected. After that water year, the availability of stored water shall be further diminished each water year such that the licensee may only recover up to 95% of any water year-to-water year storage carryover. (For example, water year 2015 lasts from October 1, 2014 through September 30, 2015.) Data collected by the licensee may be useful in consideration of modifications to this recovery provision under the limited license.

(B) Any water withdrawn from an ASR well identified in this limited license shall first be debited against the quantity available in the aquifer by virtue of ASR storage. When the ASR storage is depleted at an ASR well, any water withdrawn from an ASR well shall be considered a draft of natural ground water, requiring separate or additional authorization. This license does not authorize withdrawal of more water than was injected.

(C) The availability of stored water is a running account that is subject to determination at any time.

10) **Reporting.**

(A) Annual ASR Report. Except as otherwise noted, the licensee shall provide the Department a written report of the results of ASR testing for each water year by February 15th of the following water year. The report shall detail the several kinds of data collected during the water year (including the water-quality results in a DEQ-specified format), analyze those data to show the ASR project impacts on the aquifer, indicate the testing/development progress made under the terms of the license, and account for the injection of stored water, withdrawals of stored and natural water, and the new-year carryover storage at the ASR well. Annual reports shall be sealed and signed by a professional(s) registered or allowed, under Oregon law, to practice geology.

(B) As pertinent, data shall be submitted as described in Special Reporting Condition 11.

11) **Special Reporting Condition**. The licensees shall provide the following information to the Department:

(A) Submission of any and all hydrogeologic data collected and reports developed for the project, including but not limited to cuttings analysis, video logs, geophysical logs, aquifer tests and step tests.

(B) Submission of digital water level data for all ASR wells and any other wells measured in conjunction with the project (in a Department specified format), including annual report data.

(C) Submission of annual reports with locations and elevations for all project wells (actual locations of built wells and proposed locations for proposed wells) and locations and elevations for all non-project wells that have been used for collecting water levels or other data pertinent to the project (in a Department specified format).

(D) Notification in the annual report of any changes in well construction to the ASR limited license file.

(E) Associating all project well data with the Department Well Identification Number (Well ID Number), the Department Well Log ID, if available, and the project Well Name.

12) **Protection for Existing Users**. In the event of conflicts with existing appropriators, the licensees shall conduct all testing so as to mitigate the injurious effects. In addition, the licensees shall cooperate with the efforts of the Department to protect existing water rights and the water quality of existing users that rely upon the receiving aquifer and the injection source water.

13) **Use of Recovered Water**. The licensee shall use any recovered water for the purposes described in ORS 538.420.

14) **Additional Conditions on an Informal Basis**. The Department may suggest additional conditions to the licensees. Provided that those conditions are agreed to and undertaken by the licensees, the Department may forego formal changes to this license. This informal process does not extend to condition reductions. These additional conditions may be part of any license renewal or permit.

15) **Publicity.** The licensee shall maintain a public information program about the ASR project, which may include press releases, neighborhood meetings, brochures, or other features. This program shall include information on potential project impacts and how to report possible impacts to the licensee. The licensee shall share such reports with the watermaster within five days of receipt.

16) **Other Measures**. The licensees shall take additional measures, as appropriate, to address ASR-related issues such as landslide activation, seepage, streamflow increases, interference with nearby wells, aquifer storage limitations, and water quality protection. Further, the licensee shall notify the Department upon resolution of such issues. The licensee shall resolve these issues prior to submittal of an ASR permit application.

17) **Carryover Storage**. At the end of testing under this license, the licensees shall provide an accounting to the Department of the residual stored water based on the methods of determination given in this license. The Department shall consider this residual for carryover to a permanent ASR permit based on information which discloses the aquifer's ability to retain stored water.

18) **Well Tag Condition for Licensee Wells**. Prior to testing, the licensees shall ensure that their wells have been assigned a Department Well Identification Number (Well ID Number). A tag showing the Well ID Number shall be permanently attached to the wells. If a well does not have a Well ID Number, the licensee shall apply for one from the Department and attach it to the well. The Well ID Number shall be used as a reference in any correspondence regarding the well, including any reports of water use, water level, or pump test data.

19) **Water Level Monitoring.** The licensees shall monitor water levels in wells in the manner described in the current approved monitoring and test plans.

Dated at Salem, Oregon on November 9, 2015.

E. Timothy Wallin
Water Rights Program Manager
for Thomas M. Byler, Director

If you have questions about the Department or any of its programs please contact our Customer Service Group at 503-986-0801. Address all other correspondence to: Groundwater Section, Oregon Water Resources Department, 725 Summer St NE, Suite A, Salem OR 97301-1266, Fax: 503-986-0902.

Appendix D

EVIDENCE OF LEGAL LAND USE

Land Use Information Form

Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem, Oregon 97301-1266
(503) 986-0900
www.wrd.state.or.us

NOTE TO APPLICANTS

In order for your application to be processed by the Water Resources Department (WRD), this Land Use Information Form must be completed by a local government planning official in the jurisdiction(s) where your water right will be used and developed. The planning official may choose to complete the form while you wait, or return the receipt stub to you. Applications received by WRD without the Land Use Form or the receipt stub will be returned to you. Please be aware that your application will not be approved without land use approval.

This form is NOT required if:

1) Water is to be diverted, conveyed, and/or used only on federal lands; **OR**
2) The application is for a water right transfer, allocation of conserved water, exchange, permit amendment, or ground water registration modification, and **all** of the following apply:
   a) The existing and proposed water use is located entirely within lands zoned for exclusive farm-use or within an irrigation district;
   b) The application involves a change in place of use only;
   c) The change does not involve the placement or modification of structures, including but not limited to water diversion, impoundment, distribution facilities, water wells and well houses; and
   d) The application involves irrigation water uses only.

NOTE TO LOCAL GOVERNMENTS

The person presenting the attached Land Use Information Form is applying for or modifying a water right. The Water Resources Department (WRD) requires its applicants to obtain land-use information to be sure the water rights do not result in land uses that are incompatible with your comprehensive plan. Please complete the form or detach the receipt stub and return it to the applicant for inclusion in their water right application. You will receive notice once the applicant formally submits his or her request to the WRD. The notice will give more information about WRD's water rights process and provide additional comment opportunities. You will have 30 days from the date of the notice to complete the land-use form and return it to the WRD. If no land-use information is received from you within that 30-day period, the WRD may presume the land use associated with the proposed water right is compatible with your comprehensive plan. Your attention to this request for information is greatly appreciated by the Water Resources Department. If you have any questions concerning this form, please contact the WRD's Customer Service Group at 503-986-0801.

Land Use Information Form

Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem, Oregon 97301-1266
(503) 986-0900
www.wrd.state.or.us

Applicant: LOREN (First) ROGERS (Last)

Mailing Address: 3083 NE 49TH PLACE

HILLSBORO (City) OR (State) 97124 (Zip) Daytime Phone: (503) 844 1320

A. Land and Location

Please include the following information for all tax lots where water will be diverted (taken from its source), conveyed (transported), and/or used or developed. Applicants for municipal use, or irrigation uses within irrigation districts may substitute existing and proposed service-area boundaries for the tax-lot information requested below.

Township	Range	Section	¼ ¼	Tax Lot #	Plan Designation (e.g., Rural Residential/RR-5)	Water to be:			Proposed Land Use:
1N	2W	14	SE-SW	102	M-2	☒ Diverted	☐ Conveyed	☐ Used	PUB
1N	2W	14	SE-SW	102	M-2	☐ Diverted	☒ Conveyed	☒ Used	PUB
1N	2W	14	SW-SW	102	M-2	☐ Diverted	☒ Conveyed	☒ Used	PUB
1N	2W	23	NE-NW	102	M-2	☐ Diverted	☒ Conveyed	☒ Used	PUB
1N	2W	23	NW-NW	102	M-2	☐ Diverted	☒ Conveyed	☒ Used	PUB
1N	2W	23	SE-NW		M-2	☐ Diverted	☒ Conveyed	☒ Used	PUB

List all counties and cities where water is proposed to be diverted, conveyed, and/or used or developed:

CITY OF HILLSBORO, WASHINGTON COUNTY

B. Description of Proposed Use

Type of application to be filed with the Water Resources Department:

☒ Permit to Use or Store Water ☐ Water Right Transfer ☐ Permit Amendment or Ground Water Registration Modification
☐ Limited Water Use License ☐ Allocation of Conserved Water ☐ Exchange of Water

Source of water: ☐ Reservoir/Pond ☐ Ground Water ☒ Surface Water (name) TUALATIN VALLEY WATER DISTRICT (TVWD)

Estimated quantity of water needed: 100 ☐ cubic feet per second ☒ gallons per minute ☐ acre-feet

Intended use of water: ☒ Irrigation ☐ Commercial ☐ Industrial ☐ Domestic for _____ household(s)
☐ Municipal ☐ Quasi-Municipal ☐ Instream ☐ Other _____

Briefly describe:

THE HILLSBORO SCHOOL DISTRICT IS PROPOSING TO DEVELOP AN AQUIFER STORAGE AND RECOVERY PROJECT AT LIBERTY HIGH SCHOOL, TO SUPPLY WATER TO IRRIGATE THE ATHLETIC FIELDS DURING SUMMER MONTHS. WATER WILL BE PROVIDED BY TVWD, WHICH TVWD OBTAINS FROM THE JOINT WATER COMMISSION (JWC). INJECTION WOULD OCCUR FROM NOVEMBER TO JUNE.

Note to applicant: If the Land Use Information Form cannot be completed while you wait, please have a local government representative sign the receipt at the bottom of the next page and include it with the application filed with the Water Resources Department.

See bottom of Page 3. →

For Local Government Use Only

The following section must be completed by a planning official from each county and city listed unless the project will be located entirely within the city limits. In that case, only the city planning agency must complete this form. This deals only with the local land-use plan. Do not include approval for activities such as building or grading permits.

Please check the appropriate box below and provide the requested information

☑ Land uses to be served by the proposed water uses (including proposed construction) are allowed outright or are not regulated by your comprehensive plan. Cite applicable ordinance section(s): _____

☐ Land uses to be served by the proposed water uses (including proposed construction) involve discretionary land-use approvals as listed in the table below. (Please attach documentation of applicable land-use approvals which have already been obtained. Record of Action/land-use decision and accompanying findings are sufficient.) **If approvals have been obtained but all appeal periods have not ended, check "Being pursued."**

Type of Land-Use Approval Needed (e.g., plan amendments, rezones, conditional-use permits, etc.)	Cite Most Significant, Applicable Plan Policies & Ordinance Section References	Land-Use Approval:	
		☐ Obtained ☐ Denied	☐ Being Pursued ☐ Not Being Pursued
		☐ Obtained ☐ Denied	☐ Being Pursued ☐ Not Being Pursued
		☐ Obtained ☐ Denied	☐ Being Pursued ☐ Not Being Pursued
		☐ Obtained ☐ Denied	☐ Being Pursued ☐ Not Being Pursued
		☐ Obtained ☐ Denied	☐ Being Pursued ☐ Not Being Pursued

Local governments are invited to express special land-use concerns or make recommendations to the Water Resources Department regarding this proposed use of water below, or on a separate sheet.

Name: COLIN COOPER Title: CURRENT PLANNING MANAGER

Signature: [signature] Phone: 503.681.6230 Date: 4.15.2010

Government Entity: CITY OF HILLSBORO

Note to local government representative: Please complete this form or sign the receipt below and return it to the applicant. If you sign the receipt, you will have 30 days from the Water Resources Department's notice date to return the completed Land Use Information Form or WRD may presume the land use associated with the proposed use of water is compatible with local comprehensive plans.

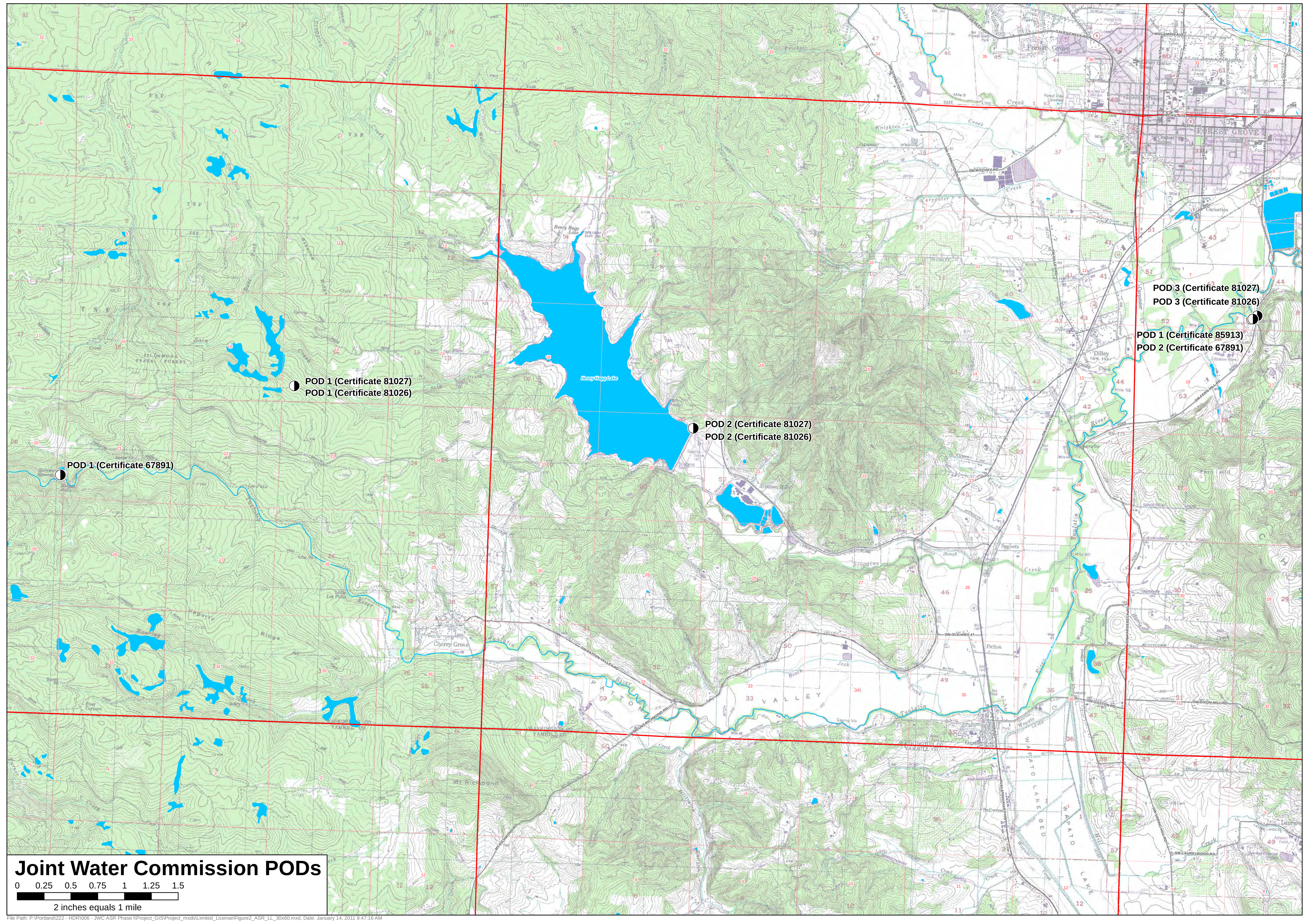
Receipt for Request for Land Use Information

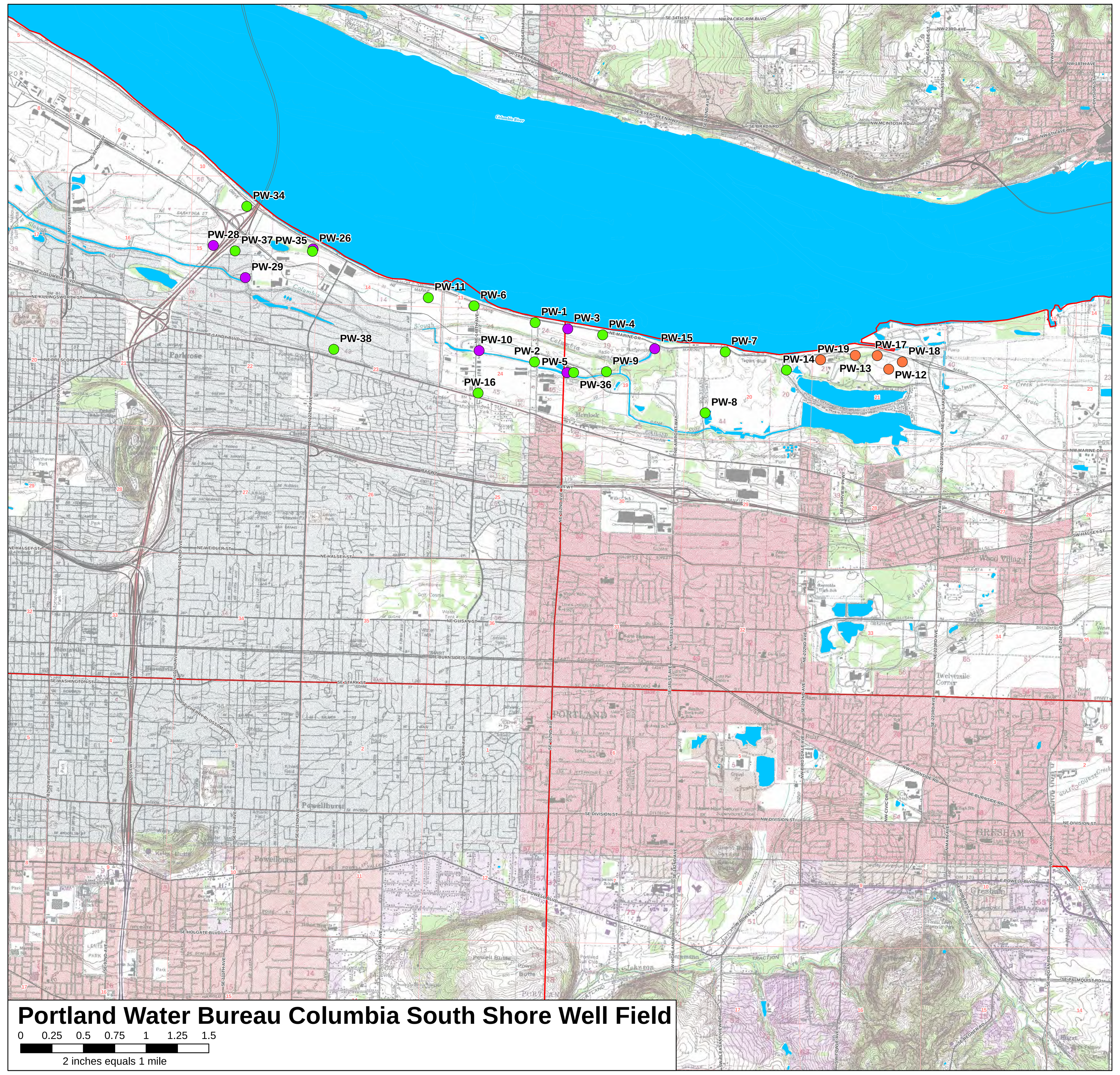
Applicant name: _____

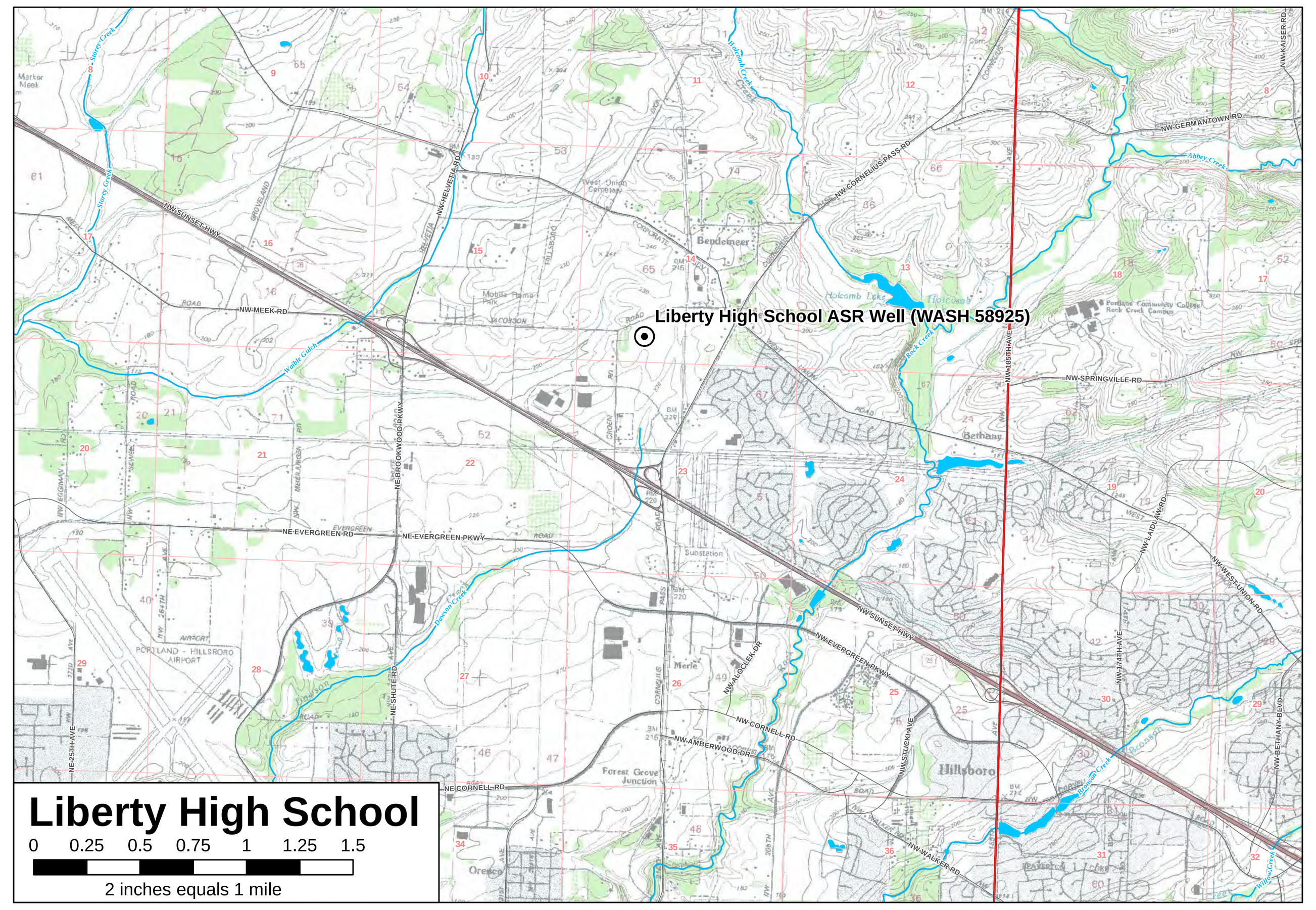
City or County: _____ Staff contact: _____

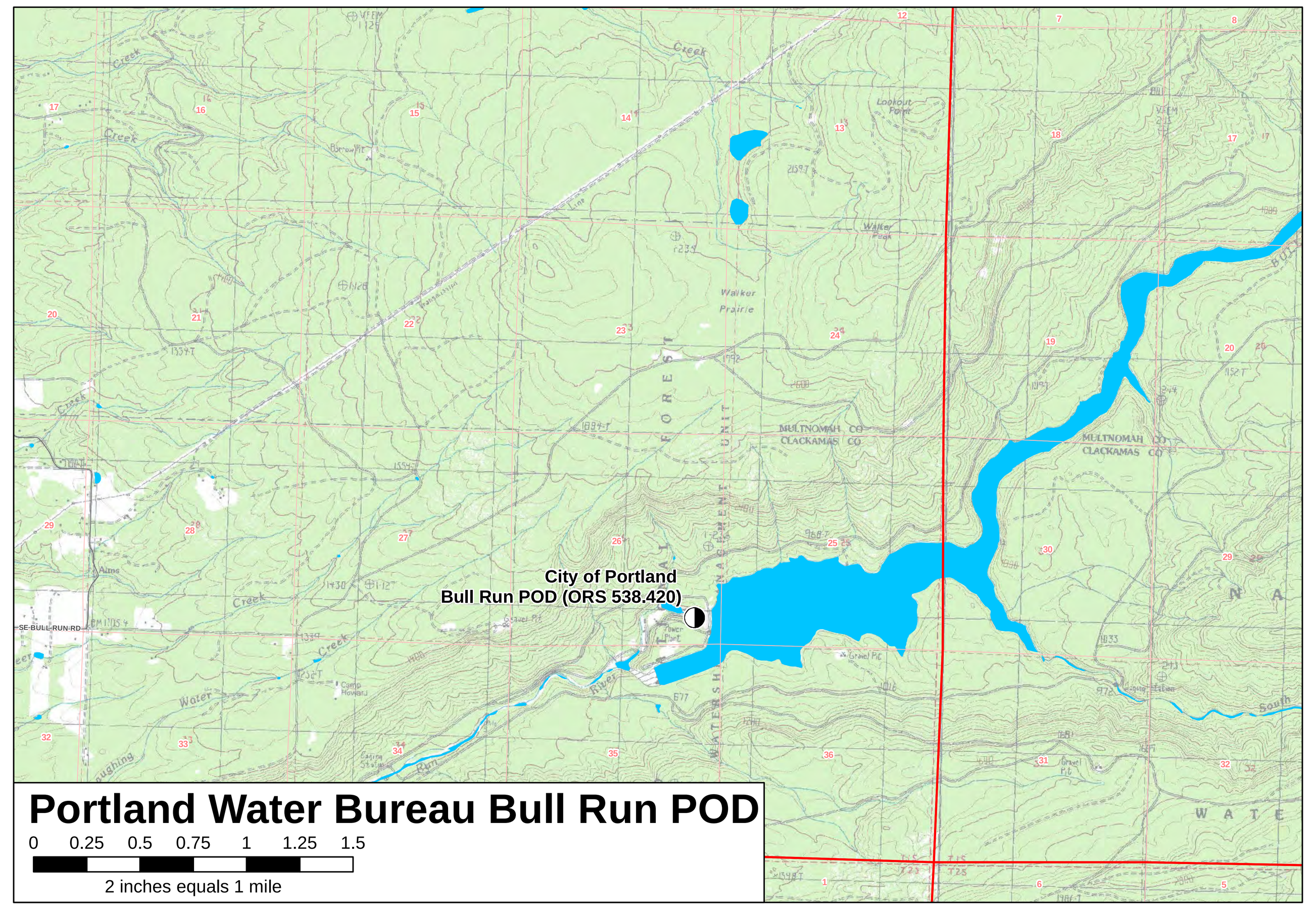
Signature: _____ Phone: _____ Date: _____

Appendix E
APPLICATION MAP









APPENDIX E

Application Map

Liberty High School Aquifer Storage and Recovery Permit Application and Supplemental Information

LEGEND

- ASR Well
- Point of Diversion (POD)

Portland Water Bureau Production Well

- BLA Aquifer
- CRSA Aquifer
- SGA Aquifer
- TGA Aquifer
- TSA Aquifer

All Other Features

- Focus Area
- Major Road
- Waterbody
- Watercourses

POINTS OF DIVERSIONS (PODs)

POD 1 (Certificate 81026) Located 750 feet North, 590 feet East from the SW corner of Section 14, Township 1 South, Range 5 West (W.M.) Latitude: 45.4792393742, Longitude: -123.275999539

POD 1 (Certificate 67891) Located 1,080 feet North, 210 feet West from the SE corner of Section 20, Township 1 South, Range 5 West (W.M.) Latitude: 45.4661442477, Longitude: -123.320222573

POD 1 (Certificate 81027) Located 750 feet North, 590 feet East from the SW corner of Section 14, Township 1 South, Range 5 West (W.M.) Latitude: 45.4792393742, Longitude: -123.275999539

POD 2 (Certificate 81026) Located 650 feet South, 650 feet West from the NE corner of Section 20, Township 1 South, Range 4 West (W.M.) Latitude: 45.4753551108, Longitude: -123.199166307

POD 2 (Certificate 81027) Located 650 feet South, 650 feet West from the NE corner of Section 20, Township 1 South, Range 4 West (W.M.) Latitude: 45.4753551108, Longitude: -123.199166307

POD 2 (Certificate 67891) Located 500 feet North, 415 feet East from the SW corner of Section 8, Township 1 South, Range 3 West (W.M.) Latitude: 45.4924844114, Longitude: -123.09276219

POD 1 (Certificate 85913) Located 515 feet North, 475 feet East from the SW corner of Section 8, Township 1 South, Range 3 West (W.M.) Latitude: 45.4925557747, Longitude: -123.092534702

POD 3 (Certificate 81026) Located 695 feet North, 685 feet East from the SW corner of Section 8, Township 1 South, Range 3 West (W.M.) Latitude: 45.4930223607, Longitude: -123.091717438

POD 3 (Certificate 81027) Located 695 feet North, 685 feet East from the SW corner of Section 8, Township 1 South, Range 3 West (W.M.) Latitude: 45.4930223607, Longitude: -123.091717438

City of Portland POD Bull Run (ORS 538.420) Located 660 feet North, 670 feet West from the SE corner of Section 26, Township 1 South, Range 5 East (W.M.) Latitude: 45.4486716721, Longitude: -122.150243168

Portland Water Bureau Columbia South Shore Well Field
The PWB appropriates groundwater from its Columbia South Shore Well Field under Permits G-10479, G-10124, G-10455, and Certificates 89117 and 89115.

MAP NOTES:
Projection: Oregon State Plane North
Date: January 14, 2011
Data Sources: OWRD, METRO

N

GSI Water Solutions, Inc.

Appendix F
PERMIT MONITORING PLAN

Technical Memorandum

To: Dave Peterson, Hillsboro School District

From: Larry Eaton, GSI Water Solutions, Inc.
Renee Fowler, GSI Water Solutions, Inc.

Date: June 2018

Re: Liberty High School Aquifer Storage and Recovery Permit Monitoring Plan -- DRAFT

This technical memorandum (TM) outlines the monitoring plan associated with Hillsboro School District's (District) aquifer storage and recovery (ASR) system at Liberty High School (Figure 1), with the associated ASR permit application submitted in June 2018.

1. Background

The District installed an irrigation well (WASH 58925) in 2002 with the intent to provide roughly 175 gallons per minute (gpm) for irrigating Liberty High School's athletic fields. The well was completed in basalt. The District applied for a native groundwater right from OWRD, but because of concerns of declining groundwater levels in this area, a permit was not issued. The District operated the existing well under a temporary permit (Permit G-16052) for several years while trying to obtain an existing water right to transfer to WASH 58925. When unable to acquire a water right, the District was left with the following options: (1) use Tualatin Valley Water District (TVWD) water for irrigation, or (2) consider using the existing well to store TVWD water (a blend of Joint Water Commission [JWC] and Portland Water Bureau [PWB] source water) for summer-time use. The system development charges for using TVWD water for irrigation were substantial because it required a 3-inch diameter connection line.

The District commissioned GSI to evaluate the option of using the existing well for ASR purposes; a smaller connection (1-inch diameter connection line) could be used to recharge the well during the winter with roughly 10 to 20 million gallons (MG) of water for summer-time irrigation. An ASR feasibility study was completed by GSI in March 2010 (GSI, 2010), and the District moved forward with submitting an ASR LL application to OWRD and retrofitted the wellhead for ASR purposes.

Since 2010, the District has been operating an ASR system at Liberty High School, using water from the ASR Well to irrigate roughly 22 acres of athletic fields. ASR pilot testing was authorized under ASR LL #017 from 2010 to 2015 (OWRD, 2010), and was renewed from 2015 to 2020 (OWRD, 2015).

In June 2018, the District applied for an ASR permit. This TM is the monitoring program associated with the ASR permit application.

2. Operation Schedule

Typically, injection starts between late October and December, and continues until dry weather initiates the need for irrigation, which is between April and June. Injection is continuous with the exception of system backflushing episodes, shutoffs caused by the high groundwater level alarm, or other issues that can take several days to several weeks to identify. The storage period is generally short, between zero and 10 days. Recovery typically continues through October.

3. Groundwater Level Monitoring

As described in the projects Operations and Maintenance (O&M) Manual (GSI, 2011) and the ASR permit application (GSI, 2018), the ASR Well is monitored using a telemetry system which recorded the injection flow rate, recovery flow rate, and groundwater level via a pressure transducer every 30 minutes. Periodic manual measurements using an electronic tape will be collected to verify transducer measurements, including before the start of the injection period and before the start of the recovery period.

As outlined in the project ASR permit application, the District requested that it no longer be required to moniter the Country Haven Observation Well (WASH 5344) based on a lack of response to ASR activities at this monitoring point.

4. Water Quality Monitoring

As outlined in the project ASR permit application, source water will be monitored on a 3-year cycle under the Liberty High School ASR permit. Source water is treated drinking water that comes from the JWC and/or PWB, through the TVWD distribution system. The ratio of JWC water to PWB water in the source water changes throughout the injection period, and from year to year.

The first two years (Year 1 and Year 2), source water quality will be monitored using the reported results from the JWC and PWB treatment facilities for partial-suite parameters, including disinfection by-products (DBPs), geochemical parameters, metals, and miscellaneous chemistry parameters (Table 1).

In Year 3, one source water sample will be collected at the Liberty High School pump house at approximately 50 percent of the injection target volume. The sample will be a full-suite sample, including geochemical parameters, metals, DBPs, bacteriological, radiological parameters, synthetic organic compounds, volatile organic compounds, field parameters, and miscellaneous chemistry parameters (Table 2).

As outlined in the ASR permit application, groundwater quality has been established during ASR pilot testing and no longer needs to be sampled as it is used for irrigation purposes. At the District's discretion, geochemical parameters may be analyzed in recovered water to continue monitoring compatibility between source water and groundwater, and results will be reported if analyzed.

5. Quality Assurance and Quality Control Plan

The purpose of the quality assurance and quality control (QA/QC) plan is to ensure data collected are valid representations of the water level and water quality. QA/QC procedures that will be used include field record keeping, water quality sampling QA/QC, and the analytical laboratory quality assurance program. Each element of the project QA/QC is described below.

Field Record Keeping

The field staff will document the following information in a field notebook:

- Date and time
- Purpose of visit
- Injection totalizer and flow rate readings
- Recovery totalizer and flow rate readings
- Manual groundwater measurement
- When collecting a water quality sample:
    - Purging time and volume of water purged, if collecting a groundwater sample
    - Field parameter values (pH, temperature, specific conductivity, dissolved oxygen, oxidation-reduction potential, and turbdity) collected during sampling
    - Appearance of sample

Water Quality Sampling QA/QC

Field meters require calibration to ensure accurate and precise measurement of field parameters. The field meters will be calibrated before each sampling event and subsequently operated in a manner consistent with the manufacture's recommendations.

No duplicate water quality samples will be collected. If laboratory test results indicate that an analyte has an unexpectedly high concentration approaching 50 percent of the maximum contaminant level[1], injection will be stopped and the location will be resampled as soon as possible.

A sample label will be secured to each water sample container. The following information will be included on the sample labels:

- Project information
- Sample ID
- Date and time of sample collection
- Type of preservative (if any)
- Other pertinent information requested by the analytical laboratory that will be analyzing the water samples

Each sample ID will be named according to the following format: LHS-CX-SW, where:

- "LHS" indicates the sample was collected for the Liberty High School
- "CX" indicates the cycle (C1 for Cycle 1, C2 for Cycle 2, etc.)
- "SW" represents source water (SW), the type of water sampled.

A chain-of-custody form will be used to track possession of each sample and document the requested analyses.

[1] 100 percent for DBPs.

Laboratory Quality Assurance Program

Samples collected during the pilot testing program will be analyzed by an analytical laboratory certified by the Oregon Environmental Laboratory Accreditation Program (ORELAP).

The analytical laboratory will use trip blanks, method blanks, spikes, laboratory duplicates, surrogates, and control samples in each analytical batch containing the District samples being analyzed, or at a frequency of at least one in every 20 samples, depending on the analysis being performed. The results from these procedures will accompany the sample test results. A copy of the analytical laboratory's quality assurance manual is available upon request.

6. References

GSI. 2010. Injection Test Results for Liberty High School Irrigation Well – Hillsboro School District Aquifer Storage and Recovery Evaluation. GSI Water Solutions, Inc. March 2010.

GSI. 2011. Operation and Maintenance (O&M) Manual, Liberty High School, Hillsboro School District Aquifer Storage and Recovery (ASR) Irrigation Well. GSI Water Solutions, Inc. March 2011.

GSI. 2018. Liberty High School Aquifer Storage and Recovery Permit Application and Supplemental Information. GSI Water Solutions, Inc. March 2011.

OWRD. 2010. Aquifer Storage and Recovery (ASR) LL #017. Oregon Water Resources Department. October 25, 2010.

OWRD. 2015. Aquifer Storage and Recovery (ASR) LL #017 Renewal. Oregon Water Resources Department. November 9, 2015.

Table 1. Year 1 and Year 2 Source Water Analyte List

Liberty High School Aquifer Storage and Recovery Permit Monitoring Plan

Class	Analyte	Lowest Regulatory Standard	Units	Regulatory Criteria	Sample Location
Disinfection By-Products	Chloroform (Trichloromethane)	None	mg/L	None	JWC and PWB
	Bromodichloromethane	None	mg/L	None	JWC and PWB
	Dibromochloromethane	None	mg/L	None	JWC
	Bromoform (Tribromomethane)	None	mg/L	None	JWC
	Total Trihalomethanes	0.08	mg/L	MCL	JWC
Geochemical	Bicarbonate	None	mg/L	None	JWC and PWB
	Calcium	None	mg/L	None	JWC and PWB
	Carbonate	None	mg/L	None	JWC and PWB
	Chloride	250	mg/L	SMCL	JWC and PWB
	Hardness (as CaCO3)	None	mg/L	None	JWC and PWB
	Magnesium	None	mg/L	None	JWC and PWB
	Nitrate as N	10	mg/L	MCL, MML	JWC and PWB
	Nitrite as N	1	mg/L	MCL	JWC and PWB
	Total Nitrate-Nitrite	None	mg/L	None	JWC
	Potassium	None	mg/L	None	JWC and PWB
	Silica	None	mg/L	None	JWC and PWB
	Sodium	20	mg/L	MCLG	JWC and PWB
	Sulfate	250	mg/L	SMCL	JWC and PWB
	Total Alkalinity	None	mg/L	None	JWC and PWB
	Total Dissolved Solids	500	mg/L	SMCL	JWC and PWB
	Total Organic Carbon	None	mg/L	None	JWC and PWB
	Total Suspended Solids	None	mg/L	None	JWC and PWB
Metals	Aluminum	0.05	mg/L	SMCL	JWC and PWB
	Antimony	0.006	mg/L	MCL	JWC and PWB
	Arsenic	0.01	mg/L	MCL	JWC and PWB
	Barium	1	mg/L	MML	JWC and PWB
	Beryllium	0.004	mg/L	MCL	JWC and PWB
	Cadmium	0.005	mg/L	MCL	JWC and PWB
	Chromium	0.05	mg/L	MML	JWC and PWB
	Copper	1	mg/L	SMCL	JWC and PWB
	Iron (Total)	0.3	mg/L	SMCL	JWC and PWB
	Lead	0.05	mg/L	MML	JWC and PWB
	Manganese (Total)	0.05	mg/L	SMCL	JWC and PWB
	Mercury	0.002	mg/L	MCL, MML	JWC and PWB
	Nickel	None	mg/L	None	JWC and PWB
	Selenium	0.01	mg/L	MML	JWC and PWB
	Silver	0.05	mg/L	MML	JWC and PWB
	Thallium	0.002	mg/L	MCL	JWC and PWB
	Zinc	5	mg/L	SMCL	JWC and PWB
Miscellaneous	Odor	3	TON	SMCL	JWC
	Color	15	ACU	SMCL	JWC and PWB
	Methylene Blue Active Substance	0.5	mg/L	SMCL	JWC
	Corrosivity (Langelier Saturation Index)	Non-Corrosive	mg/L	SMCL	JWC
	Cyanide (as free cyanide)	0.2	mg/l	MCL	JWC and PWB
	Fluoride	2	mg/L	SMCL	JWC and PWB

Table 1. Year 1 and Year 2 Source Water Analyte List

Liberty High School Aquifer Storage and Recovery Permit Monitoring Plan

Notes:

µS/cm = micro Siemens per centimeter
ACU = apparent color units
CFU/ml = colony forming units per milliliter
JWC = Joint Water Commission; collected after treatment at FW Hose, Site ID #1.
MCL = federal maximum contmainant level for drinking water
MCLG = maximum contaminant level goal, the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
mg/L = milligrams per liter
MML = Oregon Department of Environmental Quality's maximum measurable levels for groundwater
mV = millivolts
PWB = Portland Water Bureau; collected after treatment at Bull Run's Lusted Hill treatment facility.
SMCL = federal secondary maximum contaminant levels for drinking water
TON = threshold odor number

Table 2. Year 3 Source Water Analyte List

Liberty High School Aquifer Storage and Recovery Permit Monitoring Plan

Class	Analyte	Lowest Regulatory Standard	Units	Regulatory Criteria	Sample Location
Field Parameters	Temperature	None	Celsius	None	Liberty High School
	Conductivity	None	µS/cm	None	Liberty High School
	pH	6 - 8.5	Units	SMCL	Liberty High School
	Dissolved Oxygen	None	mg/L	None	Liberty High School
	Oxidation-Reduction Potential	None	mV	None	Liberty High School
	Turbidity	None	NTU	None	Liberty High School
Bacteriological	Fecal Coliforms/E.Coli	<1/100 ml	CFU/100 ml	MML	Liberty High School
	Total Coliform	<1/100 ml	CFU/100 ml	MML	Liberty High School
Disinfection By-Products	Chloroform (Trichloromethane)	None	mg/L	None	Liberty High School
	Bromodichloromethane	None	mg/L	None	Liberty High School
	Dibromochloromethane	None	mg/L	None	Liberty High School
	Bromoform (Tribromomethane)	None	mg/L	None	Liberty High School
	Total Trihalomethanes	0.08	mg/L	MCL	Liberty High School
	Monochloroacetic Acid	None	mg/L	None	Liberty High School
	Dichloroacetic Acid	None	mg/L	None	Liberty High School
	Trichloroacetic Acid	None	mg/L	None	Liberty High School
	Monobromoacetic Acid	None	mg/L	None	Liberty High School
	Dibromoacetic Acid	None	mg/L	None	Liberty High School
	Total Haloacetic Acids	0.06	mg/L	MCL	Liberty High School
	Chlorite	1	mg/L	MCL	Liberty High School
	Bromate	0.01	mg/L	MCL	Liberty High School
Geochemical	Bicarbonate	None	mg/L	None	Liberty High School
	Calcium	None	mg/L	None	Liberty High School
	Carbonate	None	mg/L	None	Liberty High School
	Chloride	250	mg/L	SMCL	Liberty High School
	Hardness (as CaCO3)	None	mg/L	None	Liberty High School
	Magnesium	None	mg/L	None	Liberty High School
	Nitrate as N	10	mg/L	MCL, MML	Liberty High School
	Nitrite as N	1	mg/L	MCL	Liberty High School
	Total Nitrate-Nitrite	None	mg/L	None	Liberty High School
	Potassium	None	mg/L	None	Liberty High School
	Silica	None	mg/L	None	Liberty High School
	Sodium	20	mg/L	MCLG	Liberty High School
	Sulfate	250	mg/L	SMCL	Liberty High School
	Total Alkalinity	None	mg/L	None	Liberty High School
	Total Dissolved Solids	500	mg/L	SMCL	Liberty High School
	Total Organic Carbon	None	mg/L	None	Liberty High School
	Total Suspended Solids	None	mg/L	None	Liberty High School
Metals	Aluminum	0.05	mg/L	SMCL	Liberty High School
	Antimony	0.006	mg/L	MCL	Liberty High School
	Arsenic	0.01	mg/L	MCL	Liberty High School
	Barium	1	mg/L	MML	Liberty High School
	Beryllium	0.004	mg/L	MCL	Liberty High School
	Cadmium	0.005	mg/L	MCL	Liberty High School
	Chromium	0.05	mg/L	MML	Liberty High School
	Copper	1	mg/L	SMCL	Liberty High School
	Iron (Total)	0.3	mg/L	SMCL	Liberty High School
	Iron (Dissolved)	None	mg/L	None	Liberty High School
	Lead	0.05	mg/L	MML	Liberty High School

Table 2. Year 3 Source Water Analyte List

Liberty High School Aquifer Storage and Recovery Permit Monitoring Plan

Class	Analyte	Lowest Regulatory Standard	Units	Regulatory Criteria	Sample Location
	Manganese (Total)	0.05	mg/L	SMCL	Liberty High School
	Manganese (Dissolved)	None	mg/L	None	Liberty High School
	Mercury	0.002	mg/L	MCL, MML	Liberty High School
	Nickel	None	mg/L	None	Liberty High School
	Selenium	0.01	mg/L	MML	Liberty High School
	Silver	0.05	mg/L	MML	Liberty High School
	Thallium	0.002	mg/L	MCL	Liberty High School
	Zinc	5	mg/L	SMCL	Liberty High School
Miscellaneous	Odor	3	TON	SMCL	Liberty High School
	Color	15	ACU	SMCL	Liberty High School
	Methylene Blue Active Substance	0.5	mg/L	SMCL	Liberty High School
	Corrosivity (Langelier Saturation Index)	Non-Corrosive	mg/L	SMCL	Liberty High School
	Cyanide (as free cyanide)	0.2	mg/l	MCL	Liberty High School
	Fluoride	2	mg/L	SMCL	Liberty High School
Radionuclides	Combined Radium 226/228	5	pCi/L	MCL, MML	Liberty High School
	Uranium	0.03	mg/L	MCL	Liberty High School
	Radon	None	pCi/L	None	Liberty High School
	Gross Alpha	15	pCi/L	MCL, MML	Liberty High School
	Gross Beta	50	pCi/L	MML	Liberty High School
Regulated Synthetic Organic Compounds (SOCs)	2,4,5-TP (Silvex)	0.01	mg/L	MML	Liberty High School
	2,4-D	0.07	mg/L	MCL	Liberty High School
	Alachlor (Lasso)	0.002	mg/L	MCL	Liberty High School
	Atrazine	0.003	mg/L	MCL	Liberty High School
	Benzo(a)Pyrene	0.0002	mg/L	MCL	Liberty High School
	BHC-gamma (Lindane)	0.0002	mg/L	MCL	Liberty High School
	Carbofuran	0.04	mg/L	MCL	Liberty High School
	Chlordane	0.002	mg/L	MCL	Liberty High School
	Dalapon	0.2	mg/L	MCL	Liberty High School
	Di(2-ethylhexyl)adipate *(adipates)*	0.4	mg/L	MCL	Liberty High School
	Di(2-ethylhexyl)phthalate *(phthalates)*	0.006	mg/L	MCL	Liberty High School
	Dibromochloropropane (DBCP)	0.0002	mg/L	MCL	Liberty High School
	Dinoseb	0.007	mg/L	MCL	Liberty High School
	Diquat	0.02	mg/L	MCL	Liberty High School
	Ethylene Dibromide (EDB)	0.00005	mg/L	MCL	Liberty High School
	Endothall	0.1	mg/L	MCL	Liberty High School
	Endrin	0.0002	mg/L	MML	Liberty High School
	Glyphosate	0.7	mg/L	MCL	Liberty High School
	Heptachlor	0.0004	mg/L	MCL	Liberty High School
	Heptachlor Epoxide	0.0002	mg/L	MCL	Liberty High School
	Hexachlorobenzene (HCB)	0.001	mg/L	MCL	Liberty High School
	Hexachlorocyclopentadiene	0.05	mg/L	MCL	Liberty High School
	Methoxychlor	0.04	mg/L	MCL	Liberty High School
	Polychlorinated Biphenyls (PCBs)	0.0005	mg/L	MCL	Liberty High School
	Pentachlorophenol	0.001	mg/L	MCL	Liberty High School
	Picloram	0.5	mg/L	MCL	Liberty High School
	Simazine	0.004	mg/L	MCL	Liberty High School
	Toxaphene	0.003	mg/L	MCL	Liberty High School
	Vydate (Oxamyl)	0.2	mg/L	MCL	Liberty High School
Regulated	1,1,1-Trichloroethane	0.2	mg/L	MCL, MML	Liberty High School

Table 2. Year 3 Source Water Analyte List

Liberty High School Aquifer Storage and Recovery Permit Monitoring Plan

Class	Analyte	Lowest Regulatory Standard	Units	Regulatory Criteria	Sample Location
Volatile	1,1,2-Trichloroethane	0.005	mg/L	MCL	Liberty High School
Organic	1,1-Dichloroethylene	0.007	mg/L	MCL, MML	Liberty High School
Compounds	1,2,4-Trichlorobenzene	0.07	mg/L	MCL	Liberty High School
(VOCs)	1,2-Dichlorobenzene (o)	0.6	mg/L	MCL	Liberty High School
	1,2-Dichloroethane (EDC)	0.005	mg/L	MCL, MML	Liberty High School
	1,2-Dichloropropane	0.005	mg/L	MCL	Liberty High School
	1,4-Dichlorobenzene (p)	0.075	mg/L	MCL, MML	Liberty High School
	Benzene	0.005	mg/L	MCL, MML	Liberty High School
	Carbon Tetrachloride	0.005	mg/L	MCL, MML	Liberty High School
	Chlorobenzene	0.1	mg/L	MCL	Liberty High School
	cis-1,2-Dichloroethylene	0.07	mg/L	MCL	Liberty High School
	Ethylbenzene	0.7	mg/L	MCL	Liberty High School
	Dichloromethane (methylene chloride)	0.005	mg/L	MCL	Liberty High School
	Styrene	0.1	mg/L	MCL	Liberty High School
	Tetrachloroethylene	0.005	mg/L	MCL	Liberty High School
	Toluene	1	mg/L	MCL	Liberty High School
	trans-1,2-Dichloroethylene	0.1	mg/L	MCL	Liberty High School
	Trichloroethylene	0.005	mg/L	MCL, MML	Liberty High School
	Vinyl Chloride	0.002	mg/L	MCL, MML	Liberty High School
	Total Xylenes	10	mg/L	MCL	Liberty High School

Notes:

µS/cm = micro Siemens per centimeter
ACU = apparent color units
CFU/ml = colony forming units per milliliter
MCL = federal maximum contmainant level for drinking water
MCLG = maximum contaminant level goal, the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
mg/L = milligrams per liter
MML = Oregon Department of Environmental Quality's maximum measurable levels for groundwater
mV = millivolts
NTU = nephelometric turbidity units
pCi/L = picoCuries per liter
SMCL = federal secondary maximum contaminant levels for drinking water
TON = threshold odor number

FIGURE 1

Site Overview

Liberty High School
Aquifer Storage and Recovery
Permit Monitoring Plan

LEGEND

- ASR Well
- Watercourse

N

0 350 700 1,050
Feet

Date: May 18, 2018
Data Sources: OWRD, USGS, METRO
Aerial photo taken in the summer of 2017

GSI Water Solutions, Inc.

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