OREGON WATER RESOURCE DEPARTMENT
WATER CONSERVATON, REUSE AND STORAGE
FEASIBILTY STUDY GRANT PROGRAM

I. Grant Information

Study Name: *Rupp Ranches Agricultural Aquifer Storage and Recovery (ASR) Feasibility Study*

Type of Feasibility Study: ☐ Water Conservation ☐ Reuse ☐ Above-Ground Storage
☒ Storage Other Than Above-Ground [Including Aquifer Storage and Recovery (ASR)]

Program Funding Dollars Requested: $ $155,000
Note: Request may not exceed $500,000

Total Cost of Feasibility Study: $ $324,000

II. Applicant Information

Applicant Name: *Rupp Ranches*		**Co-Applicant Name:**
Address:	*1925 Fowler*	Address:
	Richland, WA 99352	
Phone:	*1-509-628-7516*	Phone:
Fax:		Fax:
Email:	*randy@costlesscarpet.com*	Email:

Principle Contact: *Said Amali, PE*	
Address:	*Akana*
	6400 Se Lake Road, Suite 270, Portland, OR 97222
Phone:	*503-720-2116*
Fax:	
Email:	*said.amali@akana.us*

Certification:

I certify that this application is a true and accurate representation of the proposed work for a project feasibility study and that I am authorized to sign as the Applicant or Co-Applicant. By the following signature, the Applicant certifies that they are aware of the requirements of an Oregon Water Resources Department grant, have read and agree to all conditions within the sample grant agreement and are prepared to conduct the feasibility study if awarded.

Applicant Signature: _____ Date: 1-28-16

Print Name: Randy Rupp Title: owner

III. Feasibility Study Summary

Please give a brief summary of the feasibility study using no more than 150 words.

Rupp Ranches is seeking funding to conduct a feasibility study of storage of imported Columbia River water in local basalt aquifers to support irrigated farming in the area. The local aquifers do not receive natural recharge at rates that can support the current permitted groundwater withdrawal rates resulting in declining groundwater levels. The immediate objective of this project is to test a new approach to treat imported river water for injection into the basalt aquifers. The project's long term benefits are to 1) replenish basalt aquifers for long term sustainable use, 2) bring much-needed land that is strategically located near Columbia River into high value crop production, and 3) provide technical information to OWRD and the public regarding operational and financial viability of such systems in the Umatilla Basin.

IV. Grant Specifics

Section A. Common Criteria

Instructions: Please answer all questions contained in this section. It is anticipated that completed applications will result in additional pages.

1. Describe your goal and how this study helps to achieve the goal.

   The ultimate goal of the project is to annually replenish the basalt aquifers in the project area to their full volume for use during the irrigation season. To do that, winter water from the Columbia River will be conveyed under a new water right permit to sites on Rupp Ranches property for treatment and subsequent aquifer injection through an Aquifer Storage and Recovery (ASR) permit. The ASR permit will be issued only if the injected water meets drinking water quality. This project includes an evaluation of the practicability and feasibility of a new treatment and injection design to be conducted on a field test site located on Rupp Ranches property. The full ASR permit will be issued only if the feasibility testing proves the viability of the technical design. Sharing of the study findings with the public will allow similar systems to be constructed which will help reduce basalt aquifer water demand in the Umatilla Basin.

   The project will test the capacity of surficial soils in the project area to treat imported Columbia River water in a novel engineered design. The treated water will then be injected into a nearby basalt well owned by Rupp Ranches and the changes in storage volume and aquifer response will be measured.

   The treatment system and the well injection system (consisting of wellhead and downhole components) are designed to be scalable from the test scale to the full field scale. Additionally, the systems have to be operated and maintained within an existing irrigation system and they must use typical farming resources (labor and equipment) in an effective and cost efficient manner. In this study the information and data to gauge the applicability of the new approach, scalability requirements to design a full-scale system, and capital and O&M needs and cost of such a system will be obtained.

2. Describe the water supply need(s) that the proposed project addresses. Identify any critical local, regional, or statewide water supply needs that implementation of the project associated with the feasibility study will address. **Responses should rely upon solid water availability and needs data/analysis.** For examples of water supply needs see "Criteria and Evaluation Guidance Document."

   This project will evaluate the feasibility of agricultural ASR in the Umatilla Basin. One system has successfully been operating in the basin for a number of years. Recent studies of other systems elsewhere in the basin and at larger scales have not proven feasible. No viable above-ground sites have been identified to provide the needed storage for the basin. As a result, there is a continuing need to identify aquifer storage opportunities in the area. This project will provide information to address the following short- and long-term, local and basin-wide water supply needs:

   - *Approximately 8,000 acre feet of decrease in stored groundwater volume in the project area basalt aquifers. This condition has prompted OWRD to consider curtailment of groundwater pumping in the area. If imposed, the curtailment will cause irrigated agriculture in these highly productive grounds to cease.*

   - *Irrigation of lands near the Columbia River is less expensive than lands farther south in the Umatilla Basin. If the proposed ASR water treatment and injection system proves feasible, some of the farming needs farther south can be accommodated in the project area, thereby reducing cost of moving water to distant farms, and reducing the pressure on the aquifers there.*

   - *Several basin irrigators are in the process of receiving more than 100 cfs (combined) of year-round Columbia River water through a lease from the Port of Umatilla. There is a strong need to find ways to store the winter flow portion of this water right for summer-time use. However, there are no current viable options for*

this purpose. If the ASR project proves feasible, it may offer storage for a portion of the leased Port of Umatilla water.

Water availability studies have been completed for Columbia River for the October-March timeframe subject of this study (OWRD 2007). The OWRD findings are: 108000, 111000,0, 90, 15015, 24030, and 24744 cfs in September through March months, respectively. At full capacity, the total diversion rate from the river is estimated at 33 cfs. Water is available for appropriateion during these months. except November.

3. Explain how the proposed project will meet the water supply need(s), and indicate what percentage of that need will be met. (For example: If your water supply need is 20,000 acre-feet of additional water and the project will supply 10,000 additional acre-feet, 50 percent of your need will be met).

   The following information address the needs listed for 2) above.

- *The proposed project will meet 100% of the need to replenish the local aquifer.*

- *The interest in using the lands within the project area for irrigated farming is already known due to the expressed interests of local growers in leasing the available fields.*

- *The extent of additional storage that may be offered to other uses is dependent on the local hydrogeology information which will be obtained during the project. Preliminary analyses of the well log information suggest that additional storage volumes may exist at shallower depths than the well currently accesses. The storage volume of these zones will be assessed during this project.*

4. Describe the technical aspects of the feasibility study and why your approach is appropriate for accomplishing the specific study goals and objectives.

   The technical aspects of the planning, design, construction, and operational phases of the test system were included in an ASR Limited License application package which was submitted to OWRD on December 16, 2015. The package contains design information on the treatment and conveyance, well injection, and water flow and quality monitoring systems. The application is required by OWRD and must be approved before testing of the proposed ASR system at Rupp Ranches is allowed. Although the application is currently under review and may be refined based on the agency and public comments that may be received, we don't anticipate significant changes to its technical content. A copy of the Limited License technical information is included with this funding application as an attachment. It provides detailed technical information and justification for each aspect of the approach.

   In addition, two water right applications have been submitted to OWRD to permit the use of water for the test and full-scale systems. The first one, T-12207, is for transfer of a portion of the existing water right S-54926, to allow use during the initial year of ASR testing. A second water right application S-88150 has been submitted to permit new winter withdrawals from the Columbia River to continue the ASR testing in the subsequent years to full capacity. Irrigation water rights are required to permit the use of source water out of the Columbia River for ASR purposes. ASR is an inherent beneficial use of such permitted water supplies. These two applications are currently progressing through normal review process.

5. Describe how the feasibility study will be performed. Include:
   a. General summary statement that describes the study progression.
   b. When the feasibility study will begin.
   c. Listing of key tasks to be accomplished with each task having:
      i. Title
      ii. Timeline for completion
      iii. Description of the activities to be performed in this key task
      iv. Description of the resources necessary for accomplishing the key task

Example:

(i) Streamflow measurement;

(ii) September-April;

(iii) Weekly streamflow measurements will be performed to gather hydrographic data for the hydrologic analysis to take place in May;

(iv) A technician will be hired to perform the streamflow measurements.

(Key tasks listed here are to be placed in Section VI. Project Feasibility Study Schedule for a quick reference "graphical" representation of the schedule.)

a) General summary statement that describes the study progression.

For planning purposes, we have assumed that this Limited License (and the associated water right applications) will be approved by OWRD by sometime in March 2016. Between submittal of the Limited License and completion of the review process, Rupp Ranches will begin to construct the treatment cell and associated water delivery infrastructure in anticipation of water application sometime in March and/or April 2016. Assuming OWRD approvals are attained by then, the water will be applied to the treatment cell in March/April for completion prior to April 15th, when winter water cannot be diverted any longer under the amended permit.

The diverted water will be conveyed to the engineered treatment cell via new pipelines and throttled to achieve as high of a system throughput as possible. The treatment cell will be constructed within the native sandy soils by removing the shallow soils to a pre-determined grade, installing a liner, and moving the native soils back on the liner. Water level changes and migration rates within the treatment cell will be monitored during the test.

The treated water will be recaptured at the downgradient end of the treatment cell for water quality sampling and laboratory analyses. If the water quality is determined to meet the applicable treatment requirements of OAR 333-061-0032, it will be routed to Well 2 for injection. Until the water quality is approved for injection, the recaptured water will be discharged to the ground surface downgradient of the treatment cell and Well 2. There is ample space available for this purpose with little possibility of interference or impact to the treatment cell operation or impacts to Well 2.

We envision that even a one-week diversion and subsequent injection will provide the necessary initial system information for further design purposes. We expect that significantly greater volumes of treated water will be available for injection in the following year. The system information obtained during the first year testing will be greatly valuable to conducting the second year testing.

b) When the feasibility study will begin.

The feasibility study began in November 2015. It has so far included developing the Limited license application package and two water right applications. The project is envisioned to continue until the second year injections are completed by September 2017

c) Listing of key tasks to be accomplished with each task having:

i. Title – Task 1. Obtain new winter Columbia River water right for ASR.

ii. Timeline for completion – Begun in November 2015, to be completed in April 2016.

iii. Description of the activities to be performed in this key task - Complete and submit an application to OWRD for a new winter water right from the Columbia River to be used as source

water for the proposed ASR system. This task is being conducted so that the new water source will be ready for use during the second and subsequent years of testing.

iv. Description of the resources necessary for accomplishing the key task - Akana staff were retained and completed and submitted the application on behalf of Rupp Ranches.

i. Title – Task 2. Transfer Existing Water Right for First Year ASR Testing

ii. Timeline for completion– Begun in November 2015, to be completed in April 2016..

iii. Description of the activities to be performed in this key task - Completed and submitted an application to OWRD for temporary transfer of a portion of water right Permit S87886 to be used as source water for the first-year testing of the proposed ASR system. The use of this source will revert back to its original intended purpose after year one of testing.

iv. Description of the resources necessary for accomplishing the key task - Akana staff were retained and completed and submitted the application on behalf of Rupp Ranches.

i. Title- Task 3. Permit, Design,Construct, and Test the Proposed ASR System – Year 1.

ii. Timeline for completion – December 2015 through December 2016.

iii. Description of the activities to be performed in this key task - Develop and discuss a conceptual ASR plan with OWRD during a required pre-application meeting. Conduct a site visit to identify suitable locations for ASR testing. Complete and submit an ASR LL application including a) a hydrogeology feasibility study, b) a recharge test program, and c) a proposed system design. Develop ASR test system construction cost estimates and secure testing components and materials. Oversee construction of the ASR treatment and injection system. Conduct treatment testing, monitoring, sample collection and initial short-duration low flow rate (100 gpm) injection, data analyses and data reporting.

iv. Description of the resources necessary for accomplishing the key task – Akana staff were retained and completed and submitted the Limited License application package to OWRD in December 2015. They will be retained to assist Rupp Ranches with the remaining activities of this task. Rupp Ranches will use its own equipment and labor to construct the system under supervision of Akana licensed engineers.

i. Title - Task 4. ASR System Expansion and Testing – Year 2.

ii. Timeline for completion- October 2016 – September 2017.

iii. Description of the activities to be performed in this key task – Increase the injection rate up to an expected 1,500 gpm flow rate. Increase the size of the treatment cell based on the first year data and results. Continue monitoring and reporting and data collection.

iv. Description of the resources necessary for accomplishing the key task – Akana staff will be retained to provide engineering, construction oversight, sampling, monitoring, and reporting tasks. Rupp Ranches will provide the equipment and labor necessary for construction of the system modifications.

6. Please provide the following data and information for the proposed project and the project's sources of water supply:

a. The location of the proposed project. Include the basin, county, township, range and section. Attach a **map** that identifies the project's implementation area to this application.

Umatilla Basin; Umatilla county; T5N, R30E, WM, Sections 13 & 14; For map please see the attached Limited License Figures 1 and 3.

b. The name(s) and river mile(s) of the source water and what they are tributary to, if applicable.

Columbia River, approximately 12 miles upstream of McNary Dam;Tributarty of Pacific Ocean

c. Whether the project will be off-channel or on-channel (for above-ground storage only).

d. Water availability to meet project storage. For above-ground storage the Department typically evaluates availability using a 50 percent exceedance water availability analysis.

Water rights applied for to support this project have passed through a water availability analyses by OWRD with the determination that water is available.

e. Proposed purposes and/or uses of conserved or stored water.

ASR water will be used for crop irrigation.

f. Environmental flow needs and water quality requirements of supply source water bodies.

Water for ASR will be annually diverted during the period of October through April 14, except for the month of November. Water availability studies for the main styem Columbia River have indicated that river flow greater than the 50% exceedence flows are available in all monthds except November. The diverted water will be treated prior to aquifer injection through an engineered system.

7. What local, state or federal project permitting requirements/issues/approvals do you anticipate in order for the feasibility study to be conducted? If approvals are required, indicate whether you have obtained them. If you have not obtained the necessary permits/governmental approval, describe the steps you have taken to obtain them. If no permits are needed, please provide explanation.

Water right permits by OWRD; Limited License application approval by OWRD; these applications are currently under review. Initial input from OWRD suggests that they will be approved in the next two months with some modifications unrelarted to the technical design of the proposed systems.

8. Describe the level of involvement, interest and/or commitment of local entities associated with the feasibility study. Describe how the feasibility study and/or proposed project will benefit/impact these entities. Attach letters of support if available.

An ASR feasibility study was conducted between 2009 and 2012 in the Umatilla Basin. Its results indicated that the system as designed, was infeasible due to several reasons, primarily that the recapture of treated imported water couldn't be acomplished cost-effectively and was additionally subject to significant regulatory uncertainty. The project propsed in this application attempts to remove the sources of uncertainty through use of a new treatment approach. If successful, the findings of this project can help many more such projects to be implemented in the basin with basin-wide benefits to replenish and protect the current basalt aquifer sources within several State-designated Critical Groundwater Areas.

Additionally, the details of this project have been discussed with OWRD staff from the Gorundwater section over the last few months. It is with their suggestion and encouragement that Rupp Ranches is submitting this application. No letters of support have been requested.

9. Identify when matching funds will be secured, from whom, and the dates of matching funds availability.

   Matching funds from Rupp Ranches have already been secured and used to begin the project. Additional funds will be committed as needed to complete the project.

10. Provide a description of the relevant professional qualifications and/or experience of the person(s) that will play key roles in performing the feasibility study. If the personnel have not been decided upon, include a description of the professional qualifications and/or experience of the person(s) you anticipate will play key roles in performing the feasibility study.

    Licensed engineers and hydrogeologists, and other staff from Akana, an engieering consulting firm in Portland, have been retained to complete the study. Please see staff, capabilties at www.akana.us. Project manager is Said Amali, Ph.D., PE. Said has more than 22 years of experience with groundwater supply development, and water supply planing in the Pacific Northwest and has worked extensively on agricultural water issues in the Umatilla Basin. Resume of key staff and other information on qualifications and experience are available upon request.

11. If the project concept is ultimately deemed feasible, describe how the project will be implemented. Response should include a tentative funding plan for project implementation (e.g. other state or federally sponsored grant or loan programs) and the project proponent's track record in implementing similar projects.

    If the project proves feasible, additional injection/recovery wells will be installed in the area and the treatment cell size will be expanded. The ultimate capacity of the system is targeted to be 8,000 acre feet, which is the total volume of water withdrawn from the aquifer up to now, based on data reported to OWRD and well water level measurements.

Section B. Unique Criteria

Instructions: Address the set of items below that applies to the type of feasibility study that this grant will fund.

☐ Water Conservation or ☐ Reuse

1. Water Conservation or Reuse projects that are identified by the Department in a statewide water assessment and inventory receive a preference in the scoring process. Contact the Department's Grant Specialist to include your project on the inventory.

2. Explain how the associated project will either: (a) mitigate the need to develop new water supplies and/or (b) use water more efficiently. Reference documentation and/or examples of the success of similar or comparable water conservation/reuse projects that would be available upon request.

3. Provide a description of: (a) Local, state and/or federal permitting requirements and issues posed by the **implementation** of the project associated with the feasibility study and (b) property ownership status within the

project implementation area. If permitting or other approvals are not needed please indicate and provide an explanation.

☐ Above-Ground Storage

Please answer the following three questions **BEFORE** proceeding:

Will the project divert more than 500 acre-feet of surface water annually?	☐ Yes	☐ No
Will the project impound surface water on a perennial stream?	☐ Yes	☐ No
Will the project divert water from a stream that supports sensitive, threatened or endangered species?	☐ Yes	☐ No

If you answered "Yes" to any of these questions, by signature on this application, you are committing to include the following required elements in your feasibility study.

Describe how you intend to address the required elements in your feasibility study:

a) Analyses of by-pass, optimum peak, flushing and other ecological flows of the affected stream and the impact of the storage project on those flows.

b) Comparative analyses of alternative means of supplying water, including but not limited to the costs and benefits of water conservation and efficiency alternatives and the extent to which long-term water supply needs may be met using those alternatives.

c) Analyses of environmental harm or impacts from the proposed storage project.

d) Evaluation of the need for and feasibility of using stored water to augment instream flows to conserve, maintain and enhance aquatic life, fish life and any other ecological values.

Is the proposed storage project for municipal use?

☐ Yes ☐ No

If "Yes," then please describe how you intend to address the following required element in your feasibility study:

e) For a proposed storage project that is for municipal use, analysis of local and regional water demand and the proposed storage project's relationship to existing and planned water supply projects.

Proceed in addressing the following items:

1. Describe to what extent the project associated with the feasibility study includes provisions for using stored water to augment instream flows to conserve, maintain and enhance aquatic life, fish life or other ecological values. Projects that include the above provisions receive preference in the scoring process.

2. Provide a review of: (a) Local, state and/or federal permitting requirements and issues posed by the **implementation** of the project associated with the feasibility study and (b) property ownership status within the project implementation area.

☐ Storage Other Than Above-Ground [Including Aquifer Storage and Recovery (ASR)]

Please answer the following three questions **BEFORE** proceeding:

Will the project divert more than 500 acre-feet of surface water annually?	☒ Yes	☐ No
Will the project impound surface water on a perennial stream?	☐ Yes	☒ No
Will the project divert water from a stream that supports sensitive, threatened or endangered species?	☒ Yes	☐ No

If you answered "Yes" to any of these questions, by signature on this application, you are committing to include the following required elements in your feasibility *study.*

Describe how you intend to address the required elements in your feasibility study:

a) Analyses of by-pass, optimum peak, flushing and other ecological flows of the affected stream and the impact of the storage project on those flows.

The project report will include a summary of the assessment of the 50% exceedence flows, by-pass, optimum peak, flushing, and other ecological flows in the Columbia River during the planned diversion period

b) Comparative analyses of alternative means of supplying water, including but not limited to the costs and benefits of water conservation and efficiency alternatives and the extent to which long-term water supply needs may be met using those alternatives.

Alternative sources are native groundwater, summer time diversions from the Columbia River, and above-

ground storage. The final project report will demonstrate that native groundwatervolumes are insufficiewnt to meet the irrigatoin demand, that Columabi river is closed to further appropriationsin the summer months, and there are no viable above-ground storage opportunities identified in the area.

c) Analyses of environmental harm or impacts from the proposed storage project.

The final project report will include a discussion of potential environmental harm. Since this project includes treating surface water prior to aquifer injection, no harm to to the environment is anticipated. The surfacve activities to construct and operate the system will take place within already-farmed areas so no natural habitats are disturbed.

d) Evaluation of the need for and feasibility of using stored water to augment instream flows to conserve, maintain and enhance aquatic life, fish life and any other ecological values.

The final project report will include a discussion on this topic. The project doesn't include diversions from any local streams, other than Columbia River, and no local streams with aquatic habitat value are present for flow augmentation. The subsurface storage system doesn't allow direct discharge to surface points that may affect local surface water bodies one way or another.

Is the proposed storage project for municipal use?

☐ Yes ☒ No

If "Yes," then please describe how you intend to address the following required element in your feasibility study:

e) For a proposed storage project that is for municipal use, analysis of local and regional water demand and the proposed storage project's relationship to existing and planned water supply projects.

Proceed in addressing the following items:

1. Underground storage projects that are identified by the Department in a statewide water assessment and inventory receive a preference in the scoring process. Contact the Department's Grant Specialist to include your project on the inventory.

   The request has been made to put this prokect on the State inventory list. See attached e-mail copy and please contact Jon Unger of OWRD for additional information.

2. Provide a review of: (a) Local, state and/or federal permitting requirements and issues posed by the **implementation** of the project associated with the feasibility study and (b) property ownership status within the project implementation area.

a) The only State regulatory step that is triggred by the implementation of this project once its feasibility is proven, is that a full ASR permit is required pursuant to OAR 690-350-0030. The application will apply for that permit once the feasibility study is completed.

b) The applicant, Rupp Ranches, is the full owner of the land on which the feasibility study and the full ASR project will be conducted.

V. Match Funding Information

Applicants must demonstrate a minimum dollar-for-dollar match based on the total funding request. The match may include a) secured funding commitment from other sources, b) pending funding commitment from other sources, and/or c) the value of in-kind labor, equipment rental, and materials essential to the feasibility study. For secured funding, you must attach a letter of support from the match funding source that specifically mentions the dollar amount shown in the "Amount/Dollar Value" column. For pending resources, documentation showing a request for the matching funds must accompany the application.

In the "type" column below matching funds may include:	**In the "status" column below matching funds may have the following status:**
• **Cash** - Cash is direct expenditures made in support of the feasibility study by the applicant or partner*.	• **Secured** - Secured funding commitments from other sources.
• **In-Kind** - The value of in-kind labor, equipment rental and materials essential to the feasibility study provided by the applicant or partner.	• **Pending** - Pending commitments of funding from other sources. In such instances, Department funding will not be released prior to securing a commitment of the funds from other sources. Pending commitments of the funding must be secured within 12 months from the date of the award.

*"Partner" means a non-governmental or governmental person or entity that has committed funding, expertise, materials, labor, or other assistance to a proposed project planning study. OAR 690-600-0010.

Match Funding Source (if in-kind, briefly describe the nature of the contribution)	**Type** (✓ One)	**Status** (✓ One)	**Amount/ Dollar Value**	**Date Match Funds Available** *(Month/Year)*
Rupp Ranches will provide equipment, operators, fuel, pay for treatment cell liner material and installation cost, engineering and consulting, and other supplies	☒ cash ☒ in-kind	☒ secured ☐ pending	*$169,600*	*January 16*
	☐ cash ☐ in-kind	☐ secured ☐ pending		
	☐ cash ☐ in-kind	☐ secured ☐ pending		
	☐ cash ☐ in-kind	☐ secured ☐ pending		
	☐ cash ☐ in-kind	☐ secured ☐ pending		
	☐ cash ☐ in-kind	☐ secured ☐ pending		
	☐ cash ☐ in-kind	☐ secured ☐ pending		
	☐ cash ☐ in-kind	☐ secured ☐ pending		
	☐ cash ☐ in-kind	☐ secured ☐ pending		
	☐ cash ☐ in-kind	☐ secured ☐ pending		

VI. Feasibility Study Schedule

Estimated Study Duration: <u>November 1, 2015</u> to <u>December 31, 2017</u>

Place an "X" in the appropriate column to indicate when each Key Task of the project will take place.

	2016			2017				2018 & Beyond
Feasibility Study Key Tasks	**2nd Qtr**	**3rd Qtr**	**4th Qtr**	**1st Qtr**	**2nd Qtr**	**3rd Qtr**	**4th Qtr**	
Task 1. Obtain new winter Columbia River water right for ASR.		X						
Task 2. Transfer Existing Water Right for First Year ASR Testing.	X							
Task 3. Permit, Design,Construct, and Test the Proposed ASR System – Year 1.	X	X	X					
Task 4. ASR System Expansion and Testing – Year 2.			X	X	X	X		

- **Please Note**: Successful grantees must include all invoices and identify which key tasks are associated with each invoice when requesting financial reimbursement.

VII. Feasibility Study Budget

Section A

Please provide an estimated line item budget for the proposed feasibility study. Examples would include: labor, materials, equipment, contractual services and administrative costs.

Line Items	Number of Units* (e.g. # of Hours)	Unit Cost (e.g. hourly rate)	In-Kind Match	Cash Match Funds	OWRD Grant Funds	Total Cost
Staff Salary/Benefits	*320 hrs*	*$30.00*	*$9,600*			*$9,600*
Contractual/Consulting	*2,240 hrs*	*$125.00*	*$70,000*	*$55,000*	*$155,000*	*$280,000*
Equipment (must be approved)						
Supplies						
Other: rental of heavy equipment	*30 days*	*$750.00*	*$22,500*			*$22,500*
heavy equipment fuel	*1000 gallons*	*$2.50*	*$2,500*			*$2,500*
treatment cell liner - material+installation	*20000 sq ft*	*$0.50*	*$10,000*			*$10,000*
Administrative Costs**						
Total for Section A			*$114,600*	*$55,000*	*$155,000*	*$324,600*
Percentage for Section A			***35%***	***17***	***47***	***100%***

** Note: The "Unit" should be per "hour" or "day" – not per "project" or "contract."* *Units x Unit Costs = Total Cost*
*** Administrative Costs may not exceed 10 percent of the total funding requested from the Department*

Section B

If grant amount requested is $50,000 or greater, you MUST complete Section B. Key Tasks in Section B should be the same as the Key Tasks in Section VI (Feasibility Study Schedule).

Feasibility Study Key Tasks	In-Kind Match	Cash Match Funds	OWRD Grant Funds	Total Cost
Task 1. Obtain new winter Columbia River water right for ASR.	*$4,000*			*$4,000*
Task 2. Transfer Existing Water Right for First Year ASR Testing.	*$4,000*		*$0*	*$4,000*
Task 3. Permit, Design,Construct, and Test the Proposed ASR System – Year 1.	*$83,533*	*$32,500*	*$62,500*	*$178,533*
Task 4. ASR System Expansion, Testing, and Reporting – Year 2.	*$23,067*	*$22,500*	*$92,500*	*$138,067*
Total for Section B	*$114,600*	*$55,000*	*$155,000*	*$324,600*

Totals in Section B must match the totals in Section A

Rupp Ranches
176 Kranichwood, Richland, WA 99352

January 28, 2016

To Whom it may concern:

Rupp Ranches is the applicant for a SB 1069 cost share application for an ASR water supply feasibility study. This letter is in support of our application package. Rupp Ranches began this project in November 2015 and has contributed cash and in-kind support to it. We are committed to contribute a total of at least $169,600 to its completion and have the financial resources available to meet this commitment. Between November 2015 and present time we have expended a total of more than $61,778.22 toward the cost of this project. Supporting documentation for these amounts will be provided upon request.

Thank you,

Randy Rupp
Rupp Ranches

From: UNGER Jon J
To: Said Amali
Subject: RE: Addition of an ASR project to the State water storage inventory list
Date: Thursday, January 28, 2016 12:03:07 PM

Thanks Said, please attach your original email to your application. - Jon

Jon Unger | Grant Program Coordinator

Oregon Water Resources Department
Desk: 503.986.0869

From: Said Amali [mailto:Said.Amali@akana.us]
Sent: Thursday, January 28, 2016 11:59 AM
To: UNGER Jon J
Subject: Addition of an ASR project to the State water storage inventory list

Hi Jon – On behalf of Rupp Ranches, I would like to request that an ASR feasibility study which Rupp Ranches has begun to conduct on their property in northcentral Umatilla County be added to the State inventory list of water storage projects. Please let me know what other information you may need in conjunction with this listing. Please send me a confirmation e-mail acknowledging the receipt of this request.

Sincerely,

Said Amali, Ph.D., PE
Senior Engineer
Water Resources & the Environment

Akana
6400 SE Lake Road, Suite 270
Portland, OR 97222
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AKANA is derived from the Arikara Indian concepts of akana'u (to build) and akaana' (lodge)

ASR License No. _____
(ASSIGNED AFTER FILING)

STATE OF OREGON
WATER RESOURCES DEPARTMENT
APPLICATION FOR LIMITED WATER USE LICENSE
FOR
AQUIFER STORAGE AND RECOVERY (ASR)

Applicant(s): Rupp Ranches, Randy Rupp - Owner
Contact Person: Said Amali, PE
Mailing Address: 6400 SE Lake Road
Portland, OR 97222 503-205-9284
City State Zip Phone #

1. **DATE(S) OF PRE-APPLICATION CONFERENCE(S):** 26 October 2015

INFORMATION REGARDING ASR TESTING UNDER A LIMITED LICENSE

2. **SOURCE OF INJECTION WATER for ASR:** Columbia River
a tributary of Pacific Ocean

3. **MAXIMUM DIVERSION RATE:** 2.5 cfs

4. **MAXIMUM INJECTION RATE AT EACH WELL(S):** 2.5 cfs at Well 2 or 3

5. **MAXIMUM STORAGE VOLUME:** up to 35 acre feet (= 2.5 cfs x 2 acre feet/day/cfs x 7 days)

6. **MAXIMUM STORAGE DURATION:** April 1 through September 30

7. **MAXIMUM WITHDRAWAL RATE AT EACH WELL(S):** Well 2 has had maximum pumping rate of 2000 gpm or about 4.5 cfs.

8. **LICENSE TERM OR DURATION SOUGHT (5 year maximum):** 5 years

9. **PROPOSED USE OR DISPOSAL OF RECOVERED WATER:** Irrigation

10. **IF CONTINGENCIES PRECLUDE THE USE IN ITEM 9, SPECIFY AN ALTERNATE USE OR DISPOSAL OF THE RECOVERED WATER:** Dispose to non-farmed rural ground downgradient of Well 2

-over-

INFORMATION REGARDING THE ULTIMATE ASR PROJECT

AS CURRENTLY ANTICIPATED

11. **SOURCE OF INJECTION WATER for ASR:** Columbia River

    a tributary of Pacific Ocean

12. **MAXIMUM DIVERSION RATE:** 33.275 cfs

13. **MAXIMUM INJECTION RATE AT EACH WELL(S):** 2000 gpm at Well 2, 3600 gpm at Well 3, plus additional wells for injection and recovery to be installed to achieve the maximum source withdrawal rate.

14. **MAXIMUM STORAGE VOLUME:** 8,000 acre feet

15. **MAXIMUM STORAGE DURATION:** April 1 through September 30

16. **MAXIMUM WITHDRAWAL RATE AT EACH WELL(S):** Up to their yield but as determined through testing.

NOTE: The materials required by rule for an ASR limited license are extensive. The items on this sheet consist of those outlined in OAR 690-350-020(2) and (3)(a)(A-E). Please consult the rule and provide as attachments to this form the other requirements in OAR 690-350-020(3)(a).

Signature of Applicant _____ **Date** 12/10/15

Title Owner

Rupp Ranches

Aquifer Storage and Recovery Limited License Application

Supplemental Reports

December 2015

REGISTERED PROFESSIONAL ENGINEER
73450PE
OREGON
July 15, 2003
SAID AMALI
EXPIRES: 12/31/15

AKANA
Plan + Design + Engineer + Manage

REGISTERED PROFESSIONAL
OREGON
CHRIS R HYATT
G 1658
GEOLOGIST

Expires 12-31-15

REGISTERED PROFESSIONAL
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ROBERT EMMETT LONG JR.
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REGISTERED PROFESSIONAL ENGINEER
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R. PAUL KNOX

RENEWS 6-30-17

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ACRONYMS

ASR	Aquifer Storage and Recovery
CRBG	Columbia River Basalt Group
OWRD	Oregon Water Resources Department
ft	foot or feet
msl	Mean Sea Level
cfs	cubic feet per second
gpm	gallons per minute
in	inch or inches
DEQ	Oregon Department of Environmental Quality
USGS	U.S. Geological Survey
DOGAMI	Oregon Department of Geology and Mineral Industries
NRCS	Natural Resources Conservation Service
cm/sec	centimeters per second
mm	millimeter
MCL	Maximum Contamination Limit
MRL	Laboratory Minimum Reporting Limit
mg/l	milligrams per liter
pCi/L	pico Curries per liter
bgs	below ground surface
SWL	Static Water Level

1.0 INTRODUCTION AND PURPOSE

This Supplemental Report includes project description, a hydrogeology study, an engineering design, and a monitoring program in support of a Limited License application for aquifer storage and recovery (ASR) being submitted by Rupp Ranches, Kennewick, Washington. The contents of the report are provided in general accordance with the requirements of Oregon Administrative Rule (OAR) 690-350-0020.

The report is intended to provide a general characterization of the surficial soils, and geology and hydrogeology of the Columbia River Basalt Group (CRBG) aquifers in the vicinity of a planned ASR project located on Rupp Ranches' property in northcentral Umatilla County. The report also presents engineering information on the associated water supply and aquifer injection systems, as well as a discussion of a proposed monitoring plan.

This report represents compilation of existing literature information from area and regional studies relevant to this project, augmented with limited site-specific data collected in support of this application. We understand that there are gaps in the CRBG aquifer hydrogeology information presented herein. However, it is anticipated that data developed during the Limited License period will be used to update and supplement the information presented. Ultimately, this existing and new information will be used to develop and submit an ASR permit application that meets the requirements of OAR 690-350-0030.

2.0 PROJECT DESCRIPTION

Rupp Ranches property encompasses approximately 17,000 acres in north central Umatilla County, as shown on Figure 1. Seven center pivot systems were developed in the western part of the property in 2011 for irrigation of mint and other crops. Rupp Ranches has irrigated these fields with groundwater under permit G-16671. Groundwater is pumped from four wells (Wells 1, 2, 3, and 4) which are completed in the CRBG aquifers. Figure 2 shows relevant property features.

The water levels in the wells have declined significantly since pumping began in 2012 prompting the Oregon Department of Water Resources (OWRD) to require Rupp Ranches to seek new sources of water supplies. Rupp Ranches intends to test the feasibility of using an ASR system with water diverted from the Columbia River during the non-irrigation months to augment its groundwater supply. If proven feasible, Columbia River water will be diverted annually between 1 October and 15 April to satisfy the rate and aquifer storage capacity of the Rupp ASR Project. Rupp Ranches will apply for an ASR permit for storage of this diverted water in the CRBG aquifer for recovery during the irrigation season.

2.1 Site Description

Rupp Ranches property is adjacent to property owned by JSH Farms, Inc. An agreement exists between the two parties to allow use of the JSH irrigation pipeline and pump station by Rupp Ranches for this project (See Figure 1 for JSH pipeline alignment and point of diversion). The four irrigation wells on Rupp Ranches property are manifolded together via a 24-inch (in) pipeline. The JSH pipeline connects to the Rupp pipeline between Wells 1 and 2 at the approximate location shown on Figure 2.

During ASR testing, imported Columbia River water will be spread over an specially-designed area for infiltration into shallow sandy soils near Well 2. The infiltrated water will migrate within the subsurface sediments to a location where it is recaptured for injection into Well 2. The purpose of the infiltration and subsurface flow is to achieve the level of water treatment required by OAR 690-350-0020 and 333-061-0032 prior to ASR injection (explained in detail in Section 3.4.5). An alternative test location near Well 3 has been identified which will be used if un-anticipated field conditions cause the primary test site to be unsuitable. Figure 3 shows the approximate locations of the proposed water treatment locations.

2.2 Project Execution Plan

Source water for the ASR test will be diverted from the Columbia River. An amendment application to permit S-54926 has been submitted to OWRD to allow use of river water for this test. Permit S-54926 was issued to Rupp Ranches to divert Columbia River water between 1 October and 15 April of each year for soil profile storage. The winter irrigation system to perfect this right is currently under design. Until the winter irrigation system is fully designed and constructed, 2.5 cubic feet per second (cfs) of water from Permit S-54926 has been requested to instead be allocated to this ASR test. Assuming that this Limited License and the permit amendment are approved in March 2016, the ASR test will be conducted between the approval date and 15 April 2016, when winter water cannot be diverted any longer under the amended permit. We envision that even a one-week diversion and subsequent injection will provide the necessary initial system information for further design purposes.

The JSH conveyance system will be used for winter diversion to supply the ASR test. Their system has been designed for summer irrigation with a river pump station location shown on Figure 1 and with a total capacity of 26,000 gallons per minute (gpm) or 58 cfs. Where this system connects to the Rupp pipeline, it includes a 24-in pipe capable of carrying approximately 22 cfs of water, well more than the intended use rate of 2.5 cfs in the ASR test.

The diverted water will be conveyed to the engineered treatment cell via new pipelines and throttled to achieve as high of a system throughput as possible. The treatment cell will be constructed within the native sandy soils by removing the shallow soils to a pre-determined grade, installing a liner, and moving the native soils back on the liner. Water level changes and migration rates within the treatment cell will be monitored during the test.

The treated water will be recaptured at the downgradient end of the treatment cell for water quality sampling and laboratory analyses. If the water quality is determined to meet the applicable treatment requirements of OAR 333-061-0032, it will be routed to Well 2 for injection. Until the water quality is approved for injection, the recaptured water will be discharged to the ground surface downgradient of the treatment cell and Well 2. There is ample space available for this purpose with little possibility of interference or impact to the treatment cell operation or impacts to Well 2.

2.3 Project Schedule

For planning purposes, we have assumed that this Limited License (and the associated water right amendment application) will be approved by OWRD by sometime in March 2016. Between submittal of the Limited License and completion of the review process, Rupp Ranches will begin to construct the treatment cell and associated water delivery infrastructure in anticipation of water application sometime in March and/or April 2016. Assuming OWRD approvals are attained by then, the water will be applied to the treatment cell in March/April for completion prior to April 15th. Injection into Well 2 will occur following water quality testing and compliance with treatment standards.

Some level of coordination will need to be done with the irrigation operations that may be occurring during testing. Flow meters will be used to account for water that is used for testing as opposed to water diverted as part of regular irrigation use from the wells. These coordination activities will occur before the test begins.

We recognize that the schedule described above is relatively aggressive and may prove too optimistic given the review steps involved. We are available to provide any information needed to help expedite the process and hope that some level of injection is achieved before April 15th of 2016. We recognize that even with an expedited review, there will only be a short period of time (perhaps one to two weeks) during which to conduct the recharge and injections. Therefore, we expect that significantly greater volume of treated water will be available for injection next year. The system information obtained during this first testing will be greatly valuable to augmenting the design of the second year testing.

2.4 Project Reporting

Project reporting will occur at specific milestones during the project as follows:

- The results of the laboratory analyses of the samples to be collected from the recaptured groundwater will be communicated to OWRD immediately following receipt from the laboratory for coordination and approval of injection.
- A progress report will be prepared for submission to OWRD at the conclusion of the treatment cell recharge operations, or at the end of Well 2 injection, if completed. This report will summarize data, information, and findings and any deviations from the plan necessitated by field conditions. The report will also make recommendations regarding continued testing in 2016/2017 including changes in design and monitoring needed based on the first test results.

3.0 HYDROGEOLOGY STUDY

The preliminary feasibility evaluation of ASR for Rupp Ranches is based on site-specific and publicly available data and information gathered from a number of published and unpublished reports, and information contained in the files of OWRD, Oregon Department of Environmental Quality (DEQ), U.S. Geological Survey (USGS), Oregon Department of Geology and Mineral Industry (DOGAMI), IRZ, and GSI Water Solutions, Inc. Specifically, the regional geology, structural geology, and hydrogeology assessments presented in this document are taken in whole or in part from the report titled *"ASR Feasibility, Umatilla Basin Regional Aquifer Recovery Assessment"* by GSI Water Solutions, 2009. The reader is directed to that document for complete references to technical and geologic data sources. Additional information obtained from other sources is included with citations.

3.1 Geography

The project area is located within the Columbia-Umatilla Plateau sub-basin which lies within the larger Umatilla Basin. Most of the area is characterized by an undulating plain that slopes regionally to the north towards the Columbia River. The elevations across the Umatilla Basin vary from 5,000 feet (ft) in the upland areas of the Blue Mountains to approximately 300 ft near the Columbia River. Elevations across the Rupp Ranches property range from approximately 1,200 in the south to about 350 ft Mean Sea Level (msl) in the north at the Columbia River.

Shallow canyons drain the area hills but generally do not continue across the plain to the north. Seasonally intermittent streams from the hills infiltrate the ground surface within a short

distance from the base of the hills. The primary drainages in the area include Cold Springs Canyon located approximately 1.5 miles to the south, and Juniper Canyon located about 3 miles to the northeast.

The Columbia-Umatilla sub-basin is a semi-arid climate characterized by hot, dry summers and cool, moist winters. Annual precipitation varies by elevation and ranges from about 8 inches near the Columbia River to approximately 10 inches further to the south. Average precipitation is about 8.75 inches which falls mainly during the months of October through March. Most of the precipitation falls as rain, however, snowfall amounts can be significant in some years.

3.2 Regional Geology and Hydrogeology

The Umatilla Basin is a topographic and structural trough located between the Columbia Hills of Washington and the Blue Hills of Oregon. The axis of the trough is roughly parallel with the Columbia River between the towns of Arlington and Umatilla, Oregon. The basin and surrounding highlands are underlain by multiple basalt flows of the CRBG which are locally deformed by faults and folds. Up to 250 feet of alluvial sediments overlie the basalt flows near the basin axis.

The principal stratigraphic units in the Umatilla Basin (from youngest to oldest) are the CRBG, the Ellensburg Formation, the Alkali Canyon Formation, and the catastrophic flood deposits. Thin deposits of Holocene alluvium occur in the lower drainages of the Umatilla River and Butter Creek, and a veneer of windblown (eolian) silt and sand overlies most of the lower portion of the basin. Most of the soils of the basin are formed in this deposit. The available information regarding the geology and hydrogeology of these units is presented below.

3.2.1 Regional Suprabasalt Geology

The sediments that overlie the CRBG in the Umatilla Basin are informally called the "suprabasalt" sediments. Depending upon their location within the Umatilla Basin, the suprabasalt sediments can consist of several different stratigraphic units. We are providing a brief description and discussion of the nature of the suprabasalt sediment units important to understanding the sediments within the Rupp Ranches project area. Additional site-specific information regarding shallow soils in the project area is provided in Section 3.3.1.

Holocene Eolian Sand: The Holocene eolian sand consists predominantly of stratified to massive, unconsolidated, and friable fine sand to silty fine sand. Based on mineralogy and grain size, these eolian strata are inferred to have been derived from wind reworking older Cataclysmic

Flood deposits and post- flood, Columbia River floodplain deposits. This unit can overlie all older suprabasalt sediment units.

Holocene to Pleistocene Alluvium: This unit consists of sand, gravel, and silt deposited along local perennial (and intermittent) stream channels and floodplains Deposits of this unit often are found unconformably overlying older suprabasalt sediment units and the CRBG within the Umatilla Basin.

Pleistocene Loess: A sequence of wind-deposited, massive to poorly stratified, light colored, silt and very fine sand underlies the younger units and is commonly found overlying the older Alkali Canyon Formation in the upland areas. These strata, commonly referred to as loess (or Palouse Formation or "Palouse loess"), typically display evidence of pedogenic alteration (i.e., display evidence of soil forming processes, including animal burrow and root casts). In some areas this unit contains air-fall ash, and displays evidence of multiple, stacked, and superimposed soil horizons reflecting subtle changes in climate and erosion conditions in the region during the Quaternary. Minor (less than 0.5 in wide) stringers of caliche (discussed below) are occasionally observed transecting these strata. Where they occur, Pleistocene loess deposits are generally less than 50 ft-thick.

Pliocene-Pleistocene Calcrete ("Caliche"): The Pliocene-Pleistocene calcrete (commonly referred to as "caliche") is a pedogenic calcium carbonate deposit that typically is developed on older suprabasalt sediment units and the CRBG. This calcrete is present throughout much of the Umatilla Basin, except in areas where it has been removed by the Pleistocene Cataclysmic Floods or more recent stream erosion. Calcrete in the Umatilla Basin area usually consists of a thin (less than 1 ft thick), multiple, individual layers of discontinuous platy, hard, cemented calcrete carbonate. The total thickness of caliche is highly variable, ranging from less than 1 foot thick to more than 15 feet thick.

Miocene-Pliocene Alkali Canyon Formation: The Alkali Canyon Formation consists of interbedded fluvial (conglomerate, sandstone, siltstone, and claystone), lacustrine (claystone, siltstone, and diatomite), and minor pyroclastic (volcanic air-fall tuffs) deposits and represents the oldest suprabasalt sediment unit in the Umatilla Basin. The fluvial Miocene to Pliocene-age sediments were deposited in the Umatilla Basin, as it subsided, by both local and regional (i.e., ancestral Snake River) tributaries to the ancestral Columbia River and later (approximately 6 million years ago) by the ancestral Columbia River. Because of Pliocene-Pleistocene erosion (e.g., Cataclysmic Floods, local stream/river incision), the thickness of the Alkali Canyon Formation is highly variable, ranging from absent to more than 300 ft thick.

3.2.2 Regional Suprabasalt Hydrogeology

The shallow aquifers or water bearing zones that may be present within the suprabasalt sediments at the project site will not be the recipient of imported water due to the design of the treatment cell as a lined enclosure. Therefore, they will not be impacted by the ASR operations and no specific attempt at characterizing them has been conducted in this project. The discussion presented in this section is therefore, a review of regional information for an overall understanding of suprabasalt hydrogeology.

A shallow unconfined to locally confined aquifer is present in the alluvial sediments of the Umatilla Basin. The alluvial aquifer is a source of domestic water for rural residents in the area. The alluvial aquifer is also a major source of municipal water for the cities of Hermiston, Irrigon and Boardman and locally an important source of irrigation water.

The principal water-bearing zones of the alluvial aquifer occur in sands and gravels deposited by the catastrophic floods during the Pleistocene Epoch. The available evidence indicates that water readily infiltrates the soils of the basin and travels rapidly through the unsaturated silts, sands and gravels which overlie the alluvial aquifer. The principal source of subsurface recharge in the project area is infiltration of natural precipitation. Additional recharge comes from applied irrigation water. Regional flows in the shallow alluvial aquifers are to Umatilla or Columbia Rivers.

3.2.3 Regional Columbia River Basalt Group (CRBG) Geology

The oldest exposed geologic unit within the central portion of the Umatilla Basin is the CRBG. Individual, large-volume CRBG flows (especially Grande Ronde and Wanapum Basalts) are voluminous, thick (commonly more than 100 feet thick), and display the characteristics of basalt sheet flows. Generally, extensive CRBG flows exhibit only physical features and characteristics expected of sheet flows, with the complex internal features associated with compound flows found only at flow margins. The key geologic features of the CRBG flows are briefly described below.

Intraflow Structures – Examination of vertical exposures through CRBG flows reveals that they all exhibit the same basic three-part internal arrangement of features, as shown on Figure 4. These intraflow structures are referred to as the flow top, flow interior, and flow bottom. The combination of a flow top of one flow and the flow bottom of the overlying flow is commonly referred to as the "interflow zone."

The flow top is the crust that formed on the top of a molten lava flow. Flow tops commonly consist of glassy to very fine-grained basalt that is riddled with numerous spherical and elongate voids (vesicles), giving this portion of the flow the appearance of a sponge. Vesicles

represent gas bubbles that were trapped (frozen) as the flow cooled and solidified. The physical character of a flow top falls between two basic end-members, a simple vesicular flow top and a flow top breccia.

A simple vesicular flow top commonly consists of glassy to fine-grained basalt that displays a rapid increase in the density of vesicles near the top of the flow. Vesicles may be isolated or interconnected, resulting respectively in lower and higher permeability and porosity. Tension cooling joints, related to flow top formation/flow emplacement, augment the permeability and porosity of the flow top.

CRBG flow interiors typically consist of dense, non-vesicular, glassy to crystalline basalt that contain numerous cooling joints that formed when the lava shrank as it solidified. CRBG cooling joints often form regular patterns or styles, with the two most common being entablature-colonnade and columnar-blocky jointing. A columnar-blocky jointed basalt flow typically consists of mostly vertically oriented, relatively well formed to poorly formed, polygonal columns that can range from 1 to more than 10 feet in diameter.

Entablature-colonnade jointed basalt flows display a more complex pattern. The majority of such flows displays a pattern of numerous, irregular jointed small columns to apparently random oriented joints, called the entablature. This entablature generally overlies a thinner zone displaying well-developed columnar jointing and is called the colonnade.

Studies on the nature and characteristics of cooling joints within the CRBG have found that undisturbed joints are narrow, averaging 0.009 inch wide, and that there is no difference in joint widths between entablature and columnar-blocky jointing despite the extreme difference in their appearance. These studies also found that joints are typically 77 to +99 percent filled with secondary minerals (clay, silica, zeolite) and open spaces (voids) that, where they occur, are not well connected.

The physical characteristics of CRBG flow bottoms are largely dependent on the environmental conditions the molten lava encountered as it flowed across the Earth's surface. If the lava flow encountered relatively dry ground conditions, the flow bottom typically consists of a narrow (less than 3 feet thick) zone of sparsely vesicular, glassy to very fine-grained basalt. This type of flow bottom structure is common within the CRBG. If advancing flows encountered lakes, rivers, and areas of water-saturated, unconsolidated sediments, more complex flow bottom structures formed. Flow bottom structures can be either highly localized or wide spread.

Stratigraphy – Regional studies and mapping of the CRBG have demonstrated that there are consistent and systematic variations in lithology, geochemical compositions, and paleomagnetic polarity among flows and groups of flows. These differences have allowed for the establishment of stratigraphic units within the CRBG that can be reliably identified and mapped on a regional

basis. The stratigraphy units within the CRBG flows are depicted on Figure 5. The following sections provide a brief description of the nature of these CRBG units as they occur in the Umatilla Basin.

Saddle Mountains Basalt – The Saddle Mountains Basalt consists of 10 geochemically and lithologically distinct members and represents the youngest portion of the CRBG. These members were erupted during the waning phase of CRBG volcanism, which spanned a period from about 13.5 to 6 million years ago. In the Umatilla Basin, the Saddle Mountains Basalt is represented by the Elephant Mountain, Pomona, and Umatilla Members.

Wanapum Basalt – The Wanapum Basalt consists of five members, two of which, the Priest Rapids and Frenchman Springs Members, are present in the Umatilla Basin. The following are members of the Wanapum Basalt:

- **Priest Rapids Member.** The Priest Rapids Member is the youngest Wanapum Basalt unit and consists of two units, only one of which (basalt of Lolo) is present in the Umatilla Basin. In the Umatilla Basin, this member consists of a single sheet flow that was emplaced approximately 14.5 million years ago. The vent system that erupted this flow is located in eastern Washington.
- **Frenchman Springs Member.** This member is the most regionally extensive member within the Wanapum Basalt, consisting of up to 21 individual flows that have been subdivided into six units that can be identified and mapped on a regional basis.

  The Frenchman Springs Member flows are subdivided into six mappable units, based on a combination of lithology, geochemical composition, superposition, and paleomagnetic polarity. The estimated thickness of the Frenchman Springs Member in the Umatilla Basin ranges from more than 800 feet thick in the northern portion of the basin to less than 50 feet thick at its southern margin on the flanks of the Blue Mountains. In the Umatilla Basin, the Frenchman Springs Member is overlain by Ellensburg Formation sediments (where it is overlain by younger CRBG flows) or Alkali Canyon Formation sediments (where it is the youngest CRBG unit present). The boundary between the Frenchman Springs Member and the Grande Ronde Basalt is often represented by either sediments of the Vantage Member of the Ellensburg Formation or a well-developed paleosol on the uppermost Grande Ronde flow. Frenchman Springs Member flows in the Umatilla Basin area display both columnar-blocky and entablature-colonnade jointing styles.

Grande Ronde Basalt – The Grande Ronde is the most extensive and voluminous formation within the CRBG. In the Umatilla Basin, it is estimated that the Grande Ronde Basalt ranges from more than 1 mile thick in the northern portion of the basin to less than 0.5 mile thick at the southern margin of the basin on the flanks of the Blue Mountains.

The Grande Ronde Basalt is formally subdivided into four magnetostratigraphic units. Given that the depth to the top of the Grande Ronde Basalt within the Umatilla Basin is estimated to be more than 1,000 feet below ground surface, this unit is not of significant interest to this study.

Ellensburg Formation – Ellensburg sediments in the Umatilla Basin area include mudstone, sandstone, conglomerate, diatomite, and tuff. The sedimentology of each interbed is controlled by the depositional environment in which it formed. Sandy and gravelly portions of interbeds were deposited in river systems, silty and clayey deposits accumulated on flood plains, in lakes, and as soils.

3.2.4 Umatilla Basin Structural Geology

The present-day Umatilla Basin lies within the Columbia Basin and the eastern portion of the Columbia Trans-Arc Lowland. The Columbia Basin and Columbia Trans-Arc Lowland has experienced considerable regional-scale subsidence (5,000 to 10,000+ feet) since the onset of CRBG volcanism approximately 17 million years ago. In addition to regional subsidence, this region has been under a general north-south compression/east-west extension stress regime from the beginning of CRBG time to the present-day. This stress regime has led to the formation of folds and faults in the Columbia Basin.

The Umatilla structural basin often is described as lying within the Dalles-Umatilla Syncline, which is a major, regional-scale Yakima Fold Belt feature. However, the actual extent of this structural basin is delineated and controlled by a number of structural features:

- The northern edge of the Umatilla structural basin is delineated by the east-northeast-trending Columbia Hills (Yakima Fold Belt anticlinal ridge).
- The southern boundary is less well defined, but lies along the flanks of the Blue Mountains. West of the Service Anticline (or Service Fold Belt of Madin and Geitgey (2007)), the southern edge of this structural basin lies in the area between the Willow Creek monocline and the Milk Canyon Fold belt.
- The eastern boundary of the structural basin is defined by the area where the Columbia Hills and the uplands formed by the Horse Heaven Hills/Walulla Fault Zone (Figure 8) come together. The Rupp Ranch is located in this section of the Umatilla Basin. The ranch lays between the Columbia River to the north, the Walulla Fault Zone to the east and the Blue Mountains to the south.
- The western boundary of the Umatilla structural basin is defined as the upland area (immediately east of the John Day River) created by uplift along the northwest-trending Luna Butte-Turner Butte fault zone.

The importance of understanding the nature and physical characteristics of faults and folds is that they are known to influence and/or control the occurrence and movement of groundwater within the aquifer systems, especially the CRBG.

3.2.5 Regional CRBG Hydrogeology

Below the suprabasalt sediment aquifer is the CRBG aquifer, which consists of multiple water-bearing zones that typically exhibit confined behavior.

3.2.5.1 Hydraulic Characteristics of CRBG Flows

It is widely agreed that within CRBG aquifers, given the typical distribution and physical characteristics of CRBG intraflow structures, groundwater primarily resides within the interflow zones. As discussed previously, an interflow zone is defined as the flow top of one flow and the flow bottom of the overlying flow (plus interbedded sediment). CRBG interflow zones are tabular, laterally extensive, bodies that clearly have physical properties conducive to forming an aquifer.

Another critical, but not commonly recognized, aspect with regard to interflow zones is their potential lateral variability. For example, thick flow top breccia's are known to abruptly end with a much thinner normal flow top taking its place. The same is true for flow bottom features (e.g., pillow complexes) that can abruptly end or transition to a more simple flow bottom. These intraflow structure "facies changes" can result in radically changing the hydraulic properties and behavior of individual CRBG aquifers. Currently, it is not possible to predict the distribution and extent of CRBG flow top and flow bottom features within the Umatilla Basin.

The physical properties of undisturbed, laterally extensive, dense interiors of CRBG flows make this portion of the flow essentially impermeable for all practical purposes.

The fact that CRBG dense flow interiors typically act as aquitards accounts for the confined behavior exhibited by most CRBG aquifers. In many areas around the Columbia Plateau, artesian (flowing) conditions within the CRBG aquifer system have been encountered. CRBG aquifer artesian wells do occur within the Umatilla Basin.

Selected hydraulic properties derived from CRGB investigations are summarized in Figure 4. These typical hydraulic properties are also used in the analysis of the CRGB interflow zones encountered at the Rupp Ranch ASR project via Rupp Wells 1, 2, 3 and 4.

3.2.5.2 Secondary Controls on CRBG Hydraulic Characteristics

There are several processes that can modify the specific, and overall, hydraulic behavior of CRBG aquifers and aquitards. These include tectonic fracturing forming faults/tectonic joints, folding, secondary mineralization, and construction of uncased water wells through multiple CRBG aquifers. Understanding their impact on CRBG aquifers is critically important to accurately interpreting the behavior of the CRBG aquifer system.

Faults and Tectonic Joints – As previously discussed, numerous faults are present within the Umatilla Basin area (Figure 8). Faults have been found to affect the CRBG aquifer system in a number of ways including:

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

Faults within the Umatilla Basin that are known, or suspected, to affect (act as barriers) the CRBG aquifer system include the frontal fault on the Columbia Hills, Six Mile Trend, Boardman Trend, and faults associated with the Service Anticline.

Folding- Several groundwater investigations in the Columbia Plateau area have noted that folds (primarily anticlinal and monoclinal folds) affect the occurrence and movement of groundwater through the CRBG aquifer system. In many cases, folds have been identified as groundwater barriers or impediments that either block or restrict lateral groundwater movement through the CRBG aquifer system. Because most of the folds in this region have genetically related faults, initially one would suspect that the observed impacts of folds on the CRBG aquifer system are caused by related faults. However, the process of folding the CRBG can affect the hydraulic characteristics of interflow zones. The Willow Creek Monocline and the Service Anticline are examples where folds are known to act as barriers to lateral groundwater movement within the CRBG aquifer system.

3.2.5.3 Secondary Alteration and Mineralization

A number of different secondary processes can change the physical characteristics of CRBG interflow zones which, consequently, reduce the hydraulic properties of these features. The common aspect to all of these secondary processes is that they fundamentally change the

original physical (and hydraulic) characteristics of CRBG flow tops and flow bottoms. The two most important of these processes are described briefly in the following sections.

Paleosol Development. If a sufficiently long hiatus occurred between emplacement of CRBG flows, weathering and chemical breakdown of the glassy vesicular flow top will occur and lead to soil formation. This process typically would alter and destroy the original physical texture of a portion of the flow top as well as most of its original permeability. Within the Umatilla Basin, the most common occurrence of paleosol development is found on the uppermost Sentinel Bluffs member flow of the Grande Ronde Basalt (Vantage horizon).

Precipitation of Secondary Minerals. After the emplacement and burial of the CRBG flows, secondary minerals (e.g., silica, cryptocrystalline quartz, calcite, zeolite, pyrite, clay minerals, etc.) can partially to completely fill existing voids within interflow zones. The processes by which precipitation of these minerals occurs can be very complex and are dependent on a host of variables, including groundwater hydrochemistry, groundwater mobility/mixing rates, groundwater residence time, and local geothermal regime. The net effect of secondary mineralization on CRBG interflow zones is a reduction, ranging from slight to total, in the permeability of these zones. This process also is important in sealing the cooling fractures in dense flow interiors.

3.2.5.4 Conceptual Model of the Aquifer Systems

Recharge to the CRBG aquifers comes from both natural (precipitation and stream leakage) and man-made sources (deep percolation [past the root zone] of irrigation waters and leakage from canals and reservoirs). Potential for natural recharge to the confined CRBG aquifer system is generally limited as described below.

The interflow zones in the upper portion of the Saddle Mountains Basalt and Priest Rapids Member of the Wanapum Basalt are is inter-fingered with sedimentary units that laterally can be in direct connection with the suprabasalt sediment aquifer system and potentially receive recharge from this unit. A schematic illustration of the regional hydrogeology of the CRBG aquifers is shown on Figure 6.

Deeper CRBG aquifers (hosted by Frenchman Springs Member of the Wanapum Basalt and Grande Ronde Basalt units) potentially may receive recharge from the upland areas (on the flanks of the Blue Mountains) where their interflow zones are exposed. However, given that typical CRBG interflow zones (excluding sediments) represent less than 25 percent of the combined thickness of the two CRBG flows, the area potentially available to capture recharge is relatively limited.

CRBG flow interiors typically serve as aquitards (confining beds). Groundwater discharge from CRBG aquifers to rivers, creeks, and springs occurs where CRBG flows (interflow zones) are breached. Geologic structures (faults and folds) are known to modify the groundwater flow system, especially the CRBG aquifer system. Faults and folds within the Umatilla Basin are known to create subsurface groundwater barriers that can subdivide and compartmentalize the CRBG aquifer system.

3.3 ASR Study Area Geology and Hydrogeology

The Rupp Ranches ASR Project area is located along the north eastern margin of the Umatilla Basin (Figure 1). Figure 7 shows surface geology for the project area. Additional geologic information was obtained from area wells in support of the discussion presented in this section. The locations of area wells, available from OWRD online web database, are identified to the nearest quarter quarter section on Figure 7. Figure 7 also shows the locations of geologic cross sections A-AA (southwest to northeast) and B-BB (northwest to southeast) discussed herein. Site-specific soil characteristics, geology, and hydrogeology information and analyses results are discussed in this section.

3.3.1 Soil Characterization

The shallow soils in the project area will be used to construct a water quality treatment cell to comply with the requirements described in Section 3.4.5. An area near Well 2 has been identified with suitable soils and topographic features. The soils at this location will be used as media for the sand filtration water treatment system. This area has not been farmed before and has been in native vegetation up to now.

Area soils have been mapped and are identified as part of the Quincy Series by the U.S. Natural Resource Conservation Service (NRCS, 1988). Quincy Series soils are described as deep, excessively drained soils that formed in eolian sand and gravelly alluvium on terraces. More specifically, the soils identified immediately downslope of Well 2 are designated Dune Land by NRCS.

The Dune Land unit is described as deep, excessively drained soil on the terraces of the Columbia River. It formed in eolian sand in areas that are strongly convex and are dune-like, hummocky or hilly. The dunes are long and narrow and are oriented in a northeast to southwest direction. However, much of the dune features and relief elsewhere have been reduced by farming and irrigation practices.

The permeability of the Dune Land unit is rapid to very rapid (greater than 40 ft per day). Other soils such as fine sandy loam and fine sand and others are present near Wells 2 and 3. NRCS lists the permeability of these soils as ranging from a low of 1.2 to greater than 40 ft per day. Figure 8 shows the NRCS soil survey map units surrounding Wells 2 and 3 and a summary of their permeability values.

Soil sieve analyses were performed on two composite samples collected on November 3, 2015, from a test pit excavated approximately 500 ft northwest of Well 2 (Figure 8). Samples were collected to determine the characteristics of native soils in the area and to compare them with conventional filtration technologies. The sample designations and depths included sample "0-12" collected from zero to 12 in below grade (bgs), and sample "13-24" collected from depths of between 13 and 24 in bgs. The samples were shipped to Northwest Testing, Inc. in Wilsonville, Oregon for analyses. A copy of the laboratory analytical report is included in Appendix A.

The analytical results include percent passing sizes, effective grain sizes, and uniformity coefficients. The effective grain size (D10) of a sample is described as the grain size corresponding to the 10 percent finer by weight line on the grain size distribution curve. The uniformity coefficient (Cu) is a measure of how well or poorly sorted a sediment is and is defined as D60/D10.

The sieve analysis results indicate that sample "0-12" is comprised of 8% medium sand, 84.7% fine sand and 7.3% silt and clay, defined by the Unified Soil Classification System as poorly graded sand with silt (SP-SM). The effective grain size (D_{10}) for sample "0-12" is shown to be 0.09 millimeters (mm). The 60% passing value (D_{60}) for this sample was shown to be 0.28 mm giving a C_u of 3.1. Due to the finer grain size of the deeper sample (sample "13-24") a D_{10} value could not be obtained and, therefore, an effective grain size not determined.

Uniformity coefficients for slow sand filters typically range from 1.5 to 3.6 with effective grain size (D_{10}) values of between 0.15 and 0.40 mm (American Water Works Association, 1991; Washington State Department of Health, 2003). The soil grain size analysis of the Rupp Ranch sample "0-12" indicate that the fraction of fine sediments in the native soil at this location is at the higher end of the range achieved in typical slow sand filters. This indicates a relatively high level of filtering and treatment. However, the soil characteristics will also reduce the flow rate of water through the soil, reducing the amount of water that can be applied. These observations will be important to the analysis of the feasibility of large scale ASR at Rupp Ranches property.

3.3.2 Estimation of Soil Hydraulic Conductivity Values

For the purpose of treatment test cell design, the soil sieve analyses results were used to estimate an initial soil hydraulic conductivity. The conductivity values were then used to

estimate a rate of flow through the sediments within the treatment cell and therefore, a system throughput rate. These calculations and their results are presented below.

Hydraulic Conductivity –The hydraulic conductivity (K) of sandy sediments can be estimated from the grain size distribution curve using the Hazen Method (Fetter, 1988). The Hazen approximation is:

$K = C (D_{10})^2$

Where:

K = hydraulic conductivity (cm/sec)

D_{10} = the effective grain size (cm)

C is a coefficient based on grain size and is listed below:

Very fine sand, poorly sorted	40-80
Fine sand with appreciable fines	40-80
Medium sand, well sorted	80-120
Coarse sand, poorly sorted	80-120
Coarse sand, well sorted, clean	120-150

For this analysis C values of both 40 and 80 were used. Using the Hazen Method, the following K values were estimated:

$K = 40 (0.009)^2 = 3.25 \times 10\text{-}3$ centimeters/second (cm/sec)

$K = 80 (0.009)^2 = 6.50 \times 10\text{-}3$ cm/sec

These values are consistent with the ranges of K values for silty sands and fine sands presented in Fetter (1988). Based on the Hazen Method calculation, an average K of 5×10^{-3} cm/sec (14 ft/day) was selected for flow rate calculations through native sandy soils that would be placed in the treatment cell.

Dupuit Flow/ Seepage Face Calculations – Design of the sand filtration water treatment system requires analyzing the system's dimensions and hydraulic parameters to estimate system throughput. A schematic of the proposed sand filtration system is shown in Figure 9. Source water is input to the system at the upgradient/influent location.

Water is allowed to infiltrate within the recharge area and to flow within the subsurface soil by gravity to a recapture system at the downgradient end. The recaptured water will then be pumped to Well 2 for CRBG aquifer injection (if meeting water quality standards). The pumping and treatment system designs depend on the rate at which imported water flows

through the treatment cell. A solution for estimating the proposed system design is similar to calculating flow in an unconfined aquifer.

If a saturated-unsaturated flow system exists in the vicinity of a free outflow (discharge) boundary, much like baseflow to a stream bank, a seepage face will develop on the outflow boundary (Freeze and Cherry, 1979).

This seepage face is similar to the discharge point in the proposed sand filtration system. The discharge (Q) through a cross-section of unit width measured perpendicular to the direction of flow can be determined using the Dupuit flow assumptions which are that (a) the hydraulic gradient is equal to the slope of the water table, and (b) for small water table gradients, the streamlines are horizontal and the equipotential lines are vertical (Fetter, 1988). For steady state flow, Q must be constant through the system. The flow per unit width of a system can be determined using the Dupuit equation:

$$Q = K (h1^2 – h2^2 / 2L)$$

Where:

Q = discharge per unit width (cubic ft/day)

K = hydraulic conductivity (ft/day) = 14 ft/day

h1 = water elevation at location h1 (ft)

h2 = water elevation at location h2 (ft). (Assuming a 12-in discharge pipe and maintaining a minimum head of approximately 0.5 ft of water above the pipe).

L = distance between locations h1 and h2 (ft) = 100 ft

Solving Dupuit equation using the parameters presented above for the system shown in Figure 9 indicates that a flow rate of between approximately 0.8 and 1.25 gpm per ft of width can be expected for the soils at this location, for a hydraulic gradient ranging between 0.065 and 0.085. For design purposes, we have assumed a maximum pumping rate of 100 gpm for a 100- ft wide treatment cell.

3.3.3 Site Specific CRBG Geology and Hydrogeology

The Rupp Site is approximately 1 mile northeast of the Stage Gulch Critical Groundwater Area (Figure 1). The geology and hydrogeology of the Site are expected to be similar to CRBG characteristics elsewhere in the Umatilla Basin, i.e. the basalt aquifers yield high rates of groundwater production, but have limited recharge. This section includes an overview of the CRBG geology and hydrogeology for the area of the Rupp property based on regional information presented previously, geologic logs of the four Rupp irrigation wells, static water

level records measured in these wells, and reported aquifer water use volumes reported to OWRD. Additionally, information on area water wells available from the OWRD online database, on USGS topographic maps, and documented spring locations found on maps were used to develop the discussion in this section. The locations of area wells and springs are shown on Figure 7. The logs of the Rupp wells are included in Appendix B. The logs of area water wells in OWRD database are enclosed in Appendix C.

3.3.3.1 Basalt Geology

The basalt geology in the upper 1,000 ft of material penetrated by Rupp Wells 1, 2, 3, and 4 are of Miocene age and have been identified as Saddle Mountains and Wanapum Basalts. The target storage geology at the Rupp site is the Frenchman Springs Member of the Wanapum Basalt (Figure 5). Individual basalts of the Frenchman springs were identified though physical observations, chemical analysis, x-ray diffraction of the geologic samples collected from drill cuttings, and from the known superposition of basalt flows identified in Rupp Wells 1, 2, 3, and 4 (GSI 2012).

Generalized geologic cross-sections A-AA (West to East), and B-BB (Northwest to Southeast) are presented in Figures 10 and 11, respectively. The approximate divisions of the basalt members identified, inferred structure, and water bearing zones encountered while drilling are also shown in the cross-sections. The cross-sections were developed based on descriptions provided in Madin and Geitgey (2007) and Beason, and others (1985) with editing as pertinent to the Rupp site. CRBG formations exposed in the study area include the Saddle Mountains Basalt, represented by the Umatilla Member and the Wanapum Basalt, represented by the Frenchman Springs Member. These members are further explained below

Saddle Mountains Basalt – The Saddle Mountains Basalt is represented by undifferentiated Umatilla Member at the Rupp site. Along the Columbia, the Saddle Mountains Basalt units are largely buried and are known mostly from water well logs and limited geochemical data derived from well cuttings (Madin and Geitgey, 2007). In this area it is generally possible to identify units in well logs on the basis of their stratigraphic position and the presence of interbeds. However, proceeding south from the Columbia River the units are difficult to map due to sparse well data. The Umatilla member is described as follows:

- *Umatilla Member: Tu - Undivided Umatilla Flows Middle Miocene)* — Very fine grained basalt with rare small plagioclase and olivine phenocrysts. Locally displays ramp joints and flow banding. The Umatilla Member is exposed along the northern rim of Juniper Canyon in the northeastern quadrant of the study area, and along the northern rim of Cold Creek Canyon in south central study area, due south approximately 2-miles from Rupp Well 3. This unit was not identified in the

stratigraphy presented in (GSI 2009) based on the geochemistry of the samples analyzed or hand sample identification. The unit is distinguished by high TiO2 (2.9 percent), high P2O5 (0.92 percent), and very high barium (3200 ppm). From water well logs and analyzed cuttings the unit is 15 to 45 m (50 to 150 ft) thick. Age considered to be between 13 Ma and 14.5 Ma. The underlying Mabton interbed is typically 5 to 15 m (15 to 50 ft) thick. Magnetic polarity is normal.

Wanapum Basalt – The Wanapum Basalt is represented in the study area by the Frenchman Springs Member. Within the study area the Frenchman Springs is composed of three sub-members of similar geochemisty and polarity. In the study area these include the Basalts of Sentinel Springs, Sand Hollow, Silver Falls and potentially the Ginkgo. Wanapum basalts are generally more compositionally similar than the Saddle Mountains basalts but can be distinguished, sometimes with difficulty, on the basis of lithology and geochemistry. In general, the unit is thickest along the Columbia River, thins to pinch out to the south against the Blue Mountains, and thins to a few tens of meters to the east. The Wanapum Basalts emplacement are generally flow on flow with little or no intervening sediments. The members are described as follows:

- *Frenchman Springs Member Tfsg - Basalt of Sentinel Gap (middle Miocene)* — Numerous flows of basalt, with widespread distribution throughout the study area. Exposures as common on canyon walls in Juniper and Cold Creek Canyons, and along the Columbia River at the mouth of Juniper Creek. The unit is described by Beeson and others (1985) as rarely to sparsely phyric with plagioclase phenocrysts and glomerophenocrysts from 0.3 to 2 cm and a fine- to medium-grained groundmass that is sparsely to abundantly microphyric with equant and acicular plagioclase. The unit is distinguished from the underlying basalt of Sand Hollow by lower chromium (about 20 ppm) and from the overlying basalt of Lyons Ferry (not present in the study area) by lower TiO2. Thickness in analyzed water wells ranges from 45 to 70 m (150 to 230 ft).
- *Frenchman Springs Member Tfsh - Basalt of Sand Hollow (middle Miocene)* — Numerous flows of basalt, with widespread distribution throughout the study area. Exposures of this unit are found in the stream bed and lower walls of Cold Springs Canyon above and below the confluence of the Middle and North Forks of the Cold Spring Canyon; extending approximately a mile downstream along the main stem of Cold Spring and three miles upstream. The unit is described by Beeson and others (1985) as rarely to abundantly phyric with plagioclase phenocrysts and glomerophenocrysts from 0.3 to 3 cm and a fine to coarse-grained groundmass that is sparsely microphyric with acicular plagioclase. The unit is distinguished from the

underlying basalt of Ginkgo by higher chromium (40 ppm), lower TiO2 (2.9 to 3.0 percent) and P2O5 (0.56 percent), and higher MgO (4.3 to 4.4 percent). Thickness in analyzed water wells ranges from 60 to 105 m (200 to 345 ft).

- *Frenchman Springs Member Tsf – Basalt of Silver Falls (middle Miocene)* — Numerous flows of basalt. Although not exposed at the surface, this unit may be encountered at depth in Rupp Well 4. Compositionally distinguished from the overlying basalt of Sand Hollow by lower Chromium concertation (mean= 16.4 ppm, Beason and others 1985) but less so from the underling basalt of the Ginkgo (Chromium mean concentration = 13.9 ppm). A combination of P_2O_5 content and paleomagnetic and lithologic characteristics is often necessary to separate it from the basalt of the Ginkgo.
- *Frenchman Springs Member Tfgk basalt of Ginkgo (middle Miocene)* — Numerous flows of basalt. Although not exposed at the surface this unit may be encountered at depth in Rupp Well 4. Beeson and others (1985) described the unit as phyric to abundantly phyric with plagioclase phenocrysts and glomerocryst 0.3 to 2 cm and a fine- to medium-grained groundmass that is sparsely to abundantly microphyric with tabular plagioclase. The unit is distinguished from the underlying basalt of Palouse Falls by lower chromium (about 24 ppm) and higher P2O5 (0.67 to 0.71 percent). Thickness is about 30 m (100 ft) in the Wallula Fault escarpment, about 45 m (150 ft) at Blalock Mountain, and 25 m (80 ft) in the analyzed well (UMAT-5375) at Hermiston.

3.3.3.2 Structural Geology

The structural geology of the area of Rupp site is not well documented in the literature. The geologic mapping of the project area presented herein is based on preliminary surface geology and limited basalt geochemistry studies from wells drilled across the Umatilla Basin.

In areas to the west in the central Umatilla Basin numerous studies of basalt geology have identified significant faulting and folding. The numerous faults and folds in the basalts of the Umatilla Basin have been found to create hydraulic barriers to groundwater flow. While not specifically identified in previous reports, faulting and folding of the basalts within the study area is likely common based on studies completed to the west of the project area.

The locations of faults inferred in this report are presented on Figure 7 where limited evidence suggests the possibility of a structural solution to an apparent anomaly in the surface geology. Structural elements presented in the geologic cross-sections suggest the location of the inferred faults based on stratigraphic inconsistencies and the relative known thicknesses of the basalt

units. The inferred faults on Figure 7 appear to be to the north, south, and east of the Rupp Wells 1, 2, 3 and 4. Presence of other faults is suspected at the site based on the water bearing units' response to pumping that suggests compartmentalization of the basalt water bearing zones. The occurrence of compartmentalized basalt aquifers is common to the CRGB and has been demonstrated extensively in area wells (Zwart, 1990).

Additional field work, geologic mapping, and geochemical analysis of basalt samples and springs in the area could provide the additional evidence needed to confirm the inferred fault locations. Faulting and the subsequent weathering of the fault zones to create hydrologic barriers between the basalt aquifers is a characteristic structural feature of the CRBG in many areas of the Columbia River Plateau, including the Umatilla Basin.

The hydrogeologic conceptual model relies significantly on faulting as a mode isolating interflow aquifers into compartments of limited extent. While additional evidence is necessary to confirm locations of faults in the project area, sufficient evidence within the project area is available to support the presence of faults and the isolated basalt aquifer compartments.

3.3.4 Existing CRBG Well Network in the Project Area

Within the project area a total of twenty-four water well logs were found in the OWRD database search. The Rupp Wells 1, 2, 3 and 4 are located approximately one mile from each other, and align from west to east starting with Well 1, 2 and 3 in Sections 15, 14, and 13, respectively, within Township 5 North and Range 30 East of the Willamette Meridian (W.M.). Well 4 is located east of Well 3 in Section 7 within Township 5 North, Range 31 East W.M. Table 1 presents the well construction information.

The identified water wells in the project area are presented for the geologic, hydrologic and structural information each provides to the interpretation of hydrogeologic conditions. The water use from the wells and the relative distance of the well from the Rupp Wells can also be used for assessing the potential impacts of pumping and potentially ASR injection on the local area. The nearest wells identified are more than a mile from the center of the Rupp Wells, the closest being UMAT 3853 about one and a half miles south of Well 3 and UMAT 3848 approximately 2.1 miles west of Well 1. Well UMAT 3853 is completed to a depth of 193 ft bgs (approximate elevation 740 ft msl) and well UMAT 3848 is completed to a depth of 220 ft bgs (approximate elevation 600 ft msl). Both wells appear to tap groundwater sources above the aquifers pumped in the Rupp Wells. Neither well is likely to be hydraulically connected to the water bearing zones developed in the Rupp Wells.

The lack of available nearby wells limits the potential well network that could be used for assessment of groundwater pumping and injection to the existing Rupp Wells 1, 2, 3, and 4. The

construction of Rupp Wells 1, 2, 3 and 4 is presented in Table 1. Each well is cased and sealed to a depth just above the targeted water bearing zones that the wells develop for groundwater production.

3.3.5 Hydrogeologic Conceptual Model

The regional geologic discussion in Section 3.2.3 includes a description of the CRBG emplacement as a series of horizontal basalt flows with a generally repeating sequence of rubbly flow tops, relatively impermeable dense interiors with rubbly or glassy flow bottoms. The stacking of flow bottoms on the previous flow top form an interflow zone. This is particularly true of the basalt flows within the Frenchman Springs Member (Beeson and others 1985) which exhibit little or no weathering or depositional interbeds between basalt flows. When saturated, the interflow zones form relatively isolated and sometimes laterally extensive groundwater aquifers. Recharge for these systems is generally in the highlands and discharge is down slope on an annual basis to minor springs and tributaries where interflow zones are breached. Discharge occurs much more slowly, on the order of thousands of years, to major regional surface water features like the Columbia River.

The layered basalt aquifer system is the basis of the hydrogeology conceptual model for the Rupp site. Locally, the layered basalt aquifer system is modified by a number of high angle normal faults that act as barriers to regional flow and recharge. The horizontal emplacement of the basalts and subsequent vertical faulting can offset saturated interflow zones to create an isolated aquifer "compartment" of limited areal extent. The limited nature of a compartmentalized aquifer restricts recharge to the aquifer, and when pumped the aquifer will act like a contained reservoir, exhibiting an incremental residual drawdown. Withdrawal of water from the system will generally not be replaced by recharge infiltrating from the surface or from upland areas. The residual drawdown will compound on an annual basis as the withdrawal exceeds the annual recharge to the aquifer system.

Evidence for isolated basalt aquifer compartments in the area of the Rupp wells include the geologic mapping of potential fault plains (inferred faults), geochemistry data collected from the Rupp Wells during construction, and the hydraulic response of the aquifers to pumping. Aquifer response to pumping and lack of recharge is strong evidence that supports the compartmental basalt aquifer conceptual model. These lines of evidence as observed at the Rupp site are further described below.

Inferred Faults – The locations of three inferred faults (designated north, east, and south relative to Rupp site) are shown on Figures 7, 10, and 11 in the area of the Rupp site based on geologic stratigraphy, major topographic lineament on the landscape, and spring sites. Spring sites within the Columbia Plateau are often attributed to interflow zones that discharge at the surface

due to offset along a fault plain, however truncation of an individual flow, pinch-out of an intruded flow, or erosion into the interflow zone may also cause these springs. On cross-section A-AA an inferred fault is postulated to the east of Rupp Well 4, approximately 4 miles. The "East Fault" is proposed along the Juniper Canyon where the Umatilla Member (Tu) is found on the east rim of Juniper Canyon at an elevation below the top of the Basalt of Sentinel Gap (Tsg) on the west rim of the Canyon.

Geologic cross-section B-BB presents inferred faults to the south of Well 4, approximately 2 miles. This southern inferred fault is based on the extensive thickness of the Sentinel Gap (Tsg) along the southern wall of McCall Canyon where the fault line crosses B-BB and the lineament runs parallel to the proposed fault trace and is coincident with the spring mapped in the South Fork of Cold Spring Canyon. This lineament runs further to the west and east for several miles and can be traced across the topographic map for a distance of approximately 10 miles.

The northern inferred fault is approximately 3 miles north of Well 4. This proposed fault trace runs perpendicular to cross-section B-BB and parallel to the Columbia River. The fault is postulated based on the extensive thickness of the Basalt of the Sentinel Gap (Tsg) and coincident location of a spring near the mouth of Juniper Canyon which may be the result of a discharging interflow zone on the up-thrown side of the fault trace. Other identified faults may lay closer to the Rupp Wells as suggested by the hydraulic response of the aquifers to pumping and lack of apparent recharge.

Geochemistry – Well 4 may penetrate one such unmapped fault zone at approximately 690 ft bgs. Although not called out in the stratigraphic analysis presented in GSI (2012), the geochemistry analysis presented with the stratigraphy of Well 4 suggests a repeated stratigraphic sequence of basalt flows (Sand Hollow/Silver Falls/Sand Hollow/Sliver Falls) based on the unique high chromium content of the Basalt of the Sand Hollow relative to the much lower Chromium content of the underlying Basalt of the Silver Falls. As inter-fingering of the Frenchman Springs basalt flows has not been observed (Beeson, and others, 1985), a fault plane through the base of Well 4 would solve this apparent break in the stratigraphic continuity. Unfortunately polarity of the collected samples was not available to resolve this anomaly. The cross-sections presented herein rely predominantly on the stratigraphy as originally presented in GSI (2009). However, the geochemistry does suggest an alternative analysis that supports local faulting.

Basalt Aquifer Response to Pumping – The general history of water use from Rupp Wells 1, 2, 3 and 4 has included pumping for two or more wells on an annual basis since 2012. Table 2 includes water levels measured in the Rupp wells between 2011 and 2015 (IRZ, Personal Communication). The historical trends in well water levels are shown graphically on Figure 12. This information illustrates annual declines in water levels indicating an isolated aquifer system that is receiving little annual recharge in comparison with the annual pumped water volume.

The history of pumping from the four wells also shows that there are two separate aquifer systems, one encountered between about elevations 560 and 350 ft msl, and a deeper aquifer between elevations 160 and 100 ft msl. For the purposes of this discussion, the shallow aquifer between elevations 560 and 350 ft is referred to as Rupp Aquifer 1 (RA1) and the deeper aquifer as Rupp Aquifer 2 (RA2). The geologic stratigraphy and geochemical analysis results available for Rupp wells do not fully support a stratigraphic designation for these water bearing zones as either Silver falls or Sand Hollow aquifers. Consequently, the site-specific designations of RA1 and RA2 are used in this report instead.

Other water bearing zones were encountered at shallower depths during well construction but were sealed off during construction. Only the aquifers RA1 and RA2 have been developed at the four Rupp Wells. Rupp Wells 2 and 3 are developed in RA1 and Wells 1 and 4 are developed in the deeper RA2.

Water levels in Wells 2 and 3 show a strong hydraulic connection between the wells that withdraw water from RA1. Similarly, at greater depth, Wells 1 and 4 show a hydraulic connection and correlation of water level that demonstrates hydraulic continuity between the two wells developed in RA2. Although RA1 and RA2 are isolated by multiple horizontal aquitards in the form of dense flow interiors, the water level data collected during the 2013 irrigation season show a weak hydraulic connection between the two aquifers. This is possibly due to the uncased Rupp Stock Well that is located near Well 1 and interconnects RA1 and RA2. This connection is demonstrated by the matching pattern of drawdown and recovery exhibited in RA2 as measured in Well 1 static water levels, while Well 2 and 3 pumped groundwater from RA1 for the 2013 irrigation season.

Groundwater withdrawals through Wells 2 and 3 from RA1 over a three year period from 2012 to 2015 has resulted in a static water level decline of about 140 ft with declining water levels moving in tandem during pumping and non-pumping events (Figure 12). A similar decline of about 75 ft is shown in RA2 as a result of Well 1 and 4 groundwater withdrawal. In both aquifers, the residual drawdown compounds year to year in a step-wise manner. In RA1 the annual water level decline is about 50 ft per year over three years. In RA2 the annual decline is about 75 ft per year based on a single year of pumping. Neither aquifer exhibits evidence of significant recharge in comparison with the withdrawal volumes.

Hydrogeologic Conceptual Model Summary – The evidence presented in the geologic structure, basalt stratigraphy, basalt geochemistry, and the aquifer response to pumping each suggest that two isolated basalt aquifers, RA1 and RA2, are present beneath the Project Area. The two aquifers appear to be confined vertically by multiple dense interior basalt flows and horizontally limited in extent by faulting in at least three directions. The history of water levels

further supports the basalt aquifer compartment model due to the rapid and sustained annual drawdown. In summery both RA1 and RA2 act like isolated subsurface reservoirs.

3.3.6 Groundwater Flow Direction and Gradients

The project area contains few groundwater wells that can be used for reasonable assessments of groundwater flow direction and groundwater gradient. The only known wells that represent water levels with RA1 and RA2 are Rupp Wells 2 and 3 and Wells 1 and 4 respectively. Initial water level elevations from the wells listed in Table 2 were used to develop an estimate of the groundwater gradient. The groundwater flow direction is postulated based on regional information and the initial water levels recorded for the wells installed in RA1 and RA2.

Based on the data used, the hydraulic gradient in RA1 is estimated at 0.009 with a groundwater flow direction of West to Northwest. The gradient in RA2 is estimated at 0.003 also with a direction of West to Northwest. However, these estimates are of limited value in this analysis. The initial gradient suggests that groundwater flow would move westward from Well 3 to Well 2 in RA1. Similarly the gradient and flow directions indicate a westward flow direction in RA2 at a lower hydraulic gradient. The differences in the gradient between RA 1 and RA2 are not well understood based on the limited data. Error associated with calculations of gradient from water well records can be significant and may affect the results reported here. Groundwater flow direction is best estimated from a minimum of three wells completed within the same aquifer. The groundwater flow directions reported here are based on two wells, other regional estimates of groundwater flow direction and the general dip of the basalt flow in the area, which are to the north.

Based the hydrogeologic conceptual model for the project area, the flow direction and groundwater gradient within the isolated and compartmentalized basalt aquifers would change significantly with the start of groundwater withdrawal. Under compartmentalized conditions where annual residual drawdown occurs, the groundwater gradients within the aquifer compartments would assume a radial distribution and flow towards the pumping centers within the aquifer.

3.3.7 Aquifer Parameters

Characteristically basalt aquifers exhibit values of transmissivity in the range of about 500 square ft per day to over 50,000 square ft per day. Storage coefficients range from about 0.0015 to 0.00001, and averaged 0.0005 (Zwart, 1990). The aquifer parameters for RA1 and RA2 have not been reliably estimated. Reliable estimates of aquifer properties, including transmissivity,

storativity, and boundary conditions, are made though analysis of controlled aquifer test results.

In the absence of aquifer test results, well performance data can provide important initial information about ASR potential because these data indicate the quantity of water that can be injected and recovered from the target aquifer system over a short duration.

Well yield and drawdown during pumping and air lift testing can be used to calculate the specific capacity of the well, which is calculated by dividing the flow rate by the drawdown as follows:

Specific Capacity (SC) = Q/s (in gpm/ft of drawdown). Where:

Q = the yield (or flow rate) in gpm; and

s = observed drawdown at that flow rate (static water level pumping water level) in ft.

The higher the specific capacity, the more effective the well is at producing (and accepting) groundwater and the more transmissive the aquifer. ASR is being successfully implemented in wells with specific capacity values less than 10 gpm/ft of drawdown.

Short term pumping drawdown and pumping rate data is not available from the Rupp well construction logs to estimate specific capacity at Rupp wells. A 72-hour pump test was conducted in Well 1 in October, 2014 (IRZ 2014). The specific capacity estimate based on this test is 12.5 gpm/ft. This is a conservative estimate of specific capacity as most estimates are based on pumping durations of one to four hours, the short-term specific capacity of Well 1 is likely greater than the estimate based on the 72 hour test. Anecdotal information regarding pumping rates for Wells 2 and 3 suggest the well performance is greater (and potentially RA1 is more transmissive) than Wells 1 and 4 that are completed in RA2.

3.3.8 Estimated Aquifer Storage Capacity

Aquifer storage capacity is estimated for RA1 and RA2 in this section, however the target for ASR operations is the shallower RA1. Based on the historic use, Wells 2 and 3 in RA1 appear to be the most productive wells and are at a shallower depth than Well 1 and 4 in RA2. The shallower pump setting in Wells 2 and 3 will reduce the technical difficulty of ASR operations as well as the cost of the pilot project and recovery pumping. The higher productivity of RA1 will allow greater rates of recharge during the injection phase of the ASR cycle..

The initial goal of aquifer storage at the Rupp site is to recover the RA1 to initial static water levels at the time of drilling on an annual basis, i.e., to replace all water pumped during each irrigation season with Columbia River water. Storage of water above the initial static water

level may induce additional discharge at local springs or at new locations not previously identified as discharge points for RA1.

The pumping rates for the wells are not well documented but are assumed to be in the range of 1500 to 2000 gpm for Wells 2 and 3 and 860 to 900 gpm for Wells 1 and 4 (IRZ, Personal communication). The annual water use by aquifer is available from reported pumping records. The head-loss and water production by aquifer and year is presented in Table 3.

The historic head-loss and total water volume pumped provide a reasonable estimate of aquifer storage capacity for each aquifer, as follows:

- *Rupp Aquifer 1 Storage Capacity* – Based on the historic water levels the head-loss over three years at Wells 2 and 3, water production of RA1 has removed between 1,700 and 2,000 acre feet per year and generated a residual drawdown of approximately 50 ft per year. This suggests a storage capacity of 34 to 40 acre feet per ft of residual drawdown. The total drawdown in RA1 from the initial static water level is approximately 140 ft. The estimated available storage in RA1 based on the three years of pumping data is between 4,760 and 7,000 acre feet.

  Additional storage above the initial static water level may allow for up to 100 ft of run-up in Well 2 and 3. This run-up may allow for an additional 3,400 to 4,000 acre feet of storage in RA1.

- *Rupp Aquifer 2 Storage Capacity* – Based on the historic water levels the head-loss over three years at Wells 1 and 4, water production of RA2 has removed between 250 and 480 acre feet per year and generated a residual drawdown of approximately 75 feet per year. This suggests a storage capacity of 3.3 to 6.4 acre feet per ft of residual drawdown. The total drawdown in RA1 from the initial static water level is approximately 75 ft. The estimated available storage in RA1 is approximately 780 acre feet, essentially to total volume pumped in the historic record.

  Additional storage above the initial static water level may allow for up to 300 ft of run-up in Well 1 and 4. This run-up may allow for an additional 990 to 1,900 acre feet of storage in RA2.

Greater storage capacities are likely possible to achieve with both aquifers, however special attention to area spring production should be considered if storage volumes raise the static water levels in the aquifers above the initial static water level. Static water levels higher than the initial water level may cause water to discharge from areas not previously identified as springs. Well seals should also be evaluated for run-up conditions, which may put additional pressure on seals. Careful analysis of injection volumes and water levels should be monitored

for potential injection volume losses that could indicate loss of injection water to a spring or a failed well seal.

3.3.9 Projected Recharge and Recovery Estimates

The projected recharge and recovery estimates are based on the measured historic pumping rates and available storage capacity of the aquifer. Estimated recharge rates of approximately two thirds (2/3) of the pumping rate may be achieved based on information from basalt wells elsewhere in Oregon. Assuming a recovery rate of approximately 1,500 gpm in Well 2, an injection rate of approximately 1,000 gpm may be expected in Well 2.

3.4 Water Quality

Akana staff collected water samples from the JSH water supply system (source water) and Rupp Ranches irrigation Well 3 on November 3, 2015 for field and laboratory analyses. The field and laboratory analytical results provide a baseline of water quality parameters prior to conducting the ASR test.

Field parameters measured included water temperature, pH, oxygen-reduction potential and dissolved oxygen. The measurements were made prior to collection of laboratory samples. At both locations, the measurements were conducted and samples collected from the only spigot or faucet on the system. Both the JSH pipeline and Well 3 were operating for irrigation purposes at the time of sampling. Water was allowed to run for approximately 15 minutes at each system before field parameters were measured. Field values were recorded once a continuous flow stream was reached and water temperature and pH values stabilized to within 10 percent of the measured value. Following field measurements, laboratory samples were collected based on standard sampling protocols.

Water quality samples were submitted to Alexin Analytical Laboratories, Inc. in Tigard, Oregon for analyses of parameters approved by OWRD, and the Oregon Departments of Health Services and Environmental Quality. Laboratory analyses included a range of total metals, inorganics, synthetic organics, asbestos, total coliforms and E. coli, and radiological constituents. The water quality field and analytical results are provided in Tables 4 and 5, respectively. A copy of the laboratory analytical reports and chain-of-custody forms for the two samples is included in Appendix D.

3.4.1 Source Water Quality

The results of laboratory analyses of the JSH water system sample indicate that total metals and inorganics were either not detected at levels greater than the laboratory Method Detection Limits (MRL), or when detected were below their respective U.S. Environmental Protection Agency Maximum Contaminant Levels (MCLs). Synthetic organic compounds were not detected at concentrations above their MRLs. Asbestos was not detected at concentrations above the laboratory MRL. Total dissolved solids were detected at a concentration of 108 milligrams per liter (mg/l). Total organic carbon was detected at a concentration of 2.18 mg/l. Radiological parameters were not detected at levels greater than their MRL.

Total coliform and E. coli were detected in this sample at concentrations of 64 MPN/100 ml and 1 MPN/100 ml, respectively. However, due to laboratory mix-up, the holding time for quantification of the coliforms was exceeded. The reported values were measured passed the normal holding time and may over-estimate the true values.

3.4.2 Rupp Ranches Groundwater Quality

Laboratory analyses of the groundwater sample collected from the Rupp Ranches irrigation Well 3 indicates that the detected concentrations of total metals and inorganics were below their respective MCLs. Synthetic organic compounds and asbestos were not detected at concentrations above their laboratory MRLs. Total coliform and E. coli were absent in the sample.

Total dissolved solids were detected at a concentration of 271 mg/l. Total organic carbon was detected at a concentration of 2.66 mg/l. Radiological analytes including uranium and Gross Beta were detected at 0.0044 mg/l and 5.82 pico-curries per liter (pCi/l), respectively, in this sample. These levels are less than their MCL values.

3.4.3 Comparison of Source Water and Rupp Ranches Groundwater Chemistries

Both water samples showed relatively low concentrations of the analyzed constituents, indicating good water qualities in these two sources. The concentrations of the analyzed constituents in the river sample are either very close to, or less than, levels in the well sample. The total dissolved solids (TDS) values were 271 and 108 mg/l in the well and river water samples, respectively. The well sample contains 3.7 mg/l of nitrate and the river sample 0.299 mg/l. It appears that recharge of river water into CRBG aquifer will not likely degrade existing groundwater quality at this location based on these results.

3.4.4 Projected Compatibility of Source Water and Native Groundwater

Both water samples indicated oxidizing conditions based on their positive oxygen-reduction potentials (ORPs). The river water flows through several pumps, valves and other inline components, and several miles of pipeline before it reaches the Rupp system. Therefore, at its point of supply to Rupp system it is likely similar to, but not exactly representative of, river water geochemical conditions.

The concentrations of iron and manganese were less than MRL values in the well water sample. Concentration of manganese was at less than MRL and iron was at relatively low level of 0.057 mg/l in the river water sample. Given the similarity of water qualities between the two samples, similar oxygen-reduction potential values, and undetectable or very low total concentrations of metals, it is unlikely that chemical precipitation will present an operational issue for ASR operations at this site or lead to mobilization of metals whose anionic form is more mobile in oxidized groundwater conditions than their reduced form (such as arsenic, chromium, or selenium).

3.4.5 Water Treatment Requirements

The OAR 333-061-0032 includes treatment requirements and performance standards to be used to guide the design of the ASR test system for Rupp Ranches property. Specifically, Sub-Section (7) – Determination of Groundwater under the Direct Influence of Surface Water (GWUDI) and the sub-parts listed below are applicable to this test design.

In accordance with the provisions of sub-part (a)(A)(iii) for a sand and gravel aquifer, the edge of the infiltration area is designed to be 100 feet from the sub-surface recapture point. Therefore, the treated recaptured water from the treatment cell can be used as source water to the ASR injection well as "groundwater" for purposes of compliance with the provisions of this sub-part.

The water recaptured from the treatment cell will be conveyed to Well 2 for injection. To test for presence of coliform bacteria in this source water, as required under sub-part (c) of this sub-section, a sample of the recaptured water will be collected for coliform analyses. If the analyses results indicate absence of coliform bacterial, the recaptured water will be injected. Otherwise, it will be pumped to ground surface downgradient of Well 2.

If the sample results do not indicate presence of coliform bacteria, this source will be deemed in compliance with the provisions of sub-part (k) and not needing further treatment and evaluation.

4.0 ASR TESTING SYSTEM DESIGN AND OPERATION

4.1 Existing infrastructure

The Rupp Ranches irrigation infrastructure comprises four groundwater Wells 1 through 4, as discussed in Section 2.0. Discharge piping for Wells 1, 3, and 4 are inter-connected, while Well 2 is currently offline. The Rupp wells were recently connected to the JSH irrigation system pipeline at a location between Wells 1 and 2, as shown on Figure 2. With this connection, the JSH pipeline can convey Columbia River water to the Rupp system. The JSH pipeline will be used to provide the raw water from Columbia River to the Rupp system for ASR testing purposes.

Well 2 was selected for ASR testing based on the following factors:

- It is open to the upper water bearing strata within the CRBG aquifer system underlying the property. Wells 2 and 3 are completed within similar strata and have demonstrated greater yields than Wells 1 and 4. It is expected that most of the aquifer storage capacity has been created within the upper strata during past withdrawals.
- Storage in the upper CRBG strata is expected to result in higher potentiometric levels and therefore, lower pumping cost during recovery.
- Injection into the upper CRBG strata creates a less complex wellhead system design than injecting into deeper Wells 1 and 4.
- Land is available for developing a surface treatment system in proximity to Well 2 which hasn't previously been farmed and is near an access road.
- Coarse-grained soils are present in or near Well 2 to use to construct the treatment cell.
- Land near Well 2 has a moderately even terrain without steep slopes for constructability, and reducing the need for berm construction.

An area near Well 3 with generally similar conditions was also identified as an alternate site, in the event that work at the primary site encounters unexpected difficulties.

The borehole of Well 2 was advanced to a total depth of 635 ft bgs with a 16-in well casing constructed of 0.375 gauge welded steel. The top of well casing is 2 ft above the ground surface and sealed on top with a steel plate. The well is sealed from the formations from the ground surface to the end of the casing at 580 ft bgs (55 ft of open hole). The lowest water level in the well was observed on 31 October 2014 at approximately 495 ft bgs. Water level was last measured in this well on 1 October 2015 at a depth of 385 ft bgs. When first drilled in November

2011 the water level was at approximately 189 ft bgs. Water level data is summarized in Table 2. Well construction information is summarized in Table 1.

4.2 Proposed ASR Testing System

The proposed ASR testing system consists of the following four components:

- Component 1 comprises the connection to the capped 24-inch tap line at Well 2, pipeline to deliver water to the treatment cell, the treatment cell water infiltration system, and the monitoring and sampling units.
- Component 2 is the treatment cell including the subgrade sand filtration basin, liner, and monitoring piezometers.
- Component 3 comprises the system to recapture the treated groundwater including a sub-drain, submersible sump pumping system at the toe of the treatment cell, the outflow pipeline to Well 2, and sampling and monitoring units.
- Component 4 is the wellhead apparatus designed for injection of recaptured groundwater into Well 2, and sampling and monitoring units.

These components are described below and are shown schematically in Figures 13 through 16, respectively. The system is designed for continuous operation during the assumed testing time of approximately 7 days.

4.2.1 Design Component 1 - Surface Water Inflow System

Component 1 includes adding additional conveyance pipeline, installing flow control valves, and modifying the existing structures, such as the tap at Well 2, as shown on Figure 13. Well 2 will be isolated from the other wells so that water supply for treatment would only go to Well 2. Two isolation valves will be installed in the 24-inch pipeline: one between Well 1 and the JSH-Rupp junction point and the second between Well 2 and Well 3. At Well 2, a new conveyance pipeline for the test system will be connected to the capped tap end of the 24-inch pipe tee in the main line. The existing service line at the tee will be reduced to 4 inches using pipe reducers. A 4-in gate valve followed by a flow meter will be installed after the reducing fittings. From the flow meter, approximately 300 linear ft of 4-inch PVC, HDPE, or aluminum irrigation pipe will be installed to convey water to a pipe manifold just outside the treatment cell. The target flow rate for testing is 100 gpm based on calculations of expected maximum flow rate through the subsurface sand (see Section 3.3.2). However, the pipe size is large enough to accommodate a greater flow rate of up to 200 gpm, if the subsurface flow rate is observed to allow faster flows.

Most of the conveyance piping used for the ASR treatment testing can be laid on grade for construction, testing, and monitoring convenience. The inflow manifold will be located at one end of the surface infiltration zone where the 4 inch pipeline will split into two 4-inch 95-foot long perforated pipes. The 4-inch perforated pipes will lie on grade to allow a generally uniform pattern of water infiltration.

4.2.2 Design Component 2 – ASR Treatment Cell System

Component 2 is the treatment cell including the subgrade sand filtration basin, liner, and monitoring piezometers, as shown in Figure 14. The treatment cell is designed as a rectangular filtration basin with total dimensions of 100 ft wide (across the grade) by 120 ft long (along the grade), by approximately 5 ft deep. The cell will be lined with a geomembrane to prevent escape of water to deeper sediments. The native sandy soils will be excavated from the location of the cell and stockpiled nearby for placement atop the liner after liner installation. Additional native sand exists in proximity to the site and can be transported to the cell, if needed.

The treatment cell is divided into a 100 ft wide by 20 foot long water "infiltration zone" and a 100 foot by 100 foot "travel zone" wherein the infiltrated water will migrate in the subsurface from the infiltration zone to the recapture system. The 100 ft length of the travel zone was selected based on the travel distances listed in OAR 333-061-0032 required for designation of the subsurface water as "groundwater" (as discussed in Section 3.4.5).

The infiltration zone will be graded to be generally flat. The infiltration rate will be adjusted from the design 100 gpm, as needed, to prevent water ponding. However, an earthen berm of approximately one foot high will be constructed around the infiltration zone using nearby native soils to contain any ponding that may occur during water application. Additionally, the infiltration rate will be adjusted to allow an approximately 1-ft layer of unsaturated soil at the top of the infiltration zone. This will provide a water treatment zone based on design factors for "slow sand filtration" systems recommended in American Water Works Association (1999) or Washington State Department of Health (2003). A piezometer (PZ-1) will be installed at the center of the infiltration zone to allow measurement of water levels during infiltration.

The infiltrated water will travel laterally through the travel zone. The base of the travel zone will have a downward slope of 4 to 10 percent to increase the groundwater hydraulic gradient and the resultant driving force for groundwater movement of the infiltrated water. A second piezometer (PZ-2) will be installed within approximately 5 to 10 ft of the downgradient end of the travel zone to allow measurement of water levels upgradient of the recapture sub-drain.

A geomembrane will be used to line the base and walls of the treatment cell. The liner will be a smooth 40 mil thick high density polyethylene (HDPE) or a 30 – 40 mil thick PVC. The liner

will be secured by perimeter anchor trenches backfilled with granular fill. The liner will be placed above the native soil subgrade soil free of debris, roots, and sharp or angular rocks. A geomembrane cushion liner may be used in small areas of the subgrade where rocks and other debris cannot be easily removed. The liner will be installed by the manufacturer's technicians for seam welding of liner sections and to assist with quality control during installation.

4.2.3 Design Component 3 – Recapture and Outflow System

Treated water flowing through the sand filter will be collected in a recapture pipe system located at the toe of the travel zone, as shown on Figure 15. The recapture system will consist of a 12-in perforated plastic pipe surrounded by drain rock or similar suitable material. A "separation" layer of open-graded aggregate will be placed between the drain rock and the sand filter to help transition the flow and prevent clogging of the drain rock by the sand of the filter zone. The water collected in the recapture pipe will flow by gravity to a manhole sump where a submersible pump will be used to convey the water to Well 2.

The recapture pipe will rest at the base of a drain rock trench. The recapture trench will be approximately 3 ft wide, 2 to 2.5 ft deep, and will run 100 ft in length along the toe of the travel zone, perpendicular to flow. The top of the trench will begin at the lowest elevation of the travel zone. The top layer of drainage rock within the separation layer will be a minimum 4-in thick section of ¼ to ¾ -in open graded aggregate. Below the separation layer, a minimum of 8 inches of 1.5-in drain rock will be placed over and around the recapture pipe that will rest on the bottom of the trench. Since the trench will have a 0.5% downward slope towards the outlet and treatment cell, this will result in cover over the top of the recapture pipe at a minimum of 12 inches and a maximum of 18 inches. The recapture pipe itself will be 12-in, perforated HDPE or PVC following the 0.5% slope of the trench bottom. The pipe will be perforated in the toe trench of the treatment cell, and solid pipe as it leaves through the geomembrane pipe boot until it outfalls in a pump sump.

The manhole or sump will serve as the below grade housing structure for the submersible pump. The treated water that outflows into the sump will then need to be lifted approximately 30 ft, accounting for 8 to 10 ft to grade and approximately 20 ft of rise in elevation to the wellhead apparatus. The uphill rise of 20 ft is a conservative estimate based on approximately 400 ft of conveyance piping laid on existing grade, which will convey the treated water to Well 2 for injection (see Section 4.2.4). The conveyance piping will be 4-in PVC or HDPE, same as the inflow piping of Component 1.

Preliminary design for the submersible pump is a single phase, 3-horsepower, unit to meet a total dynamic head of 30 ft of lift, pipe friction, and energy losses. The pump will rest on the

floor of the sump at a depth to ensure that it will be submerged while in operation. The pump discharge pipe will extend vertically up through the sump cover and continue to the above-ground piping to Well 2. The sump will be sized to house the pump and riser, with access through the sump lid/cover for maintenance and drop-down installation. The pumping rate will be adjusted to correspond to the system outflow so that injection occurs as near to a constant flow process as practicable.

4.2.4 Design Component 4 – Well 2 Injection System

Component 4 is the wellhead apparatus designed for injection of recaptured groundwater into Well 2, and sampling and monitoring units. The main design criterion for Component 4 is prevention of air entrapment within the water column during injection. Information provided in Pyne (2005) is used as a general guide to develop a system for Rupp Ranches ASR testing.

It must be noted that the volume of water that will be injected during the first phase of testing in 2016 will be relatively small. Additionally, there is no pumping system in Well 2 and one will be there during testing. The design of an ASR injection system in Rupp wells that may, in the future, serve as dual injection-recovery wells will have to be different than the design proposed in this report. The injection system described in this section will be used to gain system operational data and information for future designs.

The testing injection system includes a fill pipe placed within a larger 6-in PVC (or similar) down pipe suspended within the well casing. The PVC down pipe will terminate at approximately 50 ft below the water level. The fill pipe will be extended to approximately 2 ft above the end of the down pipe. The water level will be measured prior to installation for this purpose. The wellhead apparatus is shown schematically in Figure 16.

The down pipe will have a bottom equipped with a valve system. The fill pipe will discharge into the down during the initial fill with the valve closed to allow air present within empty pipes to vent through an air release valve. Once the air has been removed from the pipes, the valve will be opened to allow flow into the well casing.

The 4-in outflow pipe from Component 3 will be reduced to a 2-in fill pipe using reducing pipe fittings. A 2-in air relief valve will be installed on the fill pipe just outside of the well casing before the injection pipe enters the down pipe through the top of the steel plate of well casing. A 6-in diameter hole will be drilled in the existing steel plate well cap to allow suspension of the down pipe. Retainer glands will be used to seal the down pipe to the steel plate of the well casing. The top of the down pipe will be capped and sealed except for an opening for the fill line and a small vent to release air from the entrained bubbles.

Specific details related to the required valving, controls and structural support will be shared with the OWRD for review and concurrence prior to any injection.

4.3 ASR Recovery System

The expected volume of water that will be injected during this first injection period will be relatively small. There are no plans to install a pump in this well in 2016. Therefore, there won't be a recovery phase of the injected water from Well 2. It is anticipated that if the treatment and injection processes prove practical and feasible, significantly greater volumes of water will be injected next year. In that case, an updated injection and recovery system design will be developed and submitted to OWRD for review.

4.4 System Operation and Maintenance

The system as proposed in this application will be operated for a relatively short period of time (approximately 7 days). During this time, the system will be attended to on a frequent basis to collect the monitoring data, adjust system flow rates, and collect water samples for laboratory analyses. No major maintenance or operational issues are expected during the testing time frame. Following completion of testing, the system components will be disassembled and stored in a safe place for reconnection and use after October 1, 2016.

5.0 MONITORING PROGRAM

The proposed parameters to be monitored during implementation of the ASR pilot program are described in this section.

5.1 Water Level Monitoring

Water level monitoring will be conducted within the treatment cell from two planned piezometers, PZ-1 and PZ-2. The piezometers will be installed at the approximate locations shown on Figure 4 during construction of the test cell. They will consist of one-inch diameter PVC casings with a 3-ft slotted lower section. They will be completed to the bottom of the treatment cell above the liner. Their total depth will be approximately 5 ft or to the final depth of the test cell, as constructed.

The piezometers will be used to observe the rate and changes in extent of rise of water in the treatment cell within the infiltration zone and the travel zone near the recapture point. The data

will be used to achieve the maximum rate of system flow rate that allows at least a 1-foot unsaturated zone to be maintained within the infiltration zone. The measurements in PZ-1 and PZ-2 will be made frequently by water level sounder during the test.

We propose that the piezometers do not need to be constructed to OWRD's well construction standards since they will be completed within a completely-enclosed system and removed at the end of testing. However, to prevent potential short-circuiting of the infiltrating water, the upper two, blank feet of the casing will be sealed by placement of bentonite which will subsequently be hydrated.

To monitor the extent of recharge in the CRBG aquifer, Well 3 will be used as an observation well. However, it is not expected that a large volume of water will be recharged during this year's test due to timeline for processing of this application. The changes in water level during injection will be monitored either through use of the well airline or separate water level measuring tape. Since Well 3 may be subject to irrigation pumping during the test period, exact measurement steps will have to be determined as we get closer to the testing time. The steps will be communicated to OWRD for review and concurrence prior to any injection.

5.2 Water Flow Monitoring

Flow meters will be installed at the inflow to the treatment cell, at the treatment cell outflow end, and at point of inflow to Well 2. The approximate locations of the meters within the system are shown in diagrams presented in Figures 15 and 16.

The treatment cell will be equipped with a gate valve and totalizing meter at the influent end of the cell to monitor and adjust the rate at which source water is being supplied to the cell. The measurements will be used to adjust the inflow rate to achieve the maximum system flow through rate. These and the totalizing meter values will be used to comply with the total and instantaneous source water rates allowed.

It is anticipated that the treatment cell will need to be monitored frequently upon startup to adjust the influent and discharge rates of the cell. Initially, the system flow rate will be monitored on a continuous basis by observers at the inflow meter, and at each of the piezometers. Water levels in the piezometers will be monitored to regulate the flow rate and to maintain optimum operating conditions. Once the treatment cell is operating properly and steady state conditions have been established, the system monitoring schedule will be reduced, as determined in the field. Since the total test duration is not expected to last for more than approximately one week, it is expected that the less frequent monitoring will be done a few times a day until the test is completed.

Outflow (discharge) from the treatment cell also will be monitored by means of totalizing meter. The discharge totaling meter will record the amount of water being injected to the ASR test Well 2. The flow rate monitoring point for the discharge water will be located between the discharge point of the treatment cell and Well 2.

5.3 Water Quality Monitoring

Water quality results for samples collected from the JSH water supply line and Rupp Well 3 in November 2015 were presented and discussed in Section 3.4. The results do not indicate presence of the analyzed constituents above their MCL in either water source, except for total coliforms and E. coli which were detected in the JSH system water sample. The overall results for Columbia River water sample are consistent with historic results for Columbia River water quality available over the last few years. Therefore, the only constituents which are proposed for testing in this application are total coliforms and E. coli.

Water samples will be collected from sampling ports constructed at the inflow pipeline to the infiltration system, at the outflow end of the recapture system, and at the inflow point to Well 2. The samples will be collected in accordance with standard sampling and handling procedures, and delivered to an accredited laboratory under chain-of-custody protocol.

Samples will be collected once the system flow regime has reached, or is deemed to be near, steady state conditions. The samples will be delivered to the laboratory for rush analyses of total coliforms and E. coli. If the results indicate absence of coliforms, the injection step will begin.

Water quality sampling of the CRBG aquifer following injections will not be presented in this application since the injection duration and rate, and therefore the total injection volume that can be achieved, are expected to be relatively minimal. It is expected that the CRBG injection step will truly be tested during the 2016 water year. We expect to provide supplemental information to OWRD regarding CRBG aquifer sampling protocol prior to that test.

6.0 REFERENCES

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TABLES

Table 1. Rupp Ranches Well Information

Rupp Well No.	1	2	3	4
State Well No.	UMAT 57044	UMAT 57042	UMAT 57041	UMAT 57043
Well Label No.	L108650	L108634	L108633	L108632
Latitude[a]	45.91510	45.94768	45.9235	45.91520
Longitude[a]	-119.04517	-118.99077	-118.99101	-119.04500
Install Date	29 June 2012	20 November 2011	6 December 2011	19 April 2012
Total Depth[b]	820	635	552	990
Casing Diameter[c]	20 from 0 to 110 16 from 110 to 738	16 from 0 to 580	16 from 0 to 494	16 from 0 to 700
Open Interval[b]	738-820	580-635	494-552	810-990
Measuring Point Elevation[d]	946.0	1,038.7	1,059.5	1048.0 until 1 April 2015 and 1,050.1 after
SWL[e]	517	189	179	572
Depth of Water Bearing Zones (Yield)[f]	133–147 (no rec) 582-597 (no rec) 790-805 (no rec) 790-805 (no rec)	0-275 (40) 275-360 (150) 360-448 (50)	0-285 (35) 285-485 (100) 485-522 (4,000)	166-189 (50) 635-655 (1,000) 930-975 (3,000)

a Datum WGS 84, measured in the field by Akana staff

b Feet below measuring point elevation, based on well log information

c Inches between depths listed, depths in ft below measuring point elevation, based on well log information

d Elevation of the concrete well pad surveyed by IRZ Consulting, Hermiston, OR

e Static water level in ft below measuring point following installation, based on well log information

f Depths in ft bgs, Yield in gpm.

Table 2 – Rupp Ranches Well Water Level Measurements[(a)]

Date	Well 1	Well 2	Well 3	Well 4
11/20/2011[(a)]		849.7[b]		
12/6/2011[(a)]			880.5	
4/20/2012[(a)]				476
6/29/2012[(a)]	429.00			
4/26/2012		830.45	866.31	854.83
7/20/2012			653.73	
1/2/2013	433.55			
1/30/2013	438.91			
2/21/2013	443.59	795.72	820.2	
3/13/2013	445.25	798.29	840.2	472.79
3/20/2013	447.04	799.53		
3/27/2013	447	799.87	820.3	
4/3/2013	446.5	800.35	801.15	472.79
4/10/2013		787.05		473
4/17/2013	443	792.7	790.44	
4/24/2013	440.6	793.29	791.55	
5/1/2013	445.98		782.75	
5/8/2013	440.4		774.44	475.1
5/15/2013	441.15	751.95		
5/22/2013	438.47			
5/29/2013	437.6	761.64		
6/5/2013	429.15			
6/12/2013	437.3			474
6/19/2013	433			
6/26/2013	429.85	671.95		
7/3/2013	431.17			
7/10/2013	425.79			474.1
7/17/2013	422.83			
7/24/2013	420.5			
7/31/2013	415.3			
8/7/2013	412.4			
8/14/2013	414			
8/21/2013	409.5			
8/28/2013	407			
9/4/2013	405.25			
9/11/2013	413.25		612.9	
9/18/2013	409.17		634.07	

Table 2 Cont'd – Rupp Ranches Well Water Level Measurements

Date	Well 1	Well 2	Well 3	Well 4
9/25/2013	381.5		620.15	
10/2/2013	408		652.4	
10/9/2013	408			
10/16/2013	413.5		663.15	
10/23/2013	417.33		571.15	
10/30/2013	419.08		671.65	
11/6/2013	422.67		676.65	
12/12/2013	430.6		722.35	
1/7/2014	438.8	729.5	725.05	
2/5/2014	444.8	737.5	737.25	
2/18/2014	448	744.2	741.95	
3/18/2014	453.4	748.95	748.45	
3/31/2014	453.45	750.6	750.05	
5/1/2014	456.17	690.55	737.15	
6/2/2014	375.92	641.53	728.75	
7/1/2014	236.04	658.7	684.99	
7/31/2014	240.92	586.2	568.25	
9/2/2014	232.33	561.2	568.48	469.5
10/1/2014	220.62	627.62	618.73	466.4
10/31/2014	296.25	543.66	624.77	465.3
12/2/2014	331.25	669.12	662.73	464.9
1/2/2015	346.67	686.45	682.48	466.25
2/2/2015	366.79	699.74	707.23	468.17
2/20/2015	383.87	695.37	703.48	469.04
4/1/2015	416.29	691.82	694.28	475
5/3/2015	421.08	683.78	625.94	474.23
6/2/2015	297.71	673.95	582.98	475.38
7/1/2015	226.08	658.87	568.9	224.02
7/21/2015	276.54	661.4	568.9	166.23
8/3/2015	222.1	662.3	568.9	366.48
8/18/2015	222.1	662.2	568.9	167.27
9/1/2015	222.1	660.95	641.9	175.77
10/1/2015	240.79	653.74	601.2	190.81
11/2/2015	223.29		606.73	290.02
12/4/2015	308.21		646.98	380.48

Notes:

a Data from IRZ Consulting, except initial data after well installation from well logs

b ft MSL

Table 3 – Annual Water Volumes by Aquifer

Aquifer	2012 Acre Feet	2013 Acre Feet	2014 Acre Feet	2015 Acre Feet
RA1	1,727.3	2,063	1,721	0
RA2	246.3	0	0	478

Table 4 – Water Quality Field Analytical Results

Compound	Units	Well 3	JSH System	MCL[a]
Dissolved Oxygen	mg/l[b]	8[c]	8.56[c]	NE[d]
Temperature	°C (°F)[e]	20.1 (68.2)	14.9 (58.8)	NE[d]
ORP[f]	mV[g]	210	179	NE[d]
pH	pH units	7.55	7.87	5.5 – 8.5

(a) MCL - EPA maximum contaminant level

(b) mg/l = milligrams per liter

(c) oxygen content fluctuated during measurements

(d) NE = not established

(e) degrees Centigrade (Fahrenheit)

(f) Oxidation-Reduction Potential

(g) milli Volts

Table 5 – Water Quality Laboratory Analytical Results

Compound	Units	Well 3	JSH System	MCL[c]
Total Metals				
Antimony	mg/l[a]	ND[b]	ND	0.006
Arsenic	mg/l	0.007	ND	0.01
Barium	mg/l	0.0197	0.0238	2
Berylium	mg/l	ND	ND	0.004
Boron	mg/l	ND	ND	NE[c]
Cadmium	mg/l	ND	ND	0.005
Calcium	mg/l	19.4	19.6	NE
Chromium	mg/l	0.0019	ND	0.1
Iron	mg/l	ND	0.057	0.3*
Magnesium	mg/l	19.1	7.94	NE
Manganese	mg/l	ND	ND	0.05*
Mercury	mg/l	ND	ND	0.002
Potassium	mg/l	6.4	1.2	NE
Selenium	mg/l	ND	ND	0.05
Silica	mg/l	42	6	NE
Sodium	mg/l	38.6	5.2	20*
Thallium	mg/l	ND	ND	0.002
Inorganics				
Alkalinity (CaCO3)	mg/l	195	78	NE
Bicarbonate	mg/l	190	77	NE
Carbonate	mg/l	ND	ND	NE
Chloride	mg/l	4.9	2.5	250*
Cyanide	mg/l	ND	ND	0.2
Fluoride	mg/l	0.42	0.17	4
Nitrate as N	mg/l	3.7	0.299	10
Nitrite as N	mg/l	0.0131	ND	1
Nitrate + Nitrite	mg/l	3.72	0.299	NE
Sulfate	mg/l	11	12	250*
Total Dissolved Solids	mg/l	271	108	NE
Total Organic Carbon	mg/l	2.66	2.18	NE

Table 5 Cont'd – Water Quality Laboratory Analytical Results

Compound	Units	Well 3	JSH System	MCL[c]
Synthetic Organic Compounds				
All Compounds	mg/l	ND	ND	Compound Specific
Asbestos				
All Forms	IFL>10-ui	ND	ND	7
Microbiological Analyses				
Total Coliforms	MPN/100 ml	absent	64	NE
E. coli	MPN/100 ml	absent	1	NE
Radiological Analyses				
Total Uranium	mg/l	0.00440	ND	0.03
Gross Alpha	pCi/L[e]	ND	ND	15
Gross Beta	pCi/L	5.82	ND	NE
Radium 226	pCi/L	ND	ND	NE
Radium 226 + Radium 228	pCi/L	ND	ND	NE
Radium 228	pCi/L	ND	ND	NE

** Secondary MCL*

(a) mg/l = milligrams per liter

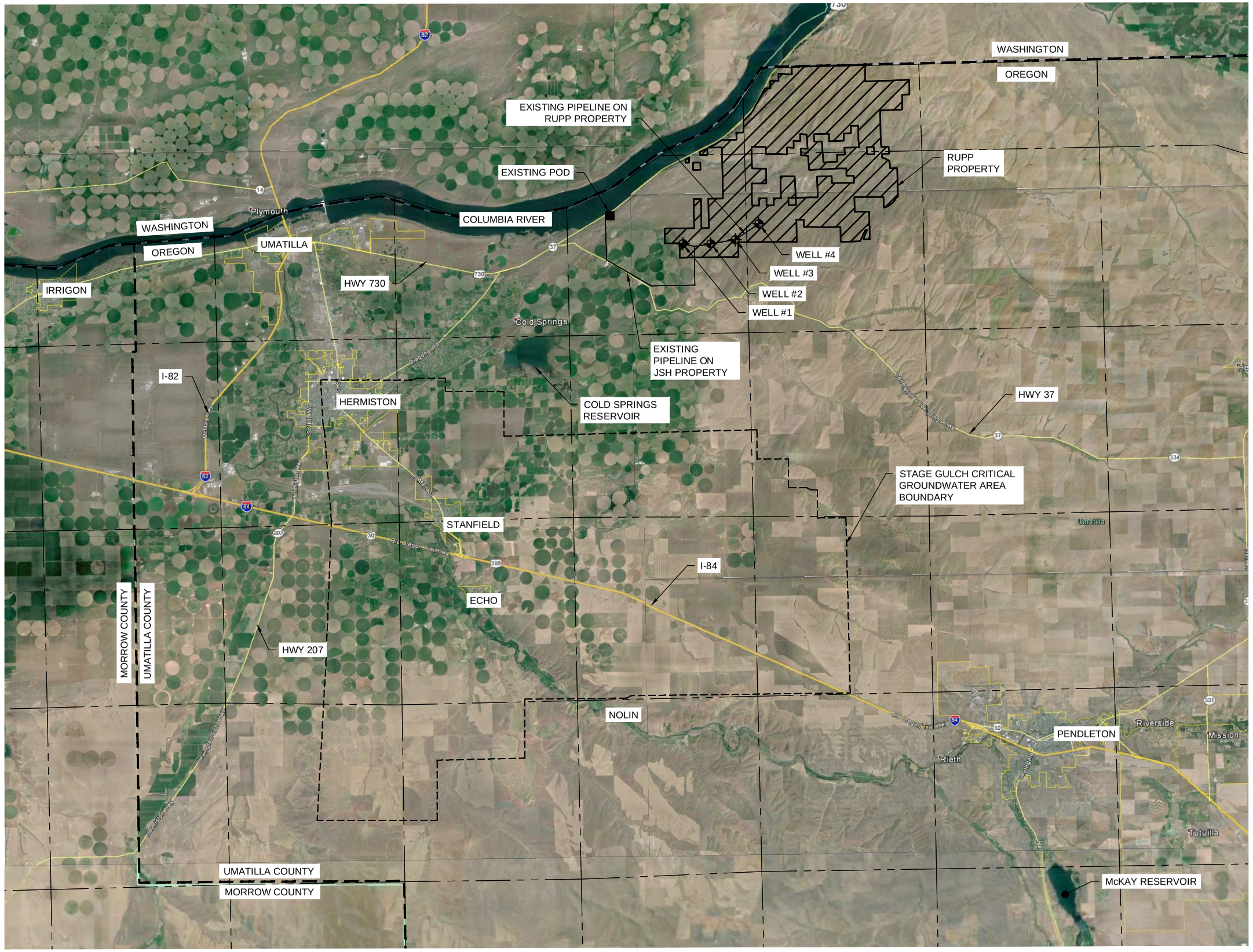
(b) ND - not detected at a concentration above the laboratory method reporting limit

© MCL - EPA maximum contaminant level

(d) NE - MCL not established

(e) pico Curries per liter

FIGURES



LEGEND

- EXISTING RUPP RANCHES WELLS
- EXISTING POINT OF DIVERSION (POD)
- RUPP PROPERTY
- TOWNSHIP LINE
- COUNTY LINE

GRAPHIC SCALE

10,000 0 10,000 20,000

(IN FEET)

EXISTING POD DESCRIPTIONS

POD 1 - COLUMBIA RIVER
2920 FEET NORTH AND 150 FEET EAST FROM THE SW CORNER OF SECTION 8, TOWNSHIP 5 NORTH, RANGE 30 EAST (W.M.)

EXISTING POA DESCRIPTIONS

WELL 1
2455 FEET SOUTH AND 2660 FEET EAST FROM THE NW CORNER OF SECTION 15, TOWNSHIP 5 NORTH, RANGE 30 EAST (W.M.)

WELL 2
2455 FEET SOUTH AND 2645 FEET EAST FROM THE NW CORNER OF SECTION 14, TOWNSHIP 5 NORTH, RANGE 30 EAST (W.M.)

WELL 3
2230 FEET SOUTH AND 2440 FEET EAST FROM THE NW CORNER OF SECTION 13, TOWNSHIP 5 NORTH, RANGE 30 EAST (W.M.)

WELL 4
646 FEET NORTH AND1156 FEET EAST FROM THE SW CORNER OF SECTION 7, TOWNSHIP 5 NORTH, RANGE 30 EAST (W.M.)

SOURCES:

- GOOGLE EARTH
- OREGON GOV. GEOSPATIAL DATA LIBRARY

BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY

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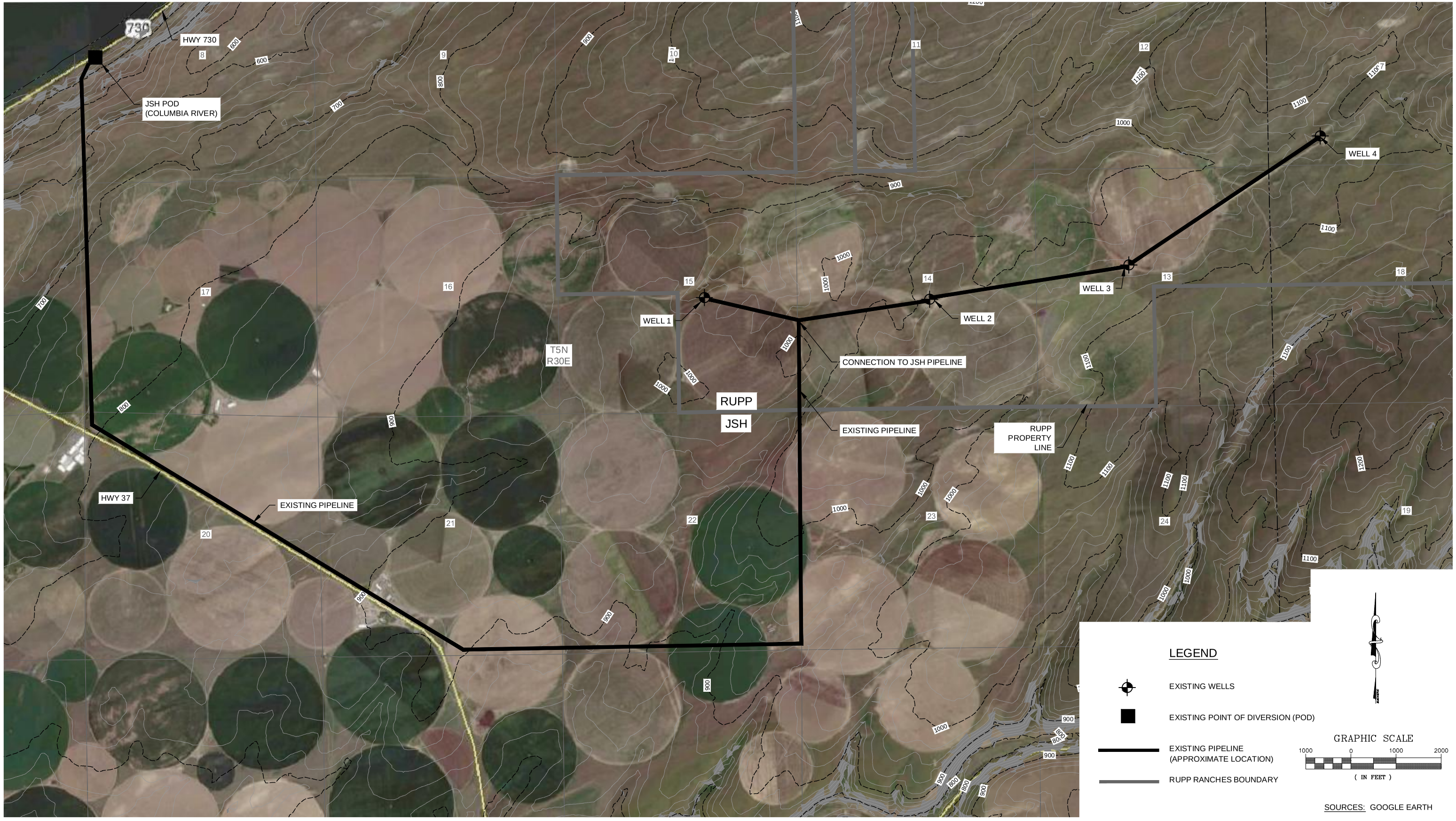
ALT — DRAWN BY
RPK — CHECKED BY
12/04/2015 — DRAWING DATE

RUPP RANCHES ASR TEST PROGRAM

AREA VICINITY MAP

FIGURE NO. 1



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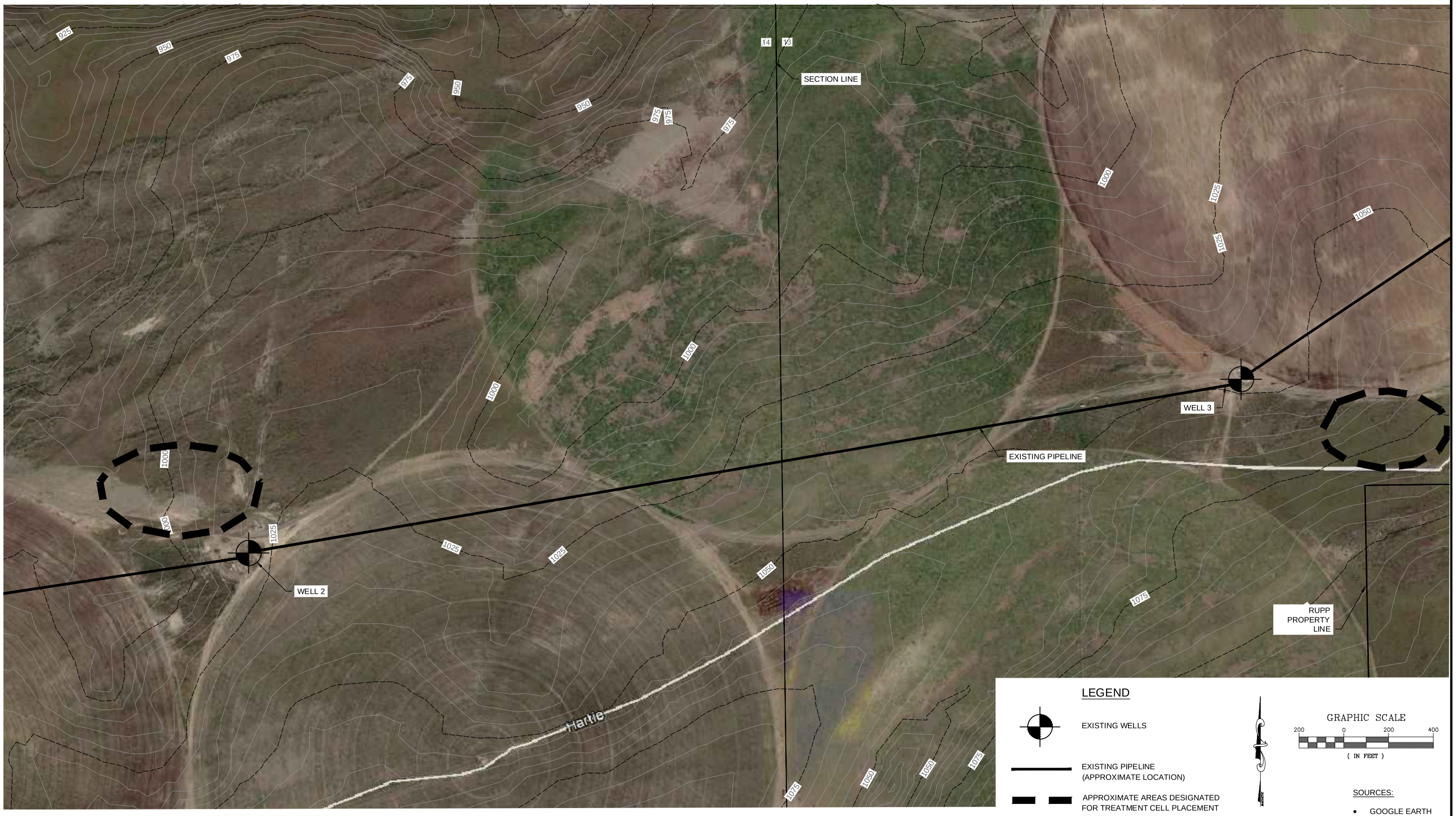
RUPP RANCHES ASR TEST PROGRAM

PROPERTY FEATURES

FIGURE NO.

2



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RUPP RANCHES ASR TEST PROGRAM

ASR TREATMENT TEST SITES
PREFERRED (WELL 2) & ALTERNATE (WELL 3)
TEST SITE LOCATIONS

FIGURE NO.
3

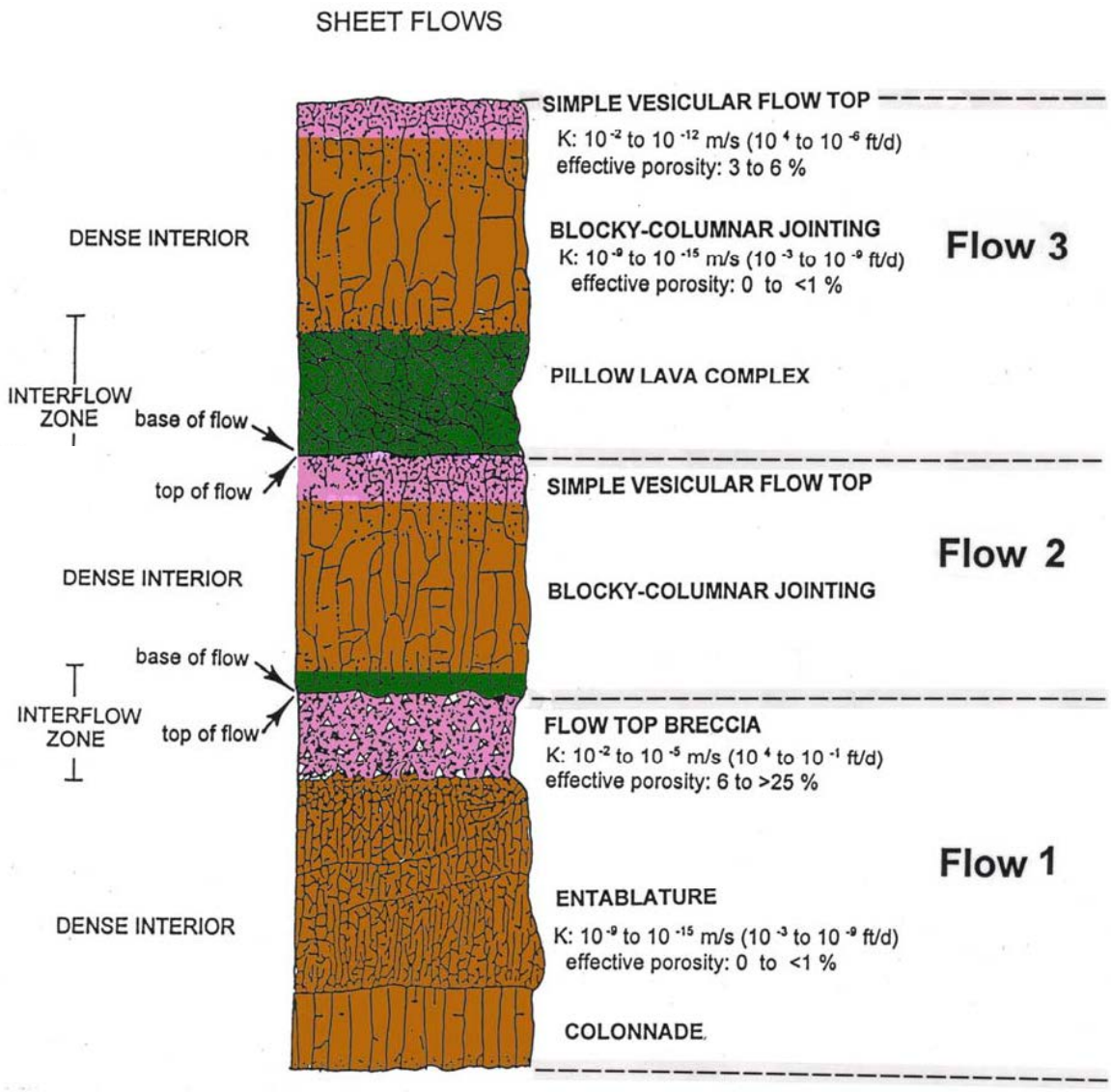


Figure 4 – Representation of Common CRBG Structures (Excerpted from GSI 2009).

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

Figure 5 – Stratigraphy of CRBG (Excerpted from GSI 2009)

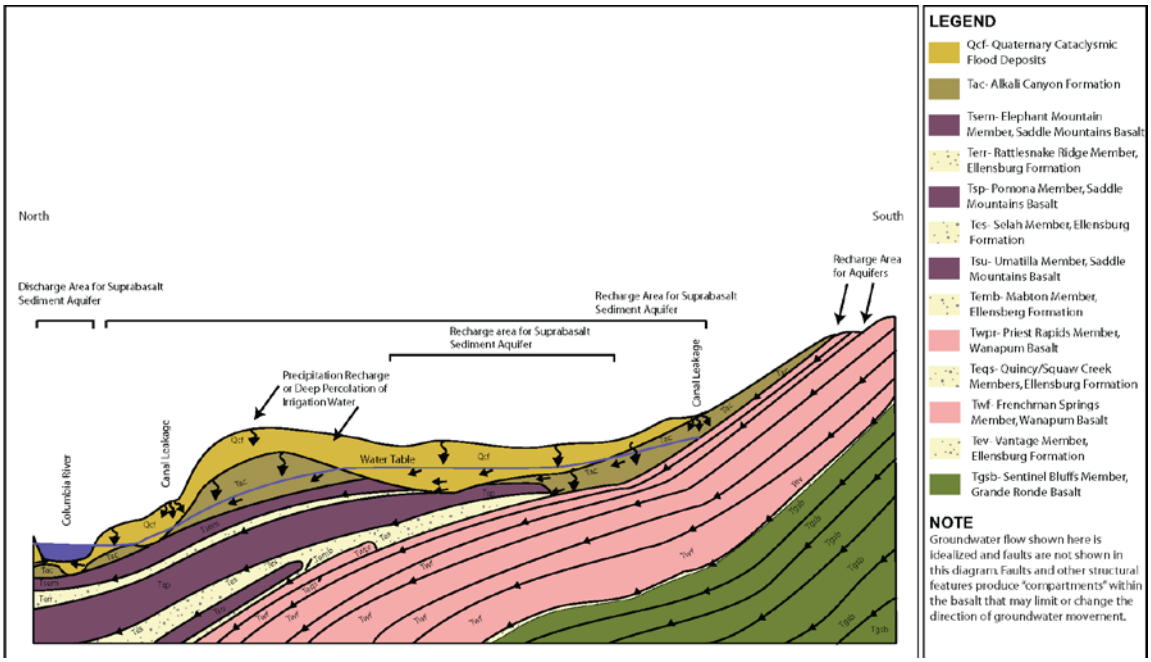
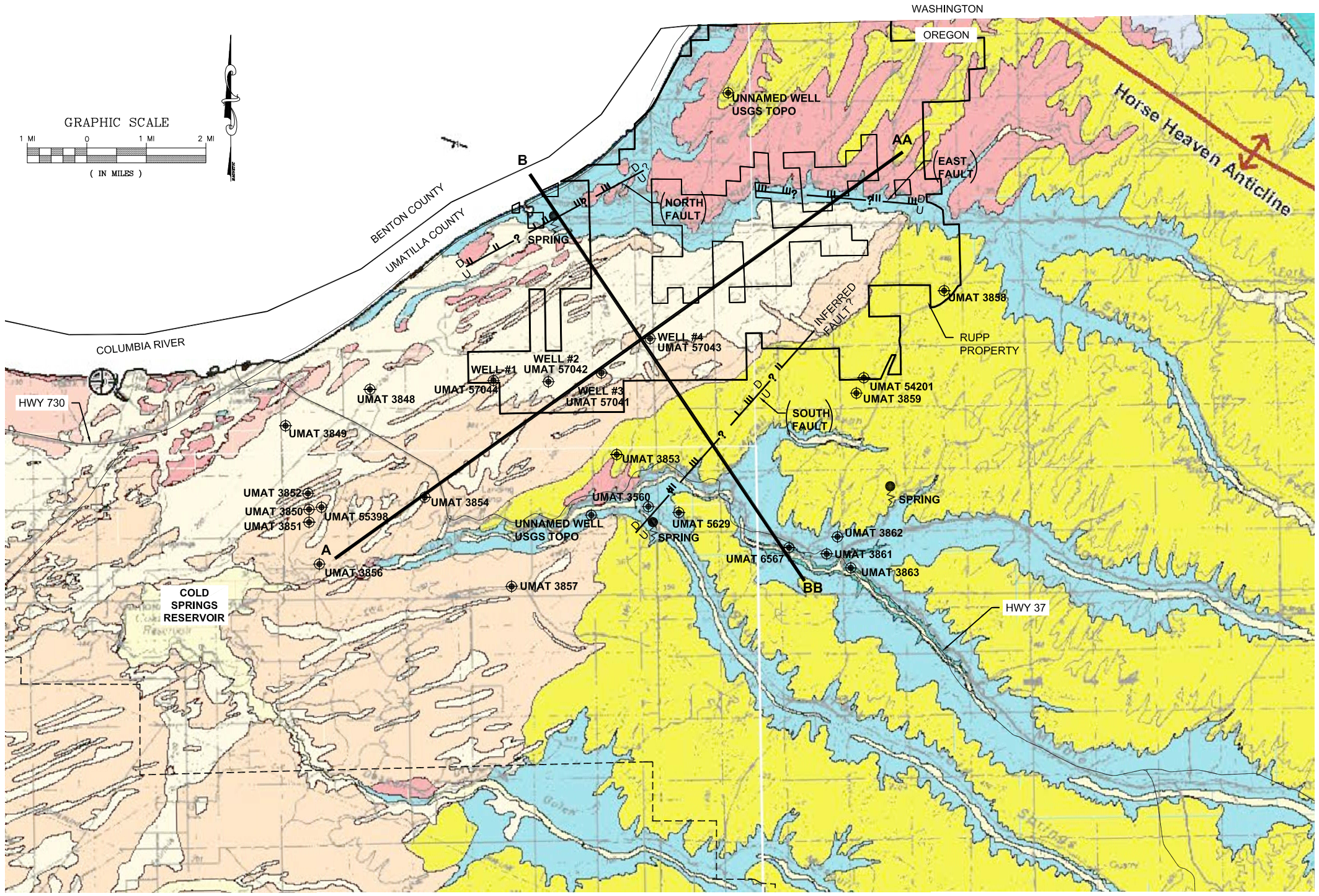


Figure 6 – Conceptual Model of Suprabasalt and CRBG Aquifers in Umatilla Basin (Excerpted from GSI 2009).



Miocene Columbia River Basalt Group

Saddle Mountains Basalt

Umatilla Member

- Tu
- Tfly — basalt of Lyons Ferry
- Tfsg — basalt of Sentinel Gap
- Tfsh — basalt of Sand Hollow

Quaternary sedimentary deposits

- Qe — eolian sand and ash
- Qal — alluvium
- Qmf — Missoula flood deposits
- QTs — older loess

SOURCE: DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES UMATILLA BASIN 2007 FILE 0-07-15.

LOCATIONS APPROXIMATE

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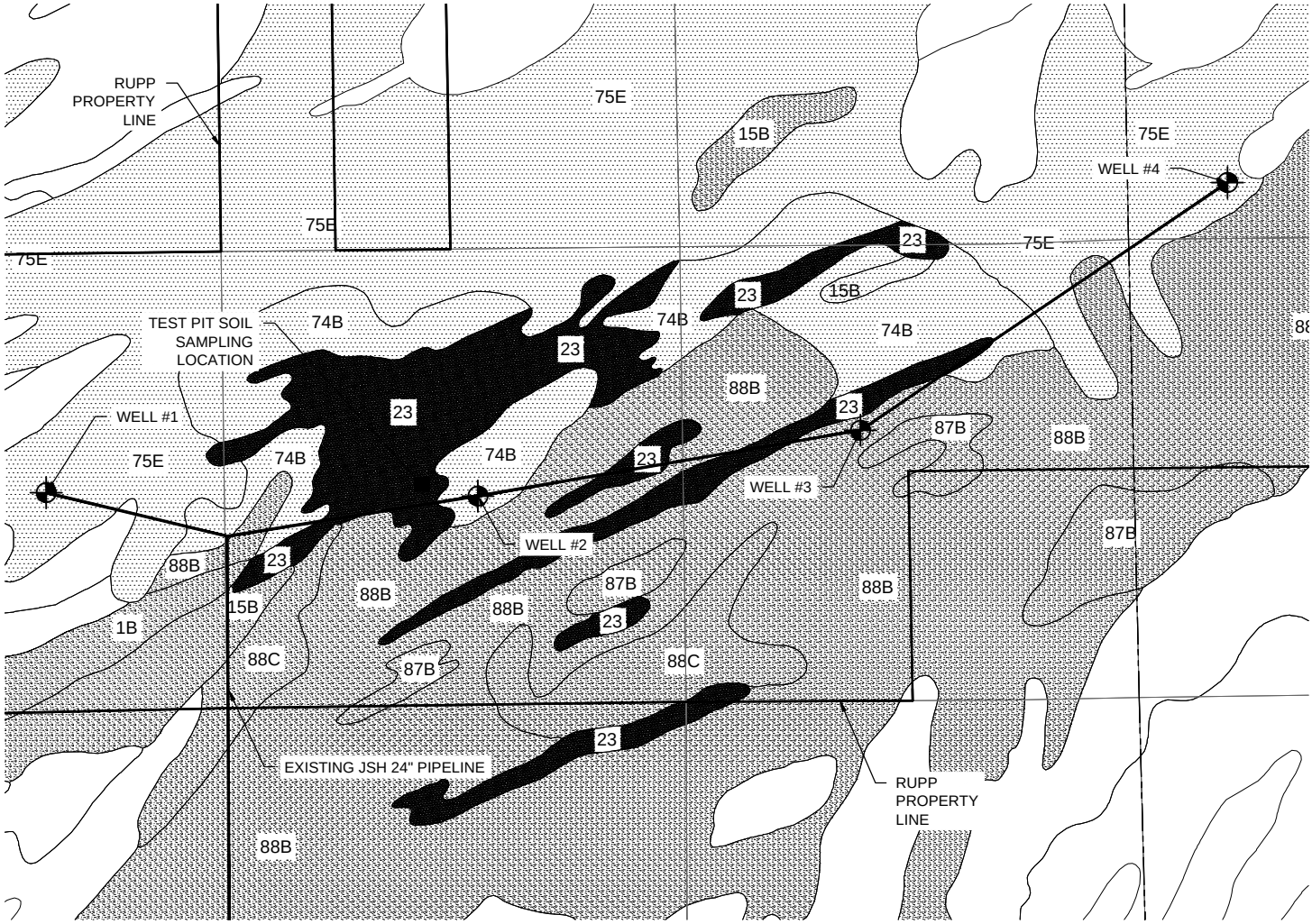
SURFACE GEOLOGY, AREA WELLS, GEOLOGIC CROSS SECTIONS

FIG 7



FINE SAND

SILT / SANDY LOAM

DUNE LAND, COARSE

NOT PROVIDED

GRAPHIC SCALE

1000 0 1000 2000

(IN FEET)

SOIL PROPERTIES*

SOIL MAP UNIT NUMBER	SOIL MAP NAME	PERMEABILITY (IN / HR)	PERMEABILITY (FT / DAY)
23	DUNE LAND	-	-
1B	ADKINS FINE SANDY LOAM, 0 TO 5 PERCENT SLOPES	0.6 - 2.0	1.2 -4.0
15B	BURKE SILT LOAM, 1 TO 7 PERCENT SLOPES	0.6 - 2.0	1.2 -4.0
74B	QUINCY FINE SAND, 0 TO 5 PERCENT SLOPES	6 - 20	12 - 40
75E	QUINCY LOAMY FINE SAND, 5 TO 25 PERCENT SLOPES	6 - 20	12 - 40
87B	SAGEHILL FINE SANDY LOAM, 2 TO 5 PERCENT SLOPES	0 - 27 INCHES DEPTH: 2.0 - 6.0 27 - 60 INCHES DEPTH: 0.6 - 2.0	0 - 27 INCHES DEPTH: 12 - 40 27 - 60 INCHES DEPTH: 1.2 - 4.0
88B	SHANO VERY FINE SANDY LOAM, 2 TO 7 PERCENT SLOPES	0.6 - 2.0	1.2 -4.0
88C	SHANO VERY FINE SANDY LOAM, 7 TO 12 PERCENT SLOPES	0.6 - 2.0	1.2 - 4.0

* "SOIL SURVEY OF UMATILLA COUNTY" NRCS (1988)

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SURFACE SOILS

NO.	DATE	BY	REVISIONS

Figure No. 8

Project No. 15-221

Drawn By ALT

Date 11/25/2015

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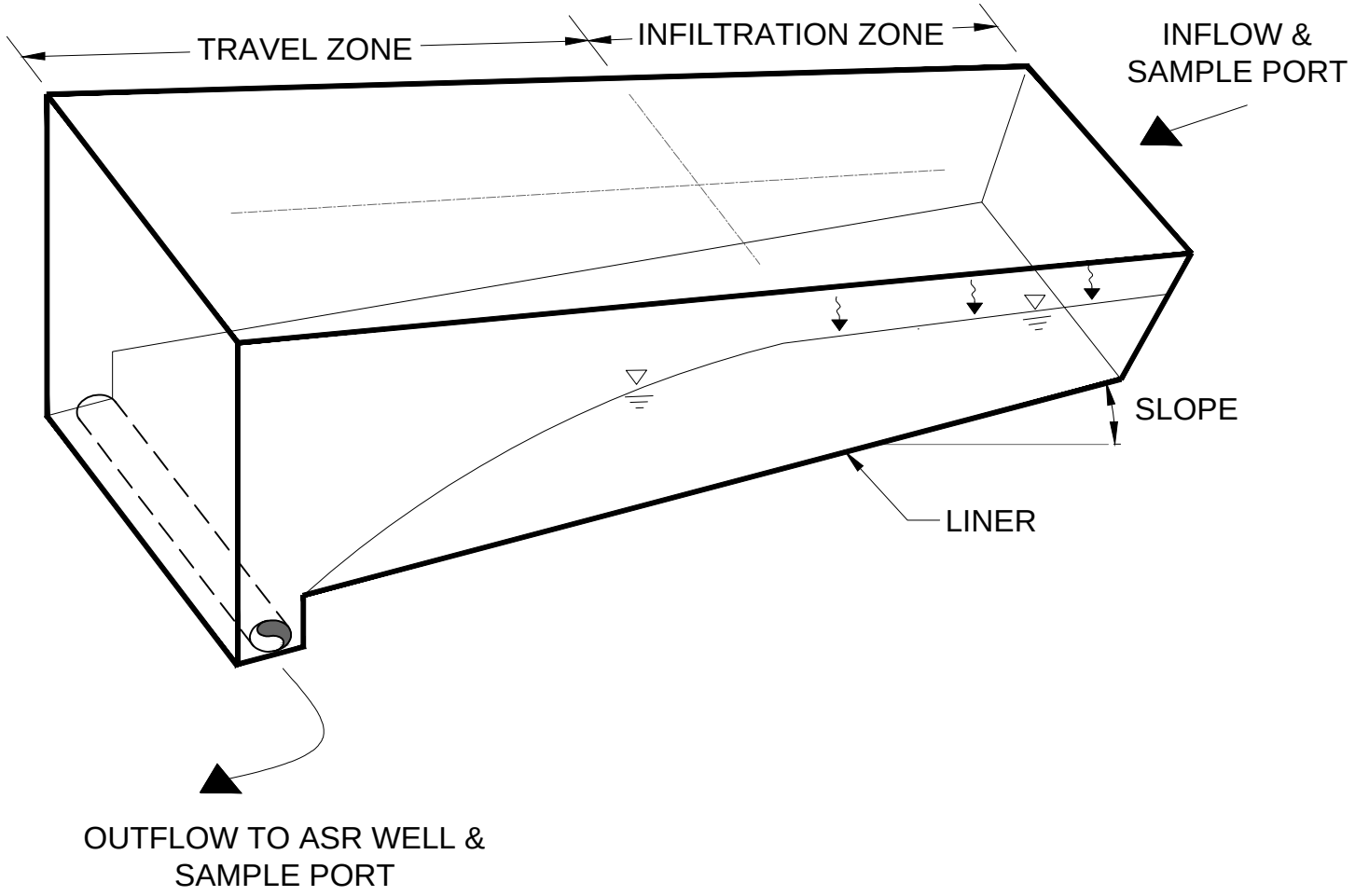

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RUPP RANCHES ASR TEST PROGRAM

WATER TREATMENT CELL
SCHEMATIC DESIGN

NO.	DATE	BY	REVISIONS

Figure No.	9
Project No.	15-221
Drawn By	ALT
Date	11/25/2015

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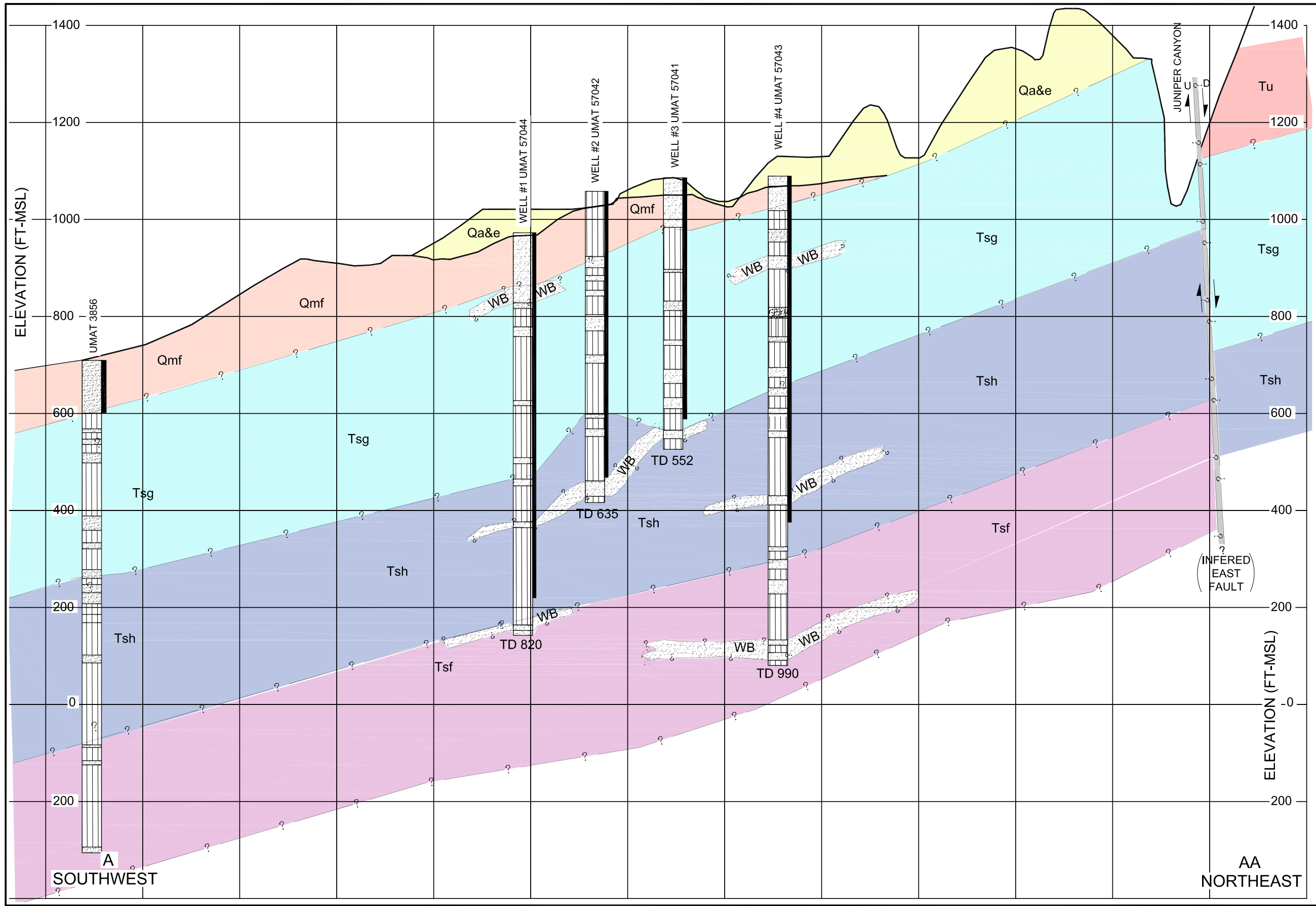


LEGEND

QUATAINARY DEPOSITS			Qa+e	QUATANARY ALLUVIAL & EOLIAN DEPOSITS
			Qmf	MISSOULA FLOOD DEPOSITS
COLUMBIA RIVER BASALT GROUP	SADDLE MOUNTAIN BASALT	UMATILLA MEMBER	Tu	UMATILLA MEMBER
	WANAPUM BASALT	FRENCHMAN SPRINGS MEMBER	Tsg	BASALT OF THE SENTINEL GAP
			Tsh	BASALT OF THE SAND HOLLOW
			Tsf	BASALT OF THE SILVER FALLS

NOTES:

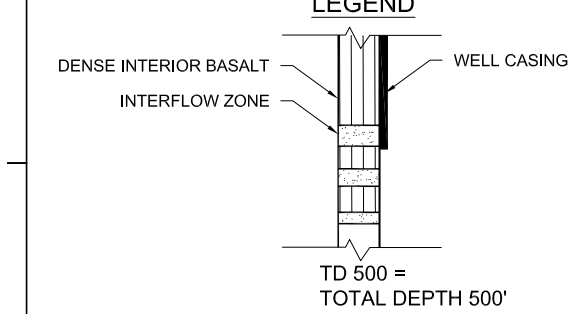
UNIT SYMBOLS AND DESIGNATIONS: DOGAMI OPEN FILE 0-07-15

RUPP WELL LOCATION AS MEASURED IN THE FIELD. WELL HEAD ELEVATIONS AS SURVEYED BY IRZ CONSULTING, INC.

AREA WELL LOCATIONS TO QUARTER-QUARTER SECTION APPROXIMATION. WELL HEAD ELEVATIONS AS READ ON USGS TOPOGRAPHIC MAP.

WB = WATER BEARING

LEGEND



HORIZONTAL
GRAPHIC SCALE

2500 0 2500 5000

(IN MILES)

RUPP RANCHES
UMATILLA COUNTY, OR
T5N, R30E, WM & T5N, R31E, WM

AKANA
Plan + Design + Engineer + Manage

6400 SE Lake Road, Ste 270
Portland, Oregon 97222
Voice (503) 652-9090

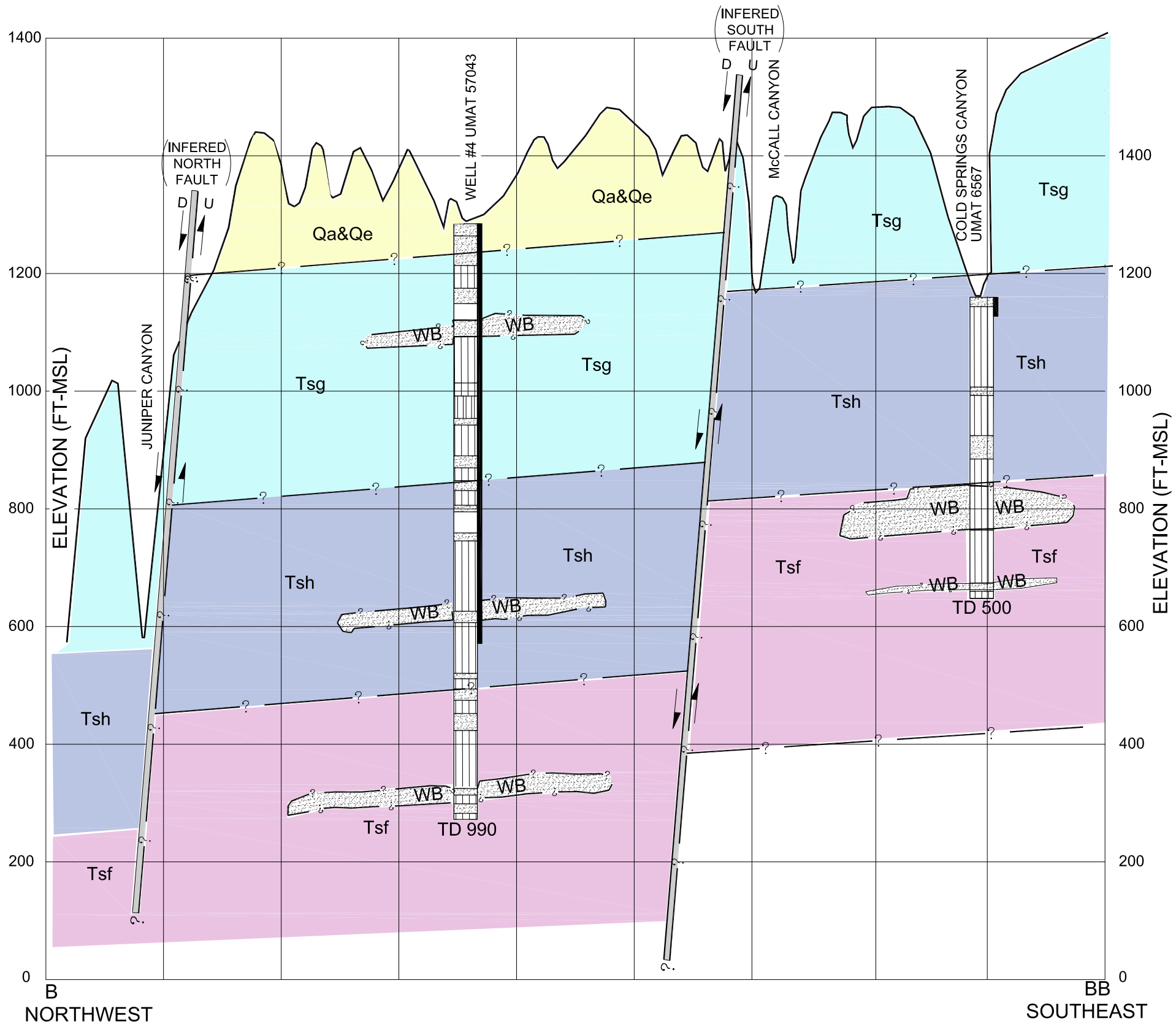
NO.	DATE	BY	REVISIONS

SA	DESIGNED BY
NLO	DRAWN BY
RL	CHECKED BY
12-11-2015	DRAWING DATE

RUPP RANCHES ASR TEST PROGRAM

GENERALIZED GEOLOGIC CROSS SECTION A - AA

Fig 10



LEGEND

QUATANARY DEPOSITS			Qa+e	QUATANARY ALLUVIAL & EOLIAN DEPOSITS
QUATANARY DEPOSITS			Qmf	MISSOULA FLOOD DEPOSITS
COLUMBIA RIVER BASALT GROUP	SADDLE MOUNTAIN BASALT	UMATILLA MEMBER	Tu	UMATILLA MEMBER
COLUMBIA RIVER BASALT GROUP	WANAPUM BASALT	FRENCHMAN SPRINGS MEMBER	Tsg	BASALT OF THE SENTINEL GAP
COLUMBIA RIVER BASALT GROUP	WANAPUM BASALT	FRENCHMAN SPRINGS MEMBER	Tsh	BASALT OF THE SAND HOLLOW
COLUMBIA RIVER BASALT GROUP	WANAPUM BASALT	FRENCHMAN SPRINGS MEMBER	Tsf	BASALT OF THE SILVER FALLS
COLUMBIA RIVER BASALT GROUP	WANAPUM BASALT	FRENCHMAN SPRINGS MEMBER	Tgk	BASALT OF THE GINKO

NOTES:

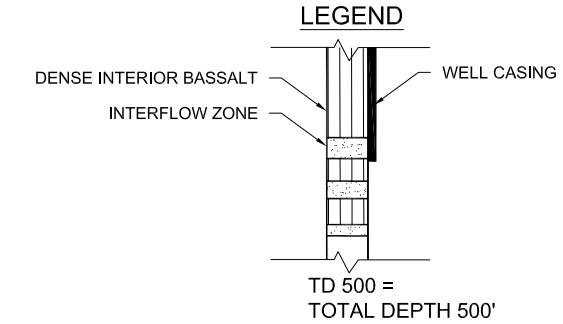
UNIT SYMBOLS AND DESIGNATIONS: DOGAMI OPEN FILE 0-07-15

RUPP WELL LOCATION AS MEASURED IN THE FIELD. WELL HEAD ELEVATIONS AS SURVEYED BY IRZ CONSULTING, INC.

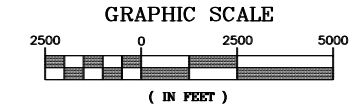
AREA WELL LOCATIONS TO QUARTER-QUARTER SECTION APPROXIMATION. WELL HEAD ELEVATIONS AS READ ON USGS TOPOGRAPHIC MAP.

WB = WATER BEARING

LEGEND



HORIZONTAL GRAPHIC SCALE



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T5N, R30E, WM & T5N, R31E, WM

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Voice (503) 652-9090

NO.	DATE	BY	REVISIONS

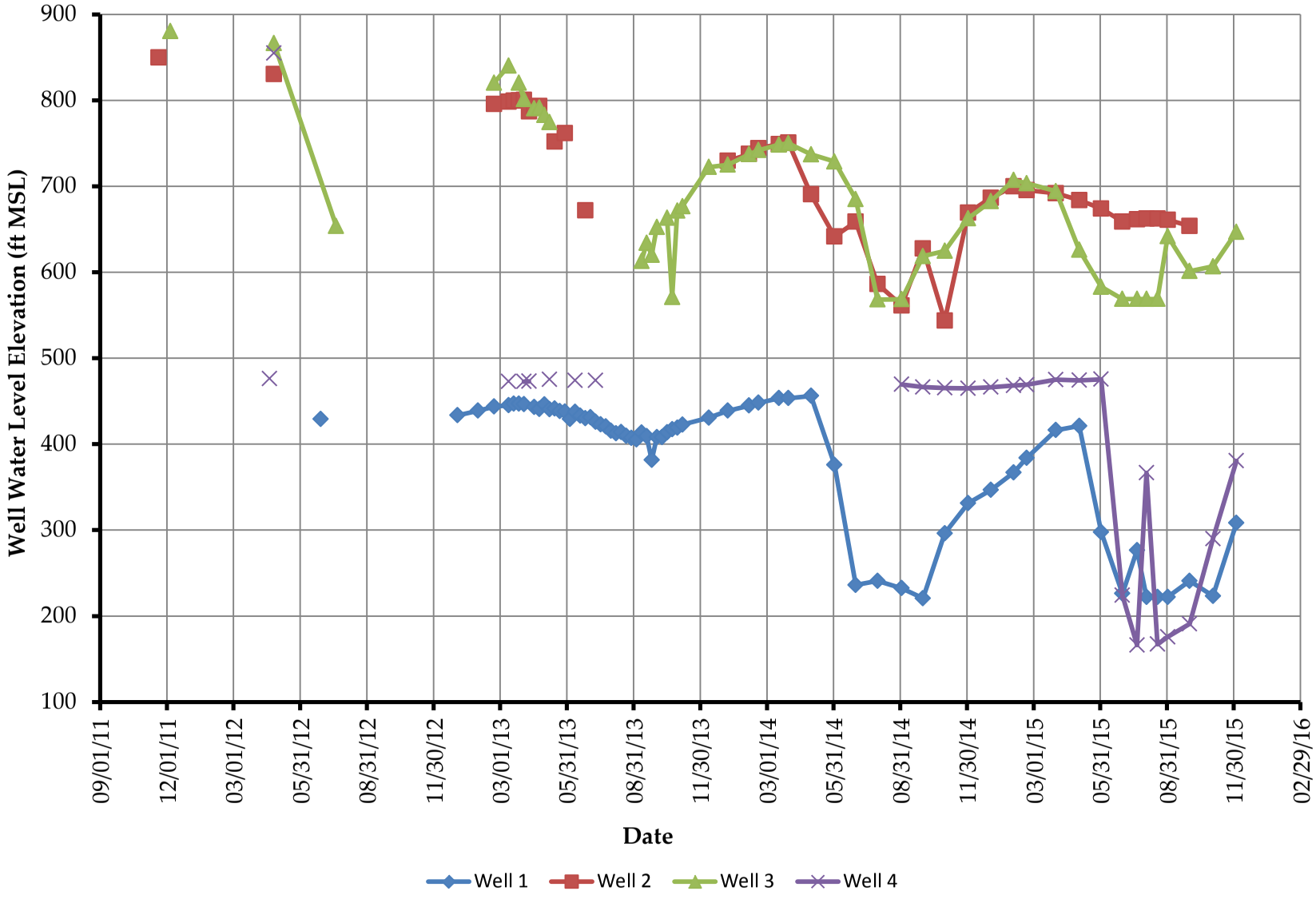
DESIGNED BY	RL
DRAWN BY	NLO
CHECKED BY	SA
DRAWING DATE	12-11-2015

RUPP RANCHES ASR TEST PROGRAM

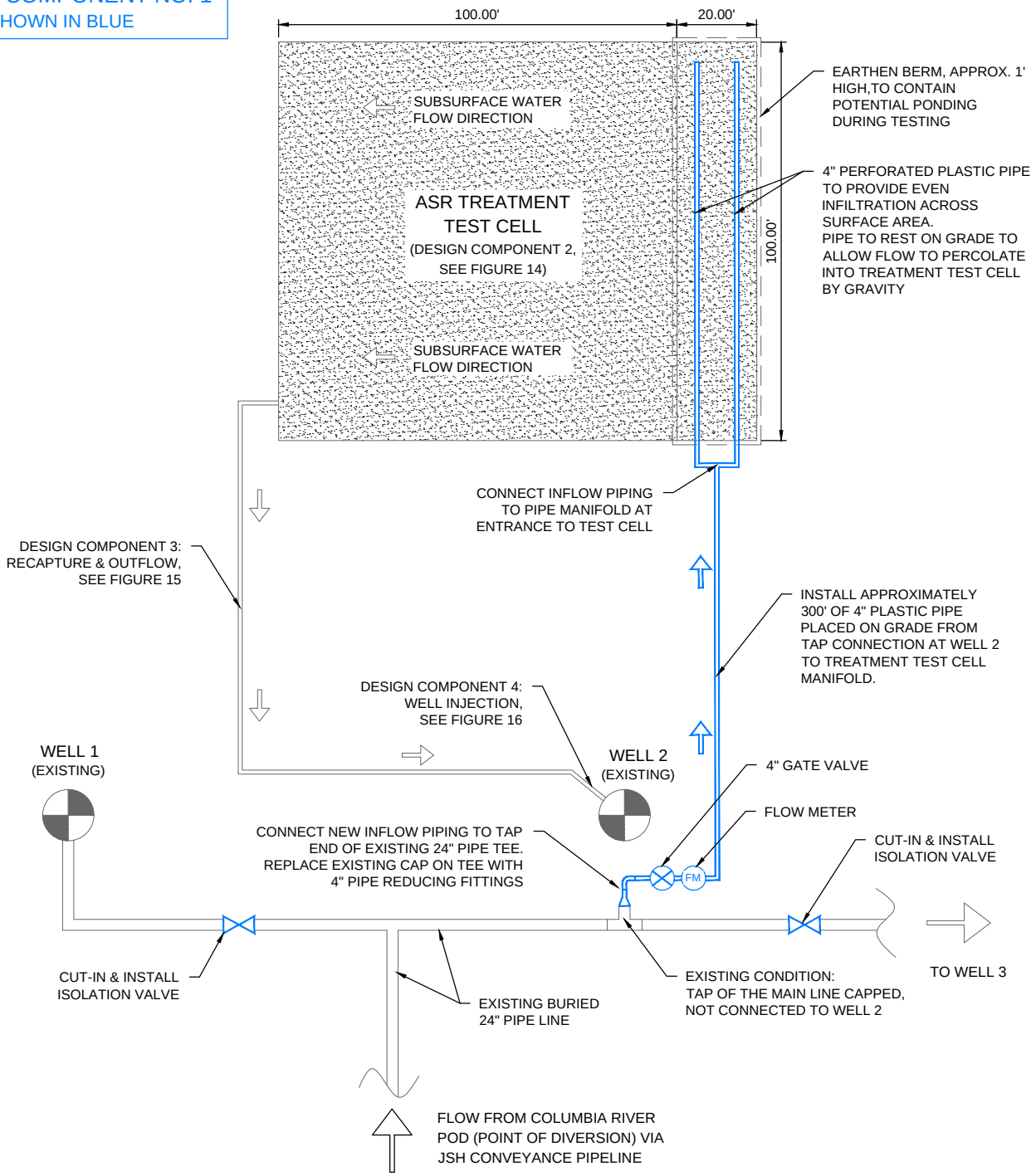
GENERALIZED GEOLOGIC CROSS SECTION B-BB

Fig 11

Figure 12 – Water Level Elevations in Rupp Ranches Wells, 2011-2015



ASR TEST SYSTEM
DESIGN COMPONENT NO. 1
SHOWN IN BLUE



NOTES:

DIMENSIONS & LOCATIONS SUBJECT TO CHANGE BASED ON FIELD CONDITIONS

PLAN VIEW

SCALE: NONE

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RUPP RANCHES ASR TEST PROGRAM

SURFACE WATER INFLOW STRUCTURE:
SCHEMATIC OF DESIGN COMPONENT NO. 1

NO.	DATE	BY	REVISIONS

Figure No. 13

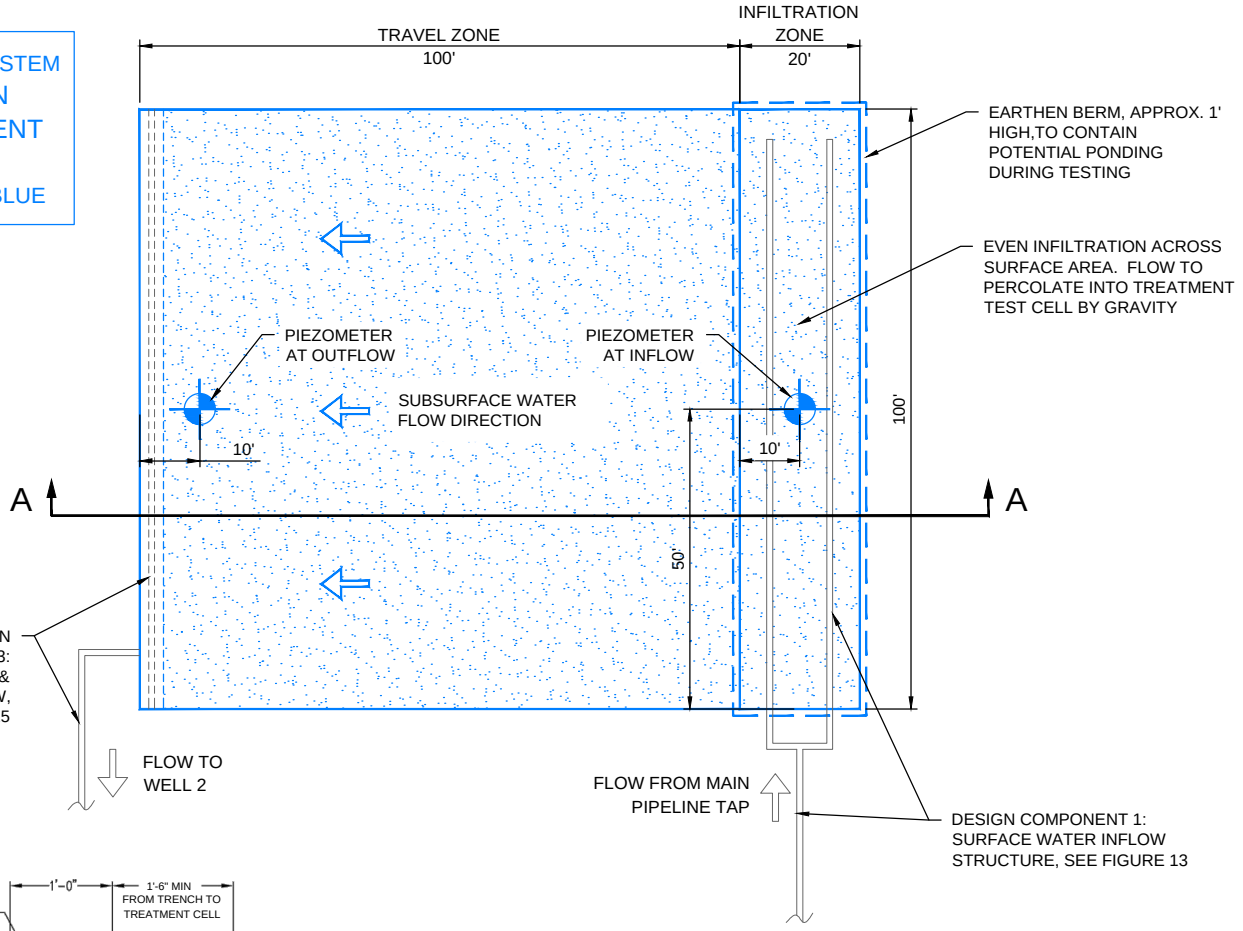
Project No. 15-221

Drawn By ALT

Date 11/20/2015

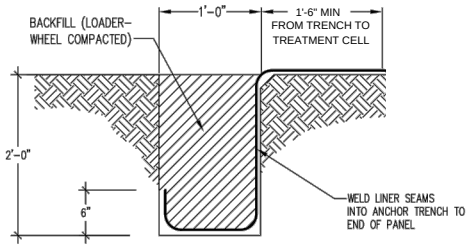
P:\PDX PROJECTS\2015\15-221 Rupp ASR Testing\CAD\2-Sheets\Civil\Schematic - Part 1 of ASR test system.dwg 12/14/2015 4:33 PM

ASR TEST SYSTEM
DESIGN
COMPONENT
NO. 2
SHOWN IN BLUE



PLAN VIEW

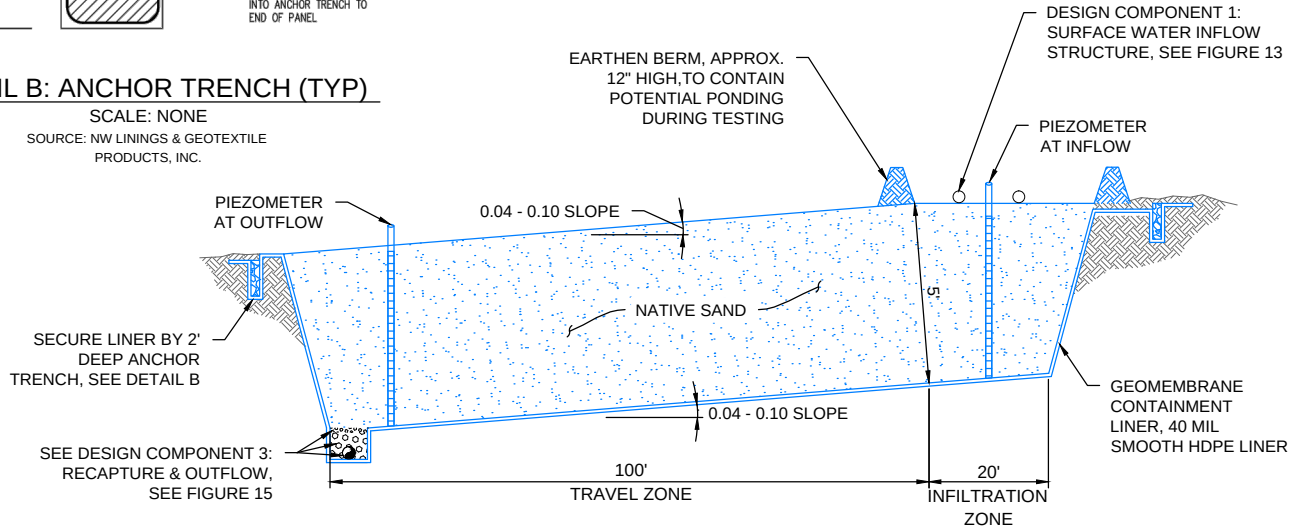
SCALE: NONE



DETAIL B: ANCHOR TRENCH (TYP)

SCALE: NONE

SOURCE: NW LININGS & GEOTEXTILE PRODUCTS, INC.



PROFILE VIEW: A-A

SCALE: NONE

NOTES:

DIMENSIONS & LOCATIONS SUBJECT TO CHANGE BASED ON FIELD CONDITIONS

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RUPP RANCHES ASR TEST PROGRAM

ASR TREATMENT TEST CELL:
SCHEMATIC OF DESIGN COMPONENT NO. 2

NO.	DATE	BY	REVISIONS

Figure No. 14

Project No. 15-221

Drawn By ALT

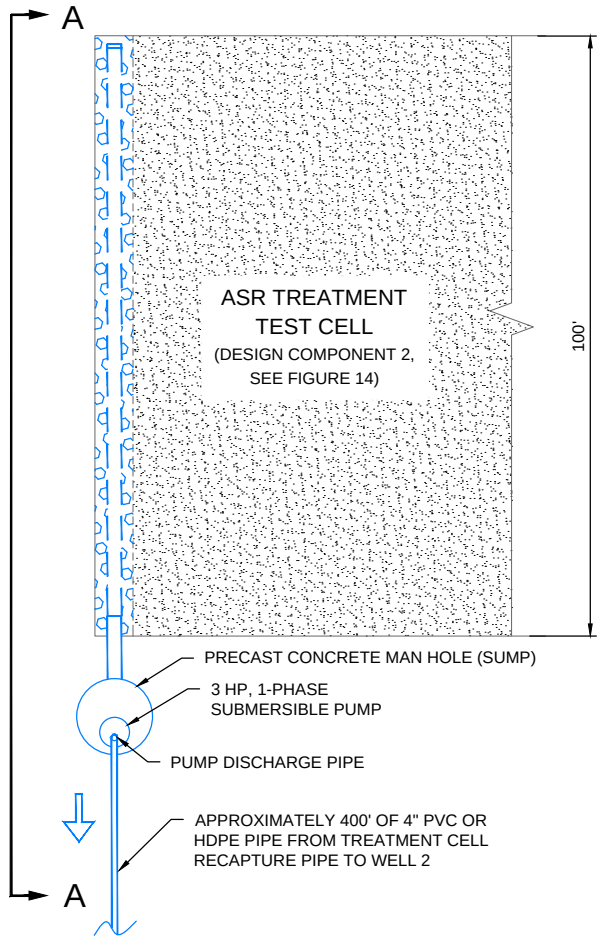
Date 11/24/2015

P:\PDX PROJECTS\2015\15-221 Rupp ASR Testing\CAD\2-Sheets\Civil\Schematic - Part 2 of ASR test system.dwg 12/14/2015 4:33 PM

ASR TEST SYSTEM
DESIGN COMPONENT NO. 3
SHOWN IN BLUE

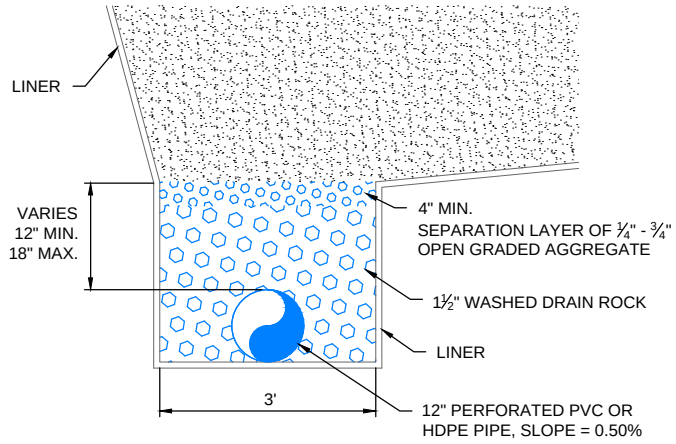
NOTES:

DIMENSIONS & LOCATIONS SUBJECT TO CHANGE BASED ON FIELD CONDITIONS



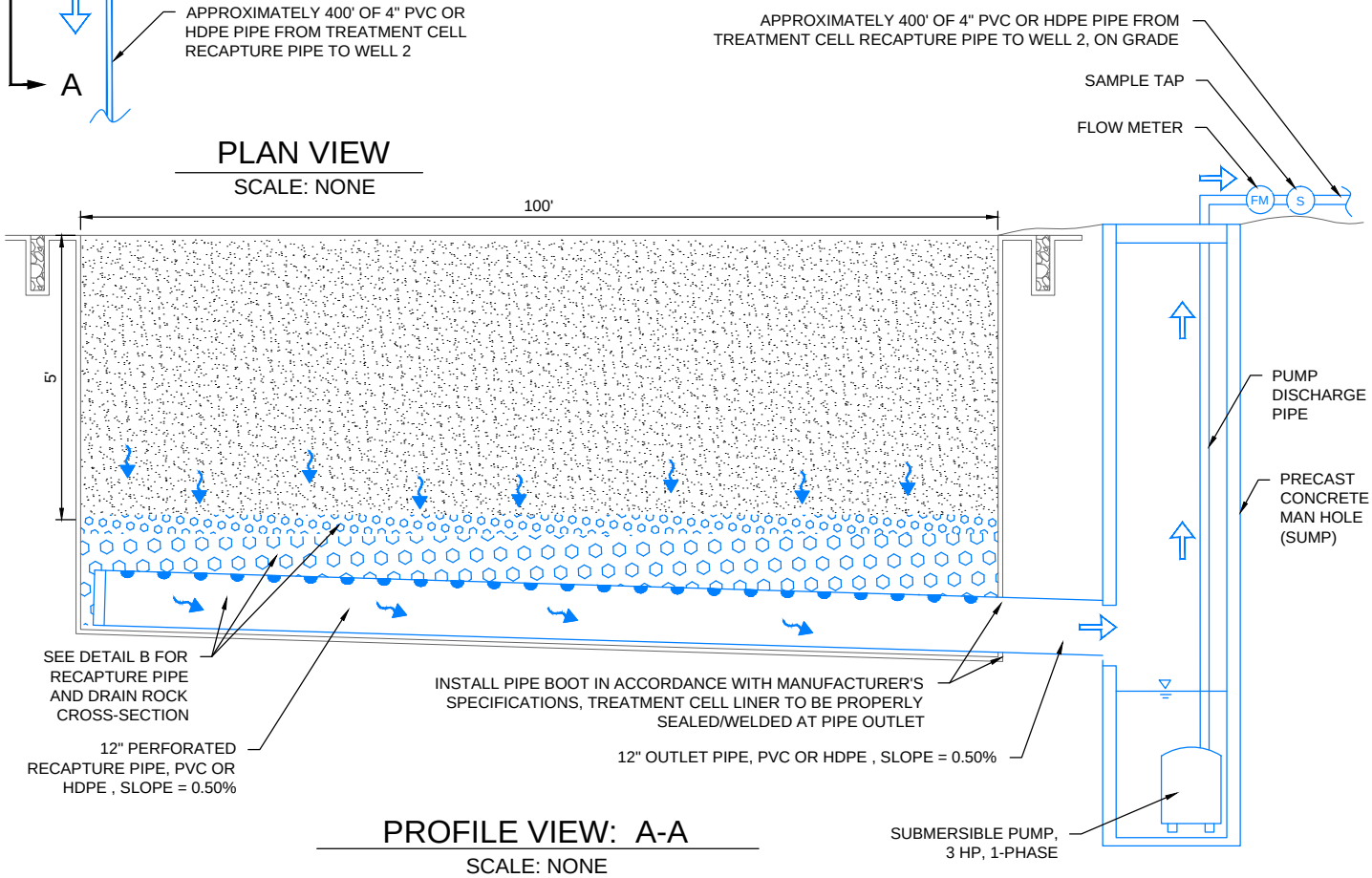
PLAN VIEW

SCALE: NONE



DETAIL B: RECAPTURE PIPE

SCALE: NONE



PROFILE VIEW: A-A

SCALE: NONE

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RUPP RANCHES ASR TEST PROGRAM

RECAPTURE & OUTFLOW STRUCTURE:
SCHEMATIC OF DESIGN COMPONENT NO. 3

NO.	DATE	BY	REVISIONS

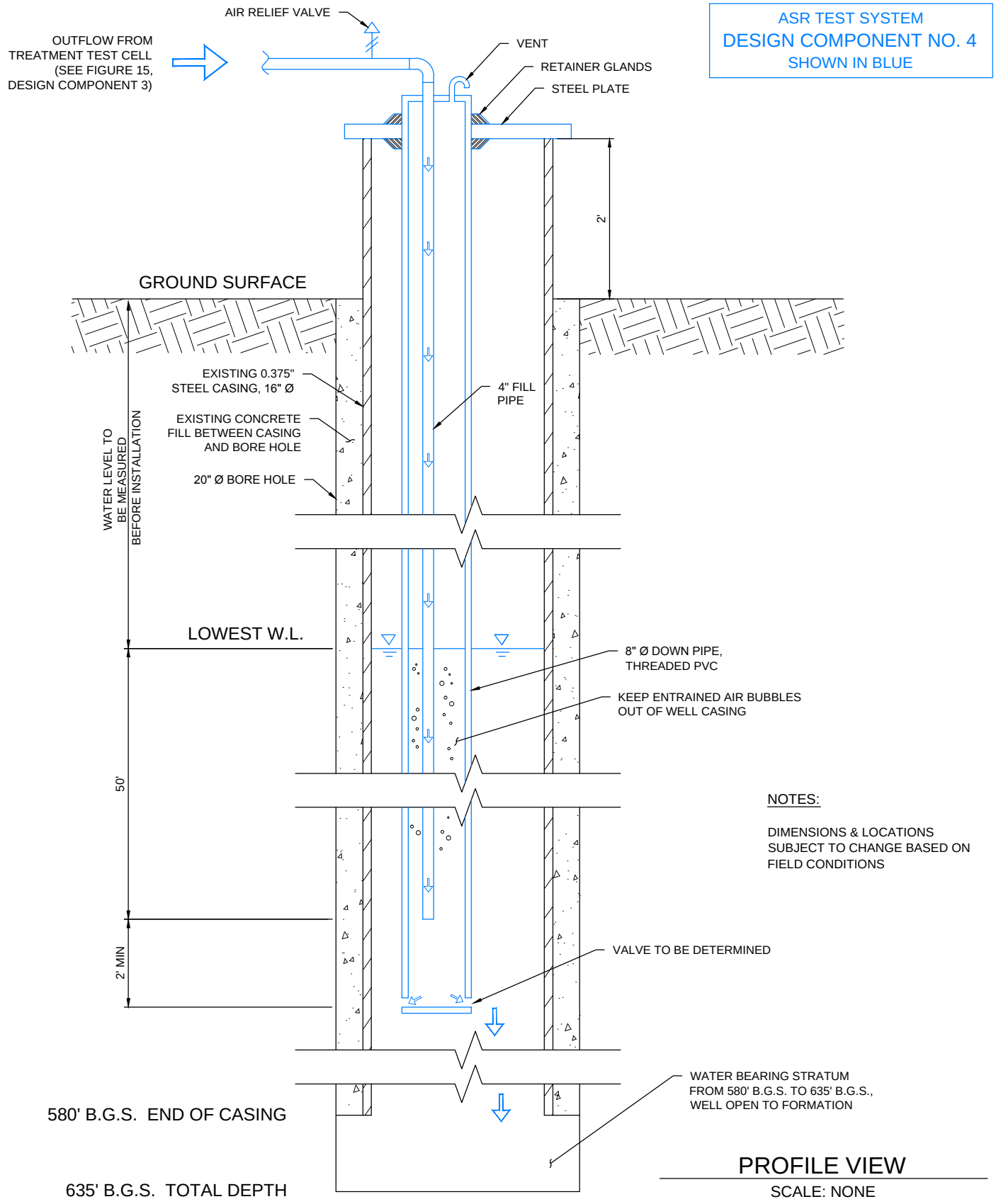
Figure No. 15

Project No. 15-221

Drawn By ALT

Date 11/25/2015

P:\PDX PROJECTS\2015\15-221 Rupp ASR Testing\CAD\2-Sheets\CivilSchematic - Part 3 of ASR test system.dwg 12/14/2015 4:34 PM



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RUPP RANCHES ASR TEST PROGRAM

WELL INJECTION:
SCHEMATIC OF DESIGN COMPONENT NO. 4

NO.	DATE	BY	REVISIONS

Figure No.	16
Project No.	15-221
Drawn By	ALT
Date	11/25/2015

P:\PDX PROJECTS\2015\15-221 Rupp ASR Testing\CAD\2-Sheets\Civil\Schematic - Part 4 of ASR test system.dwg 12/14/2015 4:34 PM

APPENDICES

Appendix A

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.
9120 SW Pioneer Court, Suite B • Wilsonville, Oregon 97070 503/682-1880 FAX: 503/682-2753

TECHNICAL REPORT

Report To:	Mr. Said Amali, P.E. Akana 6400 SE Lake Rd, Suite 270 Portland, Oregon 97222	**Date:** **Lab No.:**	11/12/15 15-385
Project:	Laboratory Testing	**Project No.:**	2995.1.1

Report of: Atterberg limits, sieve analysis and classification of soils

Sample Identification

NTI completed Atterberg limits, sieve analysis and classification of soil testing on samples delivered to our laboratory on November 9, 2015. Testing was performed in accordance with the standards indicated. Our laboratory test results are summarized on the following tables and attached pages.

Laboratory Test Results

Atterberg Limits (ASTM D4318)			
Sample ID	**Liquid Limit**	**Plastic Limit**	**Plasticity Index**
0 – 12"	NP	NP	NP

NP = non-plastic

Sieve Analysis of Aggregate (ASTM C136/ C117)	
Sieve Size	**0 – 12" Percent Passing**
#4	100
#8	100
#10	100
#16	100
#30	99
#40	92
#50	70
#100	24
#200	7.3

Note: D_{90} = 0.40mm, D_{85} = 0.36mm, D_{60} = 0.28mm, D_{50} = 0.24mm, D_{30} = 0.18mm, & D_{10} = 0.09mm

Attachments: Laboratory Test Results
Gradation Test Results

Copies: Addressee

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Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.
9120 SW Pioneer Court, Suite B • Wilsonville, Oregon 97070 503/682-1880 FAX: 503/682-2753

TECHNICAL REPORT

Report To:	Mr. Said Amali, P.E. Akana 6400 SE Lake Rd, Suite 270 Portland, Oregon 97222	**Date:** **Lab No.:**	11/12/15 15-385
Project:	Laboratory Testing	**Project No.:**	2995.1.1

Laboratory Test Results

Atterberg Limits (ASTM D4318)			
Sample ID	**Liquid Limit**	**Plastic Limit**	**Plasticity Index**
13" – 24"	NP	NP	NP

NP = non-plastic

Sieve Analysis of Aggregate (ASTM C136/ C117)	
Sieve Size	**13" – 24" Percent Passing**
#4	100
#8	100
#10	100
#16	100
#30	99
#40	97
#50	89
#100	55
#200	23.4

Note: D_{90} = 0.31mm, D_{85} = 0.28mm, D_{60} = 0.16mm, D_{50} = 0.24mm, D_{30} = 0.099mm, & D_{10} = Not determined

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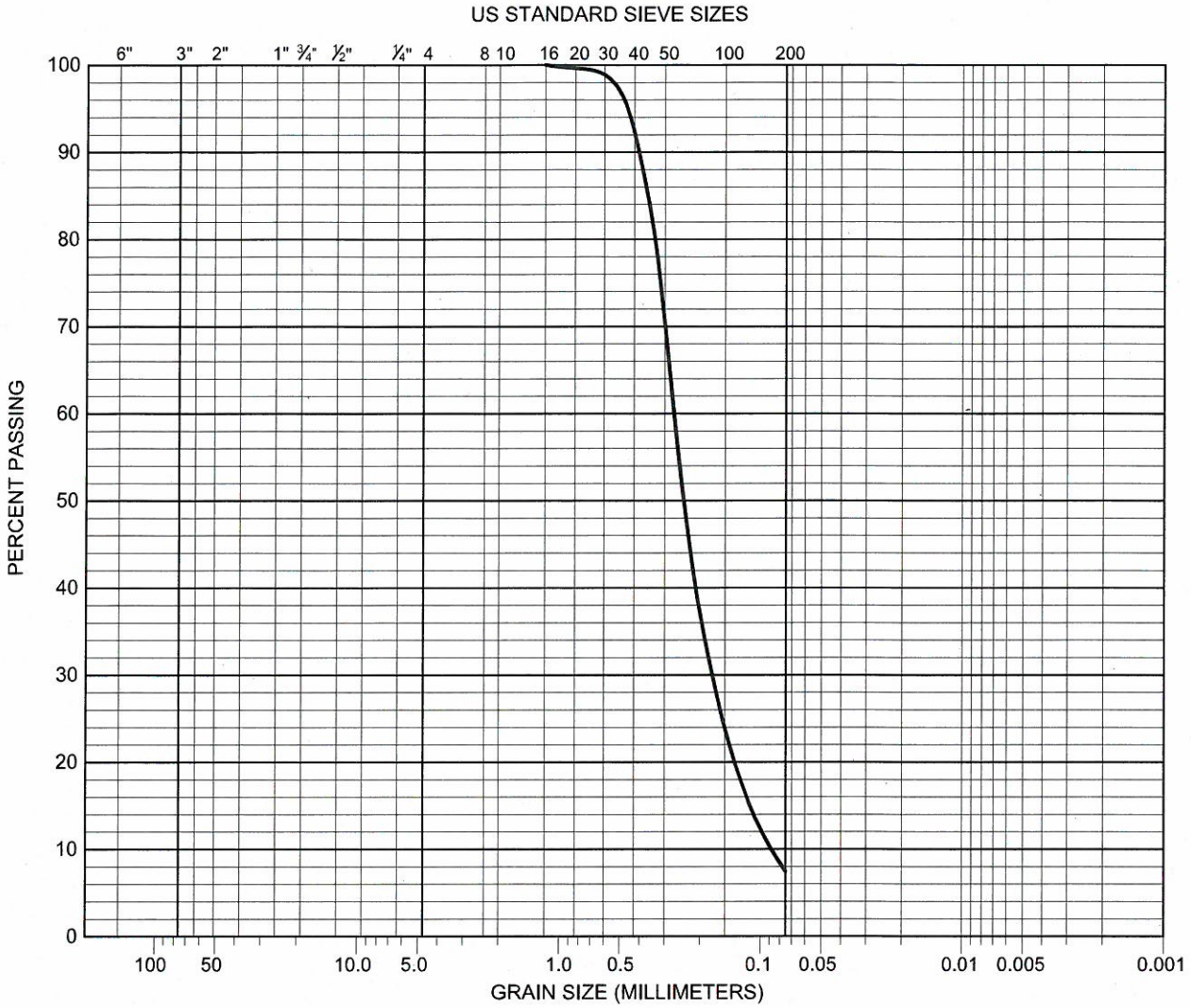


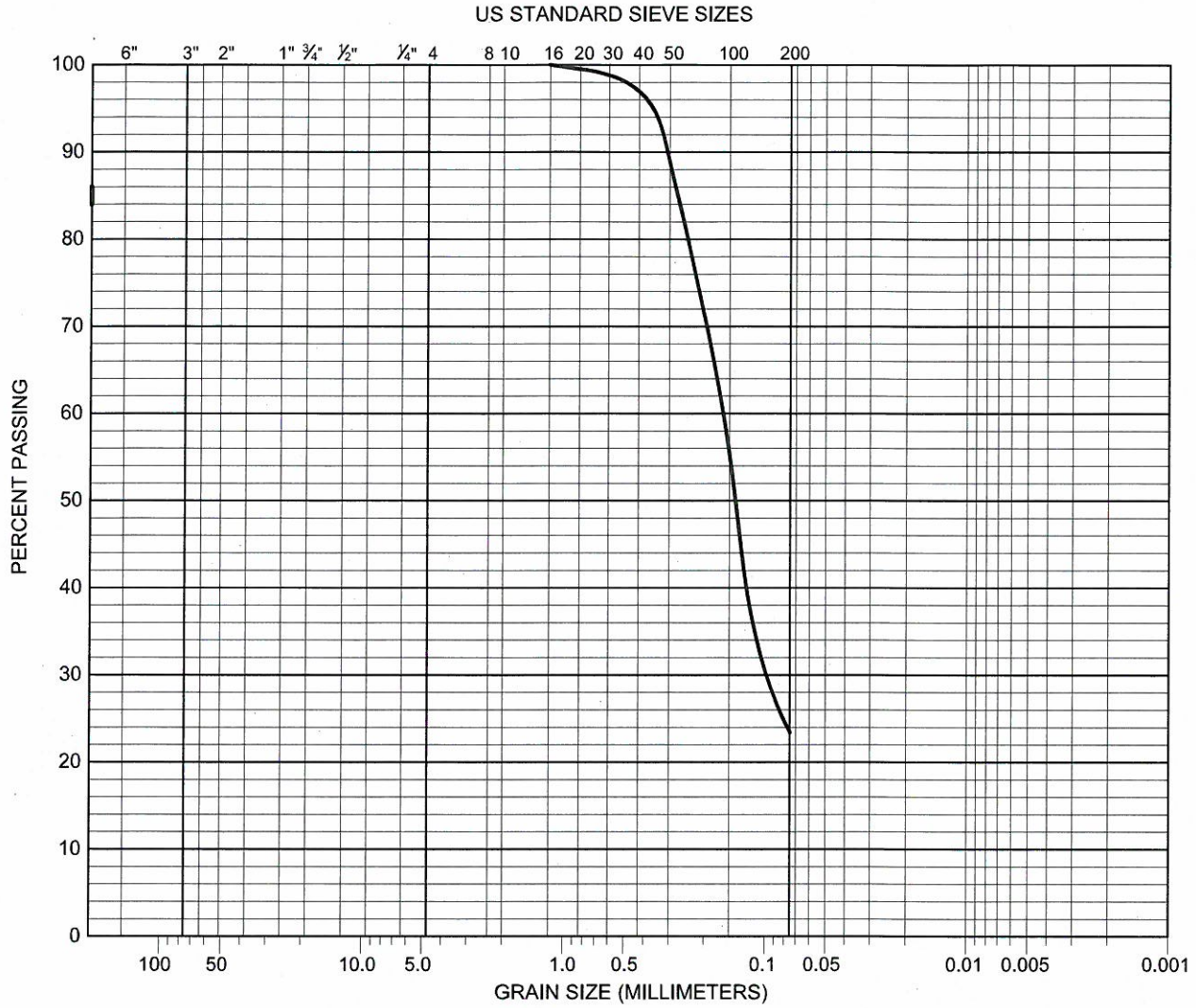
COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	
0%	0%	0%	0%	8%	84.7%	7.3%

SYMBOL	SAMPLE LOCATION	FIELD MOISTURE (%)	% PASSING NO. 200 SIEVE	% PASSING 2 μ	UNIFIED SOIL CLASSIFICATION
———	0 - 12"	--	7.3	--	SP-SM

GRADATION TEST RESULTS - ASTM D422

PROJECT NO. 2995.1.1	AKANA LABORATORY TESTING	LAB NO. 15-385

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	
0%	0%	0%	0%	3%	73.6%	23.4%

SYMBOL	SAMPLE LOCATION	FIELD MOISTURE (%)	% PASSING NO. 200 SIEVE	% PASSING 2 μ	UNIFIED SOIL CLASSIFICATION
———	13" - 24"	--	23.4	--	SM

GRADATION TEST RESULTS - ASTM D422

PROJECT NO. 2995.1.1	AKANA LABORATORY TESTING	LAB NO. 15-385

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.

Appendix B

Well #4

UMAT 57044

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

WELL LABEL # L 108650

START CARD # 206577

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

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

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

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

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

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

BORE HOLE Dia	From	To	Material	SEAL From	To	Amount	Scks/lbs
24	0	110	Bentonite	0	110		70 40
20	110	805	Cement	0	734		24 yds
15	805	820					

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

(6) CASING/LINER

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

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

(7) PERFORATIONS/SCREENS
Perforations Method
Screens Type Material

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

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

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

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

From	To	Description	Amount	Units

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

(10) STATIC WATER LEVEL

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

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found

SWL Date	From	To	Est Flow	SWL (psi)	+	SWL (ft)
6-7-12	133	147				121
6-11-12	582	597				121
6-15-12	390	605				360
6-29-12	790	805				517

(11) WELL LOG Ground Elevation

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

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

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

RECEIVED BY OWRD
JUL 16 2012
SALEM, OR

License Number Date
Signed

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

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

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

UMAT 57044

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

WELL LABEL # L 108650

START CARD # 200577

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

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

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

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

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

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

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

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

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd

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

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

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

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

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

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

From	To	Description	Amount	Units

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

(10) STATIC WATER LEVEL

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

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found _____

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

(11) WELL LOG Ground Elevation _____

Material	From	To
Soft black + Green	436	570
Med hard brown + black	570	592
Soft broken brown	582	597
Hard black	597	620
Hard Grey	620	790
Pumicous broken brown	790	805
Hard black	805	820

Date Started _____ Completed _____

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

RECEIVED BY OWRD
JUL 16 2012
SALEM, OR

License Number _____ Date _____
Signed _____

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

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

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

Well #2

UMAT 57042

UMAT 57042

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

WELL LABEL # L 108634

START CARD # 1015305

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

1) LAND OWNER Owner Well I.D. 2

First Name Randy Last Name Rupp
Company Rupp Ranches
Address 176 Kennewick Sta.
City Richland State WA Zip 99352

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

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

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

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

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

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

(6) CASING/LINER

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

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

(7) PERFORATIONS/SCREENS
Perforations Method
Screens Type Material

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

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

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

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

From	To	Description	Amount	Units

RECEIVED BY OWRD SEP 13 2012 SALEM, OR

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

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL (ft)
Existing Well/Predeepening				
Completed Well	11-20-11			189

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found 190

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

(11) WELL LOG Ground Elevation

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

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

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

RECEIVED BY OWRD JUL 16 2012 SALEM, OR

License Number ____ Date
Signed

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

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

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

UMAT 57042

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

WELL LABEL # L 109634

START CARD # 1015305

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

(1) LAND OWNER Owner Well I.D. _____
First Name Randy Last Name Rupp
Company Rupp Ranches
Address 1716 Kinnikinnick St.
City Richland State Wa. Zip 99352

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

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

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

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

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

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

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd

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

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

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

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

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

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

From	To	Description	Amount	Units

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

(10) STATIC WATER LEVEL

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

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found _____

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

(11) WELL LOG Ground Elevation _____

Material	From	To
Hard black basalt	444	471
Porous black + brown clay	471	564
Medium hard black basalt	564	531
Soft black basalt with some brown	531	561
Hard black basalt	561	582
Soft porous black basalt	582	595
Porous light brown basalt	595	615
Fractured black basalt	615	617
Hard brown basalt	617	635

Date Started _____ Completed _____

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

RECEIVED BY OWRD
JUL 16 2012
SALEM, OR

License Number _____ Date _____
Signed _____

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

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

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

UMAT 57041

UMAT 57041

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

WELL LABEL # L 108633

START CARD # 1015181

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

(1) LAND OWNER Owner Well I.D. 3 SA
First Name Randy Last Name Rupp
Company Rupp Ranches
Address 176 Ranichwood St.
City Richland State WA Zip 99352

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

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

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

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

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

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

(6) CASING/LINER

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

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

(7) PERFORATIONS/SCREENS
Perforations Method
Screens Type Material

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

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

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

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

From	To	Description	Amount	Units

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SEP 13 2012
SALEM, OR

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

(10) STATIC WATER LEVEL

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

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found 178

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

(11) WELL LOG Ground Elevation

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

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

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

RECEIVED BY OWRD
JUL 16 2012
SALEM, OR

License Number Date
Signed

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

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

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

UMAT 57041

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

WELL LABEL # L 108633

START CARD # 1015181

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

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

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

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

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

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

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

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

(6) CASING/LINER

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

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

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

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

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

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

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

From	To	Description	Amount	Units

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

(10) STATIC WATER LEVEL

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

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL (psi)	+	SWL (ft)
10-27-11	0	285				178
10-31-11	285	465				178
11-1-11	465	522				179

(11) WELL LOG Ground Elevation _____

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

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

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

RECEIVED BY OWRD
JUL 16 2012
SALEM, OR

License Number _____ Date _____
Signed _____

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

License Number 1906 Date 12-10-11
Signed [signature]
Contact Info. (optional)

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

UMAT 57041

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

WELL LABEL # L 108633

START CARD # 1015181

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

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

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

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

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

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

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

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

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd

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

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

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

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

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

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

From	To	Description	Amount	Units

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

(10) STATIC WATER LEVEL

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

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found _____

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

(11) WELL LOG Ground Elevation _____

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

Date Started _____ Completed _____

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

RECEIVED BY OWRD

License Number _____ Date JUL 16 2012

Signed _____

SALEM, OR

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

License Number _____ Date _____

Signed _____

Contact Info. (optional)

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

Well #3

UMAT 57043

UMAT 57043

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

WELL LABEL # L L108632

START CARD # 1015601

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

1) LAND OWNER Owner Well I.D. 4 LA

First Name Randy Last Name Rupp
Company Rupp Ranches
Address 1761 Kennewick St
City Kennewick State WA Zip 99352

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

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

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

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

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

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

(6) CASING/LINER

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

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

(7) PERFORATIONS/SCREENS
Perforations Method
Screens Type Material

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

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

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

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

RECEIVED BY OWRD

From	To	Description	Amount	Units

SEP 13 2012

(9) LOCATION OF WELL (legal description)
County Umatilla Twp 5.00 ⊗ or S Range 31.00 ⊗ or W W.M.
Sec 7 NW 1/4 of the SW 1/4 Tax Lot 100
Tax Map Number ____ Lot
Lat ___°___'___.___" or ____ DMS or DD
Long ___°___'___.___" or ____ DMS or DD
Street Address of Well (or nearest address)

(10) STATIC WATER LEVEL

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

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found 166

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

(11) WELL LOG Ground Elevation

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

Date Started 12-18-11 Completed 4-19-12

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

RECEIVED BY OWRD

License Number 1 Date JUL 16 2012
Signed

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

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

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

UMAT 57043

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

WELL LABEL # L 104632

START CARD # 1015601

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

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

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

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

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

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

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

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

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd

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

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

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

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

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

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

From	To	Description	Amount	Units

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

Street Address of Well (or nearest address) _____

(10) STATIC WATER LEVEL

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

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found _____

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

(11) WELL LOG Ground Elevation _____

Material	From	To
Soft Porous broken brown	635	655
Medium hard black basalt	655	744
Soft black	744	772
Soft porous red basalt	772	776
Soft black	776	791
Hard black with quartz	791	820
Greenish brown clays	820	839
Black porous basalt	839	845
Soft structural black	845	879
Medium hard gray basalt	879	930
Soft gray with green	930	975
Hard black basalt	975	980

Date Started _____ Completed _____

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

RECEIVED BY OWRD

License Number _____ Date JUL 16 2012

Signed _____

SALEM, OR

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

License Number _____ Date _____

Signed _____
Contact Info. (optional)

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

Appendix C

Oregon Water Resources Department
Well Log Query Report

Main Help
Return Contact Us

Well Log Query Results

GPS points, where available are at the far right of the table. Click link to view on map

Township: 5 N, Range: 30 E, Sections: 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36

Well Log	T-R-S/ QQ-Q	Taxlot	Street of Well	Owner	Company	Special Standards	Well Type	First Water	Completed Depth	Static Water Level	Yield	Completed Date	Received Date	Bonded Constructor	Startcard	Well Id #	New	Abandon	Deepen	Alteration	Conversion	Domestic	Irrigation	Community	Livestock	Industrial	Injection	Thermal	Dewatering	Piezometer	Latitude/ Longitude
UMAT 3849	5.00N-30.00E-19 NE-NE			LINCOLN, JACK RT 3 BOX 3739 HERMISTON OR 97838			W	490.00	685.00	345.0	42.0	06/10/1977	12/31/1977	GRIFFIN, TROY			√					√									
UMAT 3854	5.00N-30.00E-28 SE-NW			KOSMOS, TOM COLD SPRINGS PENDLETON OR 97801			W		844.00	155.0	70.0	06/20/1964	12/31/1964	JUNGMANN, CHARLES					√			√	√								
UMAT 3857	5.00N-30.00E-34 SE-SE			DORRAN, RANDOLPH HELIX OR 97835			W	163.00	364.00	131.0	75.0	11/26/1976	12/31/1976	GRIFFIN, TROY			√					√									
UMAT 3848	5.00N-30.00E-17 -				JUNIPER FARMS RT 3 BOX 63 HERMISTON OR 97838	√	W	171.00	220.00 -	160.0	10.0	12/14/1971	01/12/1972	GRIFFIN, TROY TROY GRIFFIN WELL DRILLING			√					√									
UMAT 3850	5.00N-30.00E-25 -			MCDEVITT JR, WALTER RT 3 BOX 482-D HERMISTON OR 97838		√	W	201.00	300.00	140.0	12.0	11/11/1974	11/20/1974	ALLISON, R. C.			√					√									
UMAT 3851	5.00N-30.00E-25 -				COLD SPRING RANCHES INC. 113 SE BYERS PENDLETON OR 97801	√	W		270.00	37.0	30.0	05/02/1969	05/06/1969	GRIFFIN, TROY TROY GRIFFIN WELL DRILLING			√					√									
UMAT 3852	5.00N-30.00E-25 -			ARAS, KOSMOS	ARAS, GEORG STAR ROUTE PENDLETON OR 97801	√	W		215.00	17.0		10/02/1958	10/03/1958	ILLE, FRANK W R ILLE & CO			√					√									
UMAT 3853	5.00N-30.00E-24 -			ARAS, KOSMOS	ARAS, GEORG STAR ROUTE PENDLETON OR 97801	√	W		193.00	18.0	25.0	08/26/1958	10/08/1958	ILLE, FRANK W R ILLE & CO			√					√									
UMAT 3855	5.00N-30.00E-28 -			KOSMOS, PETER COLD SPRINGS RD PENDLETON OR 97801		√	W		527.00				05/16/1960	BARRON, A H BARRON & STRAYER			√	√					√ - [illegible]								
UMAT 3856	5.00N-30.00E-31 -				POWELL GOODIN FARMS 2305 N CLARK PORTLAND OR 97227	√	W		1008.00	300.0	200.0	02/24/1965	10/10/1966	JANNSEN, EDWARD M A M JANNSEN WELL DRILLING CO.			√														

1 2 3

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14- WATER well

Oregon Water Resources Department
Well Log Query Report

Main Help
Return Contact Us

Well Log Query Results

GPS points, where available are at the far right of the table. Click link to view on map

Township: 5 N, Range: 30 E, Sections: 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36

Well Log	T-R-S/ QQ-Q	Taxlot	Street of Well	Owner	Company	Special Standards	Well Type	First Water	Completed Depth	Static Water Level	Yield	Completed Date	Received Date	Bonded Constructor	Startcard	Well Id #	New	Abandon	Deepen	Alteration	Conversion	Domestic	Irrigation	Community	Livestock	Industrial	Injection	Thermal	Dewatering	Piezometer	Latitude/ Longitude
UMAT 55398	5.00N-30.00E-30 NE-NE	30	E WALLS RD	JEWELL, GREG PO BOX 130 HERMISTON OR 97838			W	480.00	535.00	163.0	12.0	05/05/2005	05/09/2005	AMOS, LYLE OLIN TRIPLE A DRILLING	165154	69897	√					√									
UMAT 57041	5.00N-30.00E-13 SE-NW	100	JUNIPER RD, HERMISTON	RUPP, RANDY	RUPP RANCHES 176 KRANICHWOOD ST. RICHLAND WA 99352		W	178.00	552.00	179.0	4000.0	12/06/2011	07/16/2012	SMITH, DAVID C BLUE STAR ENTERPRISES NW	1015181	108633	√						√								
UMAT 57042	5.00N-30.00E-14 SW-NE	100	JUNIPER RD, HERMISTON	RUPP, RANDY	RUPP RANCHES 176 KRANICHWOOD ST RICHLAND WA 99352		W	190.00	635.00	189.0	2000.0	11/20/2011	07/16/2012	SMITH, DAVID C BLUE STAR ENTERPRISES NW	1015305	108634	√						√								
UMAT 57044	5.00N-30.00E-15 SW-NE	100	JUNIPER RD, HERMISTON	RUPP, RANDY	RUPP RANCHES 176 KRANICHWOOD ST RICHLAND WA 99352		W	121.00	820.00	517.0	2000.0	06/29/2012	07/16/2012	SMITH, DAVID C BLUE STAR ENTERPRISES NW	1016703	108650	√						√								
UMAT 57282	5.00N-30.00E-18 SW-NE	NA	N/A CAPSTONE SWITCH YARD N OF HWY 37	PLATT, ARRON	WATT CONSTRUCTION SERVICES INC, 61610 GRIBBLING ROAD BEND OR 97701		G		42.00		0.0	01/13/2014	01/22/2014				√	√													45.9154, -119.1099
UMAT 57283	5.00N-30.00E-18 SW-NE	NA	N/A CAPSTONE SWITCH YARD N OF HWY 37	PLATT, ARRON	WATT CONSTRUCTION SERVICES INC, 61610 GRIBBLING ROAD BEND OR 97701		G		42.00		0.0	01/13/2014	01/22/2014				√	√													45.9153, -119.1098
UMAT 57284	5.00N-30.00E-18 SW-NE	NA	N/A CAPSTONE SWITCH YARD N OF HWY 37	PLATT, ARRON	WATT CONSTRUCTION SERVICES INC, 61610 GRIBBLING ROAD BEND OR 97701		G		42.00		0.0	01/13/2014	01/22/2014				√	√													45.9152, -119.1096
UMAT 57285	5.00N-30.00E-18 SW-NE	NA	N/A CAPSTONE SWITCH YARD N OF HWY 37	PLATT, ARRON	WATT CONSTRUCTION SERVICES INC, 61610 GRIBBLING ROAD BEND OR 97701		G		42.00		0.0	01/13/2014	01/22/2014				√	√													45.9157, -119.1096
UMAT 57286	5.00N-30.00E-18 SW-NE	NA	N/A CAPSTONE SWITCH YARD N OF HWY 37	PLATT, ARRON	WATT CONSTRUCTION SERVICES INC, 61610 GRIBBLING ROAD BEND OR 97701		G		42.00		0.0	01/13/2014	01/22/2014				√	√													45.9157, -119.1095
UMAT 57287	5.00N-30.00E-18 SW-NE	NA	N/A CAPSTONE SWITCH YARD N OF HWY 37	PLATT, ARRON	WATT CONSTRUCTION SERVICES INC, 61610 GRIBBLING ROAD BEND OR 97701		G		42.00		0.0	01/14/2014	01/23/2014				√	√													45.9156, -119.1093

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Well Log Query Report

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Well Log Query Results

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Township: 5 N, Range: 30 E, Sections: 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36

Well Log	T-R-S/ QQ-Q	Taxlot	Street of Well	Owner	Company	Special Standards	Well Type	First Water	Completed Depth	Static Water Level	Yield	Completed Date	Received Date	Bonded Constructor	Startcard	Well Id #	New	Abandon	Deepen	Alteration	Conversion	Domestic	Irrigation	Community	Livestock	Industrial	Injection	Thermal	Dewatering	Piezometer	Latitude/ Longitude
UMAT 57288	5.00N-30.00E-18 SW-NE	NA	N/A CAPSTONE SWITCH YARD N OF HWY 37	PLATT, ARRON	WATT CONSTRUCTION SERVICES INC, 61610 GRIBBLING ROAD BEND OR 97701		G		42.00		0.0	01/14/2014	01/23/2014				√	√													45.9155, -119.1091
UMAT 57289	5.00N-30.00E-18 SW-NE		N/A CAPSTONE SWITCH YARD N OF HWY 37	PLATT, ARRON	WATT CONSTRUCTION SERVICES INC, 61610 GRIBBLING ROAD BEND OR 97701		G		42.00		0.0	01/14/2014	01/23/2014				√	√													45.9153, -119.1094

1 2 3

Download Data

The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT SALEM, OREGON 97310 within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)

RECEIVED
JUN 17 1977
(Do not write above this line)

UMAT 3849

State Well No. 5N/30E-19aa

State Permit No.

Page 1

(1) OWNER: WATER RESOURCES DEPT. SALEM, OREGON

Name Jack Lincoln

Address Rt 3 Box 3739
Hermiston, Oregon 97838

(2) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED: Threaded ☐ Welded ☒

6" Diam. from 0 ft. to 38 ft. Gage 250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS: Perforated? ☐ Yes ☒ No.

Type of perforator used

Size of perforations in. by in.

perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☐ Yes ☒ No

Manufacturer's Name

Type Model No.

Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level

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

Yield: gal./min. with ft. drawdown after hrs.
" " "
Air 42 " 275 " 1 "
Bailer test 25 gal./min. with 175 ft. drawdown after 1 hrs.

Artesian flow g.p.m.

Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:

Well seal—Material used Cement

Well sealed from land surface to 38 ft.

Diameter of well bore to bottom of seal 9 in.

Diameter of well bore below seal 6 in.

Number of sacks of cement used in well seal 10 sacks

How was cement grout placed?

Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? depth of strata

Method of sealing strata off

Was well gravel packed? ☐ Yes ☒ No Size of gravel:

Gravel placed from ft. to ft.

(10) LOCATION OF WELL:

County Umatilla Driller's well number

NE ¼ NE ¼ Section 19 T. 5N. R. 30E. W.M.

Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.

Depth at which water was first found ft.

Static level 345 ft. below land surface. Date 6-10-77

Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing 6"

Depth drilled 685 ft. Depth of completed well 685 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Sand	0	13	
Claystone, brown	13	25	
Rock, broken brown	25	31	
Rock, black	31	45	
Rock, hard, brown	45	67	
Rock, red	67	75	
Rock, brown	75	105	
Rock, red	105	113	
Rock, black	113	130	
Claystone, brown	130	147	
Rock, black	147	155	
Rock, brown	155	161	
Rock, black	161	210	
Rock, brown	210	215	
Rock, red	215	232	
Rock, black	232	278	
Shale, brown	278	285	
Rock, black	285	300	
Rock, black & green claystone	300	310	

Work started 6-7 1977 Completed 6-10 1977

Date well drilling machine moved off of well 6-10 1977

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Troy Griffin (Drilling Machine Operator) Date 6-10, 1977

Drilling Machine Operator's License No. 15

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Name TROY GRIFFIN (Person, firm or corporation) (Type or print)

Address 900 HERMISTON AVE. HERMISTON ORE

[Signed] Troy Griffin (Water Well Contractor)

Contractor's License No. 65 Date 6-10, 1977

(USE ADDITIONAL SHEETS IF NECESSARY) Con't on Page 2

SP*45656-119

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310
within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

State Well No. .....
State Permit No. .....

Page 2

(1) OWNER:
Name Jack Lincoln
Address R43 Box 3739
Hermiston, Oregon 97838

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

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

(5) CASING INSTALLED: Threaded ☐ Welded ☒
6" Diam. from 0 ft. to 38 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS: Perforated? ☐ Yes ☒ No.
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
Air lift 42 " 275 " 1 "
~~Bailer test~~ 25 gal./min. with 175 ft. drawdown after 1 hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Cement
Well sealed from land surface to 38 ft.
Diameter of well bore to bottom of seal 9 in.
Diameter of well bore below seal 6 in.
Number of sacks of cement used in well seal 10 sacks
How was cement grout placed?

Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Umatilla Driller's well number
NE ¼ NE ¼ Section 19 T. 5N. R. 30E. W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found ft.
Static level 345 ft. below land surface. Date 6-10-77
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing 6"
Depth drilled 685 ft. Depth of completed well 685 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Rock, hard brown	310	327	
Basalt, black	327	345	
Rock, brown	345	363	
Basalt, black	363	435	
Rock, brown	435	440	
Rock, black & red	440	447	
Rock, black	447	458	
Rock, red	458	466	
Rock, black	466	490	
Rock, dark brown	490	498	W.B.
Basalt	498	663	
Rock, brown	663	685	W.B.

Work started 6-7 1977 Completed 6-10 1977
Date well drilling machine moved off of well 6-10 1977

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Troy Griffin (Drilling Machine Operator) Date 6-10, 1977
Drilling Machine Operator's License No. 15

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name TROY GRIFFIN (Person, firm or corporation) (Type or print)
Address 900 HERMISTON AVE. HERMISTON OPE.
[Signed] Troy Griffin (Water Well Contractor)
Contractor's License No. 65 Date 6-10, 1977

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date of well completion.

RECEIVED
JAN 13 1972
STATE ENGINEER
SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

UMAT 3848

State Well No. 5N/30-17
State Permit No.

(1) OWNER:
Name Juniper Farms
Address R13 Box 63
Hermiston Oregon 97838

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

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

(5) CASING INSTALLED: Threaded ☐ Welded ☒
6" Diam. from 0 ft. to 108 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

PERFORATIONS: Perforated? ☐ Yes ☒ No.
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " "
" " "
~~Bailer test~~ air 10 gal./min. with 20 ft. drawdown after 1 hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Bentonite & cement
Well sealed from land surface to 108 ft.
Diameter of well bore to bottom of seal 9 in.
Diameter of well bore below seal 6 in.
Number of sacks of cement used in well seal 3 sacks
Number of sacks of bentonite used in well seal 2 sacks
Brand name of bentonite National
Number of pounds of bentonite per 100 gallons of water lbs./100 gals.
Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Umatilla Driller's well number
¼ ¼ Section 17 T. 5N R. 30E. W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 171 ft.
Static level 160 ft. below land surface. Date 12-14-71
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing 6
Depth drilled 220 ft. Depth of completed well 220 ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
Topsoil	0	1	
Claystone, Yellow	1	80	
Claystone, dark brown	80	102	
Rock, med brown	102	115	
Basalt	115	135	
Rock, light brown	135	150	
Rock, black	150	158	
Basalt	158	171	
Rock, brown waterbearing	171	190	
Rock, dark red waterbearing	190	208	
Basalt	208	220	

Work started 12-10 1971 Completed 12-14 1971
Date well drilling machine moved off of well 12-14 1971

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Troy Griffin (Drilling Machine Operator) Date 12/15, 1971
Drilling Machine Operator's License No. 15

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name TROY GRIFFIN (Person, firm or corporation) (Type or print)
Address 925 HERMISTON AVE. HERMISTON OREGON
[Signed] Troy Griffin (Water Well Contractor)
Contractor's License No. 65 Date 12/15, 1971

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

The original and first copy of this report are to be filed with the

STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

UMAT 3850

WATER WELL REPORT

STATE OF OREGON

(Please type or print)

(Do not write above this line)

RECEIVED NOV 20 1974 STATE ENGINEER SALEM, OREGON

State Well No. 5N/30E-25

State Permit No.

(1) OWNER:

Name Walter Mc Devitt Jr.

Address R. 3 Box 482-D Hermiston, Ore. 97838

(2) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED:

Threaded ☐ Welded ☒

6" Diam. from 0 ft. to 115 ft. Gage 250

" Diam. from ft. to ft. Gage

" Diam. from ft. to ft. Gage

PERFORATIONS:

Perforated? ☐ Yes ☒ No.

Type of perforator used

Size of perforations in. by in.

perforations from ft. to ft.

perforations from ft. to ft.

perforations from ft. to ft.

(7) SCREENS:

Well screen installed? ☐ Yes ☒ No

Manufacturer's Name

Type Model No.

Diam. Slot size Set from ft. to ft.

Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:

Drawdown is amount water level is lowered below static level

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

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

" " "

air " " "

Bailer test 12 gal./min. with 100 ft. drawdown after 2 hrs.

Artesian flow g.p.m.

Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:

Well seal—Material used cement

Well sealed from land surface to 25 ft.

Diameter of well bore to bottom of seal 10 in.

Diameter of well bore below seal 6 in.

Number of sacks of cement used in well seal 3 sacks

Number of sacks of bentonite used in well seal sacks

Brand name of bentonite

Number of pounds of bentonite per 100 gallons of water lbs./100 gals.

Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? depth of strata

Method of sealing strata off

Was well gravel packed? ☐ Yes ☒ No Size of gravel:

Gravel placed from ft. to ft.

(10) LOCATION OF WELL:

County Umatilla Driller's well number

¼ ¼ Section 25 T. 5N R. 30E W.M.

Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.

Depth at which water was first found 201 ft.

Static level 140 ft. below land surface. Date 11-12-74

Artesian pressure lbs. per square inch. Date

(12) WELL LOG:

Diameter of well below casing 6

Depth drilled 300 ft. Depth of completed well 300 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
surface sandy soil	0	3	
clay yellow	3	18	
Gravel	18	20	
clay brown	20	99	
rock brown soft	99	114	
rock black med.	114	146	
rock black hard	146	201	
rock red soft	201	215	140
rock black hard	215	267	140
rock black soft	267	290	140
rock black hard	290	300	140

Work started 11-7 19 74 Completed 11-11 19 74

Date well drilling machine moved off of well 11-12 1974

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] R. L. Allison Date 11-12, 1974

(Drilling Machine Operator)

Drilling Machine Operator's License No. 300

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Name Allison Drilling Co.

(Person, firm or corporation) (Type or print)

Address R. 2 Box 309-A Hermiston, Ore. 97838

[Signed] R. L. Allison

(Water Well Contractor)

Contractor's License No. 419 Date 11-12, 1974

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON, within 30 days from the date of well completion.

RECEIVED MAY 6 1969 STATE ENGINEER SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

UMAT 3851

State Well No. 5N/30-25

State Permit No.

(1) OWNER:
Name Cold Spring Ranches, Inc.
Address 113 S.E. Byers
Pendleton, Oregon

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

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

(5) CASING INSTALLED: Threaded ☐ Welded ☒
8" Diam. from 0 ft. to 25 ft. Gage 250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS: Perforated? ☐ Yes ☒ No.
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WATER LEVEL: Completed well.
Static level 37 ft. below land surface Date 5/2/69
Artesian pressure lbs. per square inch Date

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " "
Air 25 " 103' " "
Air test 30 gal./min. with 163 ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☒ No

(10) CONSTRUCTION:
Well seal—Material used Cement
Depth of seal 25 ft.
Diameter of well bore to bottom of seal 10 in.
Were any loose strata cemented off? ☐ Yes ☒ No Depth
Was a drive shoe used? ☐ Yes ☒ No
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(11) LOCATION OF WELL:
County Umatilla Driller's well number
¼ ¼ Section 25 T. 5N R. 30E. W.M.
Bearing and distance from section or subdivision corner

(12) WELL LOG: Diameter of well below casing 8" to 230' 6" 230 to 270
Depth drilled 270 ft. Depth of completed well 270 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level as drilling proceeds. Note drilling rates.

MATERIAL	From	To	SWL
Topsoil	0	4	
Gravel with clay	4	19	
Basalt, grey hard	19	50	
Rock, black w. blue shale	50	68	
Basalt	68	96	
Rock, black w. blue shale	96	106	
Basalt	106	125	
Rock, black, brown	125	130	
Rock, black w. blue shale	130	155	
Basalt	155	158	
Rock, light brown	158	160	
Rock, black	160	170	
Rock, black w. blue shale	170	180	
Basalt	180	198	
Rock, black w. blue shale	198	228	
Rock, hard grey	228	237	
Rock, black w. blue shale	237	245	
Basalt	245	270	

Work started 4-26 1969 Completed 5-2 1969
Date well drilling machine moved off of well 5-3 1969

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Troy Griffin (Drilling Machine Operator) Date 5-3, 1969
Drilling Machine Operator's License No. 15

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
NAME TROY GRIFFIN (Person, firm or corporation) (Type or print)
Address 925 HERMISTON AVE, HERMISTON, ORE.
[Signed] Troy Griffin (Water Well Contractor)
Contractor's License No. 65 Date 5-3, 1969

(USE ADDITIONAL SHEETS IF NECESSARY)

ORIGINAL
File Original and Duplicate with the STATE ENGINEER, SALEM, OREGON

UMAT 3852

WATER WELL REPORT
STATE OF OREGON

State Well No. 5N/30-25F(2

State Permit No.

(1) OWNER:
Name Kosmos & Georgaras
Address Star Route
Pendleton Ore.

(2) LOCATION OF WELL:
County Umatilla Owner's number, if any—
¼ ¼ Section 24 T. 5 R. 30 W.M.
Bearing and distance from section or subdivision corner

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

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

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED: Threaded ☐ Welded ☐
6" Diam. from 0 ft. to 22 ft. Gage 280
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS: Perforated? ☐ Yes ☐ No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS: Well screen installed ☐ Yes ☐ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Was well gravel packed? ☐ Yes ☐ No Size of gravel:
Gravel placed from ft. to ft.
Was a surface seal provided? ☐ Yes ☒ No To what depth? ft.
Material used in seal—
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? Depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 17 ft. below land surface Date 10/1/58
Artesian pressure lbs. per square inch Date

Log Accepted by:

[Signed] (Owner) Date 19

(11) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: 40 gal./min. with 2 ft. drawdown after 1 hrs.
" " " "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG: Diameter of well 6 inches.
Depth drilled 215 ft. Depth of completed well 215 ft.
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Sand & Gravel	0	16
Basalt	16	215

RECEIVED
OCT 3 1958
STATE ENGINEER
SALEM, OREGON

Work started 8-30 19 58 Completed 10/2 19 58

(13) PUMP:
Manufacturer's Name Peerless
Type: Jet H.P. 2

Well Driller's Statement:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME A.R. Iler & Co. (Person, firm, or corporation) (Type or print)
Address P.O. Box 24 Hermiston
Driller's well number
[Signed] A.R. Iler (Well Driller)
License No. 136 Date 10-6 19 58

(USE ADDITIONAL SHEETS IF NECESSARY)

ORIGINAL
File Original and Duplicate with the STATE ENGINEER, SALEM, OREGON

UMAT 3853

WATER WELL REPORT
STATE OF OREGON

State Well No. 7/30-26L(2

State Permit No.

(1) OWNER:
Name Kosmos & George Aras
Address Star Route
Pendleton Oregon

(2) LOCATION OF WELL:
County Umatilla Owner's number, if any—
¼ ¼ Section 24 T. 5 R. N30 W.M.
Bearing and distance from section or subdivision corner

(3) TYPE OF WORK (check):
Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

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

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED: Threaded ☐ Welded ☐
6" Diam. from 00 ft. to 26 ft. Gage 280
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS: Perforated? ☐ Yes ☐ No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS: Well screen installed ☐ Yes ☐ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.
Was a surface seal provided? ☒ Yes ☐ No To what depth? 35 ft.
Material used in seal Cement
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? Depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 18 ft. below land surface Date
Artesian pressure lbs. per square inch Date

Log Accepted by: P. Ackerson
[Signed] (Owner) Date , 19

(11) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test 25 gal./min. with 40 ft. drawdown after 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG: Diameter of well 6 inches.
Depth drilled 193 ft. Depth of completed well 193 ft.
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Sand & Silt	0	18
Sand & Gravel	18	26
Basalt	26	193

RECEIVED OCT 8 1958 STATE ENGINEER

Work started 7/20 19 . Completed 8/26 19 58

(13) PUMP:
Manufacturer's Name Universal Mfg Co
Type: Jet H.P. 1/2

Well Driller's Statement:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
NAME W. R. Tiller & Co (Person, firm, or corporation) (Type or print)
Address P.O. Box 24 Hermiston
Driller's well number
[Signed] W. R. Tiller (Well Driller)
License No. 136 Date 10-6 , 19 58

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with the STATE ENGINEER, SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON

UMAT 3854

State Well No. 5N/30-28F

State Permit No.

RECEIVED JAN 4 1965 STATE ENGINEER

(1) OWNER:
Name MR. TOM KOSMOS
Address COLDSPRINGS ORE.

(2) LOCATION OF WELL:
County Umatilla Owner's number, if any—
SE ¼ NW ¼ Section 28 T. 5N R. 30 E W.M.
Bearing and distance from section or subdivision corner
S 37° 44' 30" E – 2707.8' from NW Corner. (of Sec. 28)

(3) TYPE OF WORK (check):
New Well ☐ Deepening ☒ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

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

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED: Threaded ☐ Welded ☐
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage
NONE BY THIS CONTRACTOR

(7) PERFORATIONS: Perforated? ☐ Yes ☒ No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS: Well screen installed ☐ Yes ☐ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.
Was a surface seal provided? ☒ Yes ☐ No To what depth? 147 ft.
Material used in seal— CEMENT
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? Depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 1.55 ft. below land surface Date 6/20/64
Artesian pressure lbs. per square inch Date

Log Accepted by:
[Signed] Tom Kosmos (Owner) Date Dec. 29, 1964

(11) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? CONTRACTOR
Yield: gal./min. with ft. drawdown after hrs.
PUMP TO LARGE FOR AMOUNT OF "WATER WELL" WOULD YIELD "
Bailer test 70 gal./min. with 20 ft. drawdown after 2 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☒ No

(12) WELL LOG: Diameter of well 18X16X12 inches.
Depth drilled 851 ft. Depth of completed well 844 ft.
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
DRILLED PREVIOUS TO OUR WORK	0	744
BLACK HARD BASALT	744	818
GREY HARD BASALT	818	825
BLACK HARD BASALT	825	831
BROWN BASALT	831	846
HARD BLACK BASALT	846	851

Work started FEB 17 1964 Completed JUNE 20 1964

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

Well Driller's Statement:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
NAME CHARLES SUNGMANN DRILLING CO. (Person, firm, or corporation) (Type or print)
Address 115 REES AVE. W.W. WASH
Driller's well number
[Signed] Charles Sungmann (Well Driller)
License No. 364 236 Date JULY 6, 1964

(USE ADDITIONAL SHEETS IF NECESSARY)

RECEIVED
MAY 16 1960
STATE ENGINEER
SALEM, OREGON

UMAT 3855

File Original and First Copy with the STATE ENGINEER, SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON

State Well No. 5N/30-28F

State Permit No.

(1) OWNER:
Name Peter Kosmos
Address Cold Springs Road
Pendelton Ore

(2) LOCATION OF WELL:
County Umatilla Owner's number, if any—
¼ ¼ Section 28 T. 5 R. 30 W.M.
Bearing and distance from section or subdivision corner

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☒
If abandonment, describe material and procedure in Item 11.

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

(5) TYPE OF WELL:
Rotary ☒ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED: Threaded ☐ Welded ☒
18" Diam. from 0 ft. to 140' ft. Gage
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS: Perforated? ☐ Yes ☐ No
Type of perforator used none
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS: Well screen installed ☐ Yes ☐ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Was well gravel packed? ☐ Yes ☐ No Size of gravel:
Gravel placed from ft. to ft.
Was a surface seal provided? ☐ Yes ☐ No To what depth? ft.
Material used in seal—
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? Depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level ft. below land surface Date
Artesian pressure lbs. per square inch Date

Log Accepted by:
[Signed] Date 19
(Owner)

(11) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG: Diameter of well 16 inches.
Depth drilled 527 ft. Depth of completed well ft.
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Sand and clay	0	135
Gravel	135	140
Pipe held by clamp at 140 '		
shoe welded on starter piece		
Gray Basalt	140	400
Black Basalt	400	500
Coarse Basalt with clay seams	500	527

This imformation from owner we are now atempting to fish lost tools out of well there is a 12" bit 30 ft stem and set of broken jars in well

Lance Hayes

December 28 19r59 Tools lost in Well . Well abandoned by French Drilling Co

Work started July 19 . Completed 19

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

Well Driller's Statement:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Resumed Rotary Test Well (Person, firm, or corporation) (Type or print)
Address
Driller's well number 5-28 Drilling at
[Signed] (Well Driller)
License No. 33 Date 19

(USE ADDITIONAL SHEETS IF NECESSARY)

LMW

The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

UMAT 3857

WATER WELL REPORT
STATE OF OREGON
(Please type or print)

(Do not write above this line)

RECEIVED DEC 2 1976 WATER RESOURCES DEPT. SALEM, OREGON

State Well No. 5N/30E 34c

State Permit No.

(1) OWNER:

Name Randolph Dorran

Address Heline, Oregon 97835

(2) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED: Threaded ☐ Welded ☒

6" Diam. from 0 ft. to 33 ft. Gage .250

" Diam. from ft. to ft. Gage

" Diam. from ft. to ft. Gage

(6) PERFORATIONS: Perforated? ☐ Yes ☒ No.

Type of perforator used

Size of perforations in. by in.

perforations from ft. to ft.

perforations from ft. to ft.

perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☐ Yes ☒ No

Manufacturer's Name

Type Model No.

Diam. Slot size Set from ft. to ft.

Diam. Slot size Set from ft. to ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level

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

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

" " "

" " "

Air ~~Bailer~~ test 45 gal./min. with 133 ft. drawdown after 1 hrs.

Artesian flow g.p.m.

Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:

Well seal—Material used Cement & bentonite

Well sealed from land surface to 29 ft.

Diameter of well bore to bottom of seal 9 in.

Diameter of well bore below seal 6 in.

Number of sacks of cement used in well seal 5 sacks

Number of sacks of bentonite used in well seal 1 sacks

Brand name of bentonite National

Number of pounds of bentonite per 100 gallons of water lbs./100 gals.

Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? depth of strata

Method of sealing strata off

Was well gravel packed? ☐ Yes ☐ No Size of gravel:

Gravel placed from ft. to ft.

(10) LOCATION OF WELL:

County Umatilla Driller's well number

SE ¼ SE ¼ Section 34 T. 5N R. 30E. W.M.

Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.

Depth at which water was first found 163 ft.

Static level 131 ft. below land surface. Date 11-26-76

Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing 6"

Depth drilled 364 ft. Depth of completed well 364 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
Topsoil	0	6	
Claystone, brown	6	28	
Basalt, hard	28	58	
Rock, med., black	58	67	
Basalt	67	94	
Rock, med. brown	94	103	
Claystone, light brown	103	116	
Basalt	116	163	
Claystone, brown	163	177	
Claystone, red	177	183	
Basalt	183	288	
Claystone, brown with gravel	288	264	W.B.
Rock, soft black	264	273	W.B.
Basalt, med.	273	345	
Basalt	345	364	

Work started 11-23 1976 Completed 11-26 1976

Date well drilling machine moved off of well 11-26 1976

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Troy Griffin (Drilling Machine Operator) Date 11-26, 1976

Drilling Machine Operator's License No. 15

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Name TROY GRIFFIN (Person, firm or corporation) (Type or print)

Address 900 HERMISTON AVE, HERMISTON ORE.

[Signed] Troy Griffin (Water Well Contractor)

Contractor's License No. 65 Date 11-26, 1976

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

RECEIVED UMAT 55398

MAY 09 2005

WATER RESOURCES DEPT
SALEM, OREGON

UMAT
55398

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)
Instructions for completing this report are on the last page of this form.

WELL I.D. # L 69997
START CARD # 165154

(1) LAND OWNER Well Number
Name Greg Jewell
Address P.O. Box 130
City Hermiston State Oregon Zip 97838

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

(3) DRILL METHOD:
☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☒ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 535 ft.
Explosives used ☐ Yes ☐ No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
12	0	20	Holeplug	0	20	14
8	20	160	cement	140	160	600 lbs
6	160	535				

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☒ Other Poured
Backfill placed from ft. to ft. Material
Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	8	+2	150	250	☒	☐	☒	☐
	6	140	160	250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Drive Shoe used ☐ Inside ☒ Outside ☐ None
Final location of shoe(s) 8" 150' 6" 160'

(7) PERFORATIONS/SCREENS:
☐ Perforations Method
☐ Screens Type Material

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						☐	☐
						☐	☐
						☐	☐
						☐	☐

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

Yield gal/min	Drawdown	Drill stem at	Time
12	—	530	1 hr.

Temperature of water 57° Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom

(9) LOCATION OF WELL by legal description:
County Umatilla Latitude Longitude
Township 5 N or S Range 30 E or W. WM.
Section 30 NE 1/4 NE 1/4
Tax Lot 30 Lot Block Subdivision
Street Address of Well (or nearest address) E. Walls Rd.

(10) STATIC WATER LEVEL:
163 ft. below land surface. Date 5-5-05
Artesian pressure lb. per square inch Date

(11) WATER BEARING ZONES:
Depth at which water was first found

From	To	Estimated Flow Rate	SWL
480	490	12	163

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AUG 12 2005
WATER RESOURCES DEPT
SALEM, OREGON

(12) WELL LOG:
Ground Elevation

Material	From	To	SWL
Sand	0	11	
Silty Clay	11	32	
Brown Clay	32	100	
Gravel	100	101	
Brown Clay	101	141	
Gravel	141	150	
Basalt (Brown)	150	181	
Black Basalt	181	210	
Soft Basalt	210	226	
Black Basalt	226	289	
Black Basalt & claystone	289	298	
Black Basalt	298	381	
Green Claystone & Basalt	381	395	
Black Basalt	395	463	
Black Basalt & Claystone	463	497	
Black Basalt & Red	497	496	163
Basalt	496	535	

Date started 5-1-05 Completed 5-5-05

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

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work

RECEIVED OCT 10 1966 STATE ENGINEER OREGON

RECEIVED OCT 26 1966 STATE ENGINEER SALEM, OREGON

UMAT 3856

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)

State Well No. 5N/30-31
State Permit No.

(1) OWNER:
Name: Powell-Goodin Farms
Address: 2305 N. Clark
Portland, Ore.

(2) LOCATION OF WELL: #2
County: Umatilla Driller's well number
¼ ¼ Section 31 T. 5N R. 30E W.M.
Bearing and distance from section or subdivision corner

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

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

(5) TYPE OF WELL:
Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED:
Threaded ☐ Welded ☒
6" Diam. from 0 ft. to 103 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS:
Perforated? ☐ Yes ☒ No
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS:
Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Well seal—Material used in seal ~~Test well~~ Bentonite
Depth of seal 103 ft. Was a packer used? No
Diameter of well bore to bottom of seal 10 in.
Were any loose strata cemented off? ☐ Yes ☒ No Depth
Was a drive shoe used? ☐ Yes ☒ No
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 300 ft. below land surface Date 2-24-65
Artesian pressure lbs. per square inch Date

(11) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a ~~pump test~~ airlift made? ☒ Yes ☐ No If yes, by whom?
Yield: 200 gal./min. with appr. 200 ft. drawdown after 8 hrs.
" " " "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☒ No

(12) WELL LOG:
Diameter of well below casing 6
Depth drilled 1008 ft. Depth of completed well 1008 ft.

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

MATERIAL	FROM	TO	
Top soil	0	45	
Sand, broken rock	45	51	
Sand	51	88	
Rock, broken	88	92	FT
Solid rock	92	140	DI
Broken rock, silt & gravel	140	146	IF
Solid rock	146	161	DI
Wet sand & silt	161	166	
Rock	166	185	
Sandy silt, mud & gravel	185	206	
Soft rock	206	315	
Soft rock, porous	315	341	
Sand	341	345	
Hard rock	345	371	
Soft rock & sand-water 10 gpm	371	382	
Rough hard rock	382	426	
Soft rock, soapstone-water 5 gpm	426	438	
Rough broken rock	438	453	
Soft rock, sand, soapstone-water 10 gpm	453	472	
Soft rock	472	477	
Black rock	477	479	DL
Soft & black broken black rock-water-150 gpm	479	492	IF
Hard black rock	492	496	DL

Work started 10-30 1964 Completed 2-24 1965
Date well drilling machine moved off of well 2-24 1965

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

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME A. M. Jannsen Drilling Co. (Person, firm or corporation) (Type or print)
Address 21075 SW Tual. Vlly. Hwy. Aloha, Ore.
Drilling Machine Operator's License No. 274 & 235
[Signed] Edward M. Jannsen (Water Well Contractor)
Contractor's License No. 79 Date 9-30, 1966

(USE ADDITIONAL SHEETS IF NECESSARY)

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date of well completion.

RECEIVED OCT 10 1966 STATE ENGINEER SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON
(Please type or print)

RECEIVED OCT 26 1966 STATE ENGINEER SALEM, OREGON

State Well No. 5N/30-31
State Permit No.

(1) OWNER:
Name Powell-Goodin Farms
Address 2305 N. Clark
Portland, Ore.

(2) LOCATION OF WELL:
County Driller's well number
¼ ¼ Section T. R. W.M.
Bearing and distance from section or subdivision corner

(3) TYPE OF WORK (check):
New Well ☐ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED:
Threaded ☐ Welded ☐
..... " Diam. from ..... ft. to ..... ft. Gage .....
..... " Diam. from ..... ft. to ..... ft. Gage .....
..... " Diam. from ..... ft. to ..... ft. Gage .....

(7) PERFORATIONS:
Perforated? ☐ Yes ☐ No
Type of perforator used
Size of perforations in. by in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

(8) SCREENS:
Well screen installed? ☐ Yes ☐ No
Manufacturer's Name .....
..... Model No. .....
Diam. ..... Slot size ..... Set from ..... ft. to ..... ft.
Diam. ..... Slot size ..... Set from ..... ft. to ..... ft.

(9) CONSTRUCTION:
Well seal—Material used in seal .....
Depth of seal ..... ft. Was a packer used? .....
Diameter of well bore to bottom of seal ..... in.
Were any loose strata cemented off? ☐ Yes ☐ No Depth .....
Was a drive shoe used? ☐ Yes ☐ No
Was well gravel packed? ☐ Yes ☐ No Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level ft. below land surface Date
Artesian pressure lbs. per square inch Date

(11) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG:
Diameter of well below casing .....
Depth drilled ft. Depth of completed well ft.
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Soft porous black rock-water 100 gpm-cemented off	496	501
Hard & soft black rock	501	510
Soft porous black rock w/ green soapstone	510	512
Fairly solid black rock	512	518
Soft black porous rock-some green soapstone-water 50 gpm-cemented off	518	526
Rock, a little harder	526	529
Black porous rock-water 25 gpm-cemented off	529	533
Fairly solid black rock	533	554
Soft black rock	554	556
Fairly solid black rock	556	604
Soft black porous & red volcanic rock-waterbearing 15 gpm-cemented off	604	617
Black rock	617	637
Soft black rock w/ hard layers	637	721
Hard black basalt	721	785
Soft black rock	785	787
Fairly hard black rock	787	812
Soft black rock w/ green soapstone water bearing-100 gpm-cemented off	812	814
Brown lava rock	814	817

Work started 19 Completed 19
Date well drilling machine moved off of well 19

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

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME A. M. Jannsen Drilling Co.
(Person, firm or corporation) (Type or print)
Address 21075 SW Tual. Vlly. Hwy. Aloha, Ore.
Drilling Machine Operator's License No. 274 & 235
[Signed] Edward M. Jannsen
(Water Well Contractor)
Contractor's License No. 79 Date 9-30, 1966

(USE ADDITIONAL SHEETS IF NECESSARY)

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date of well completion.

UMAT

WATER WELL REPORT
STATE OF OREGON
(Please type or print)

RECEIVED
OCT 2 1966
STATE ENGINEER
SALEM, OREGON

State Well No. 5N/30-31
State Permit No.

(1) OWNER:
Name Powell-Goodin Farms
Address 2305 N. Clark
Portland, Ore.

(2) LOCATION OF WELL:
County Driller's well number
¼ ¼ Section T. R. W.M.
Bearing and distance from section or subdivision corner

(3) TYPE OF WORK (check):
New Well ☐ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED:
Threaded ☐ Welded ☐
..." Diam. from ... ft. to ... ft. Gage ...
..." Diam. from ... ft. to ... ft. Gage ...
..." Diam. from ... ft. to ... ft. Gage ...

(7) PERFORATIONS:
Perforated? ☐ Yes ☐ No
Type of perforator used
Size of perforations in. by in.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.

(8) SCREENS:
Well screen installed? ☐ Yes ☐ No
Manufacturer's Name ...
... Model No. ...
Diam. ... Slot size ... Set from ... ft. to ... ft.
Diam. ... Slot size ... Set from ... ft. to ... ft.

(9) CONSTRUCTION:
Well seal—Material used in seal ...
Depth of seal ... ft. Was a packer used? ...
Diameter of well bore to bottom of seal ... in.
Were any loose strata cemented off? ☐ Yes ☐ No Depth ...
Was a drive shoe used? ☐ Yes ☐ No
Was well gravel packed? ☐ Yes ☐ No Size of gravel: ...
Gravel placed from ... ft. to ... ft.
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level ft. below land surface Date
Artesian pressure lbs. per square inch Date

(11) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG:
Diameter of well below casing ...
Depth drilled ft. Depth of completed well ft.
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Hard black rock	817	863
Soft brown & black rock	863	886
Hard semi-grey rock	886	993
Soft black porous rock	993	1005
Soft reddish lava	1005	1008

Work started 19 Completed 19
Date well drilling machine moved off of well 19

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

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME A. M. Jannsen Drilling Co.
(Person, firm or corporation) (Type or print)
Address 21075 SW Tual. Vlly. Hwy. Aloha, Ore.

Drilling Machine Operator's License No. 274 & 235
[Signed] Edwin M. Jannsen
(Water Well Contractor)
Contractor's License No. 79 Date 9-30, 19 66

(USE ADDITIONAL SHEETS IF NECESSARY)

Oregon Water Resources Department
Well Log Query Report

Main Help
Return Contact Us

Well Log Query Results

GPS points, where available are at the far right of the table. Click link to view on map

Township: 5 N, Range: 31 E, Sections: 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36

Well Log	T-R-S/ QQ-Q	Taxlot	Street of Well	Owner	Company	Special Standards	Well Type	First Water	Completed Depth	Static Water Level	Yield	Completed Date	Received Date	Bonded Constructor	Startcard	Well Id #	New	Abandon	Deepen	Alteration	Conversion	Domestic	Irrigation	Community	Livestock	Industrial	Injection	Thermal	Dewatering	Piezometer	Latitude/ Longitude
UMAT 3858	5.00N-31.00E-12 NW-NW			MAUTZ, ROBERT	MICHEAL THORNE 113 SEBYERS PENDLETON OR 97801		W	354.00	585.00	270.0	15.0	12/14/1976	12/31/1976	GRIFFIN, TROY			√					√									
UMAT 3861	5.00N-31.00E-34 SW-NW				HOLDMAN RANCHES HOLDMAN ROUTE PENDLETON OR 97801		W	220.00	490.00	67.0	75.0	12/08/1977	12/31/1977	BURD, LARRY			√					√									
UMAT 3862	5.00N-31.00E-34 -NW				HOLDMAN RANCHES 812 S.EBYERS AVE PENDLETON OR 97801		W		220.00	30.0	25.0	08/29/1963	12/31/1963	GRIFFIN, TROY			√					√									
UMAT 5629	5.00N-31.00E-30 NW-SW			HEVELL, SHIRLY PO BOX 756 HOLDMEN RT PENDLETON OR 97801			W		125.00	110.0		01/24/1992	02/14/1992	BURD, LARRY	36051					√		√									
UMAT 6567	5.00N-31.00E-33 SE-NE	800000000		WHITE MICHAELS, BETTY J	MICHAELS, LOUIS H		W	317.00	500.00	109.0	40.0	08/22/1995	10/25/1995	WALLACE, PATRICK C	78002		√					√									
UMAT 3859	5.00N-31.00E-15 -			BAYSINGER, DOC STAR RT 545 PENDLETON OR 97801		√	W	376.00	402.00	275.0	10.0	02/03/1984	02/29/1984	UNKNOWN, UNKNOWN			√					√									
UMAT 3860	5.00N-31.00E-30 -			TUCKER, DALE PENDLETON OR 97801		√	W			22.0	60.0	02/10/1962	06/05/1962	FRENCH, ROY T			√					√	√								
UMAT 3863	5.00N-31.00E-34 -			MITCHELL, DELBERT PENDLETON OR 97801		√	W		174.00	105.0	12.0	04/15/1963	05/31/1963	FRENCH, ROY T			√					√									
UMAT 54201	5.00N-31.00E-15 -	1400		HARDMAN, LARRY HARTLE RD PENDLETON OR 97801			W	255.00	404.00	192.0	20.0	04/30/2001	05/23/2001	BURD, LARRY LARRY BURD WELL DRILLING	130153	46656	√					√									
UMAT 57043	5.00N-31.00E-7 NW-SW	100		RUPP, RANDY	RUPP RANCHES 176 KRANICHWOOD ST RICHLAND WA 99352		W	166.00	990.00	572.0	3000.0	04/19/2012	07/16/2012	SMITH, DAVID C BLUE STAR ENTERPRISES NW	1015601	108632	√								√							

Download Data well #4

10- water wells

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

UMAT 3858

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

RECEIVED DEC 20 1976 WATER RESOURCES DEPT. SALEM, OREGON

State Well No. 5N/31E-12 bb
State Permit No.

(1) OWNER:
Name Robert Mantz + Michael Thorne
Address 113 S.E. Byers
Pendleton, Oregon 97801

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

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

(5) CASING INSTALLED: Threaded ☐ Welded ☒
6" Diam. from 0 ft. to 60 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS: Perforated? ☐ Yes ☒ No.
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " "
" " "
~~Bailer~~ Air test 15 gal./min. with 45 ft. drawdown after 1 hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Cement
Was sealed from land surface to 60 ft.
Diameter of well bore to bottom of seal 9 in.
Diameter of well bore below seal 6 in.
Number of sacks of cement used in well seal 11 sacks
Number of sacks of bentonite used in well seal sacks
Brand name of bentonite
Number of pounds of bentonite per 100 gallons of water lbs./100 gals.
Was a drive shoe used? ☐ Yes ☒ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Umatilla Driller's well number
N.W ¼ N.W ¼ Section 12 T. 5N. R. 31E. W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 354 ft.
Static level 270 ft. below land surface. Date 12-14-76
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing 6"
Depth drilled 585 ft. Depth of completed well 585 ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
Topsoil	0	15	
Claystone, brown	15	31	
Rock, brown	31	38	
Rock, red	38	66	
Basalt, black	66	237	
Rock, brown	237	248	
Rock, black	248	282	
Basalt, hard, gray	282	325	
Basalt, mod. hard, black	325	338	
Basalt, hard, gray	338	354	
Rock, med. hard, brown	354	361	W.B.
Basalt, black	361	383	
Basalt, hard, gray	383	465	
Basalt, hard, gray	465	585	
(Water bearing at 525)			

Work started 12-8 1976 Completed 12-14 1976
Date well drilling machine moved off of well 12-14 1976

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Troy Griffin (Drilling Machine Operator) Date 12-15, 1976
Drilling Machine Operator's License No. 15

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name TROY GRIFFIN (Person, firm or corporation) (Type or print)
Address 900 HERMISTON AVE, HERMISTON ORE
[Signed] Troy Griffin (Water Well Contractor)
Contractor's License No. 65 Date 12-15, 1976

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

WATER WELL REPORT
STATE OF OREGON

UMAT 3859

RECEIVED
FEB 29 1984
WATER RESOURCES DEPT.
SALEM, OREGON

State Well No. 5N/31E-15

State Permit No.

PLEASE TYPE or PRINT IN INK

(1) OWNER:

Name Doc Baysinger
Address Star Rt 545
City Pendleton OR State

(2) TYPE OF WORK (check):

New Well ☑ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary Air ☑ Driven ☐
Rotary Mud ☐ Dug ☐
☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☑ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐
Thermal: Withdrawal ☐ Reinjection ☐

(5) CASING INSTALLED: Steel ☑ Plastic ☐ Threaded ☐ Welded ☑

6 " Diam. from +1½ ft. to 52 ft. Gauge 0.250

" Diam. from ft. to ft. Gauge

LINER INSTALLED:

" Diam. from ft. to ft. Gauge

(6) PERFORATIONS: Perforated? ☐ Yes ☑ No

Type of perforator used

Size of perforations in. by in.

perforations from ft. to ft.

perforations from ft. to ft.

perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☐ Yes ☑ No

Manufacturer's Name

Type Model No.

Diam. Slot Size Set from ft. to ft.

Diam. Slot Size Set from ft. to ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level

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

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

Air test 10 gal./min. with drill stem at 400 ft. 1 hrs.

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

Artesian flow g.p.m.

Temperature of water 63° Depth artesian flow encountered ft.

(9) CONSTRUCTION: Special standards: Yes ☐ No ☐

Well seal—Material used Cement

Well sealed from land surface to 19 ft.

Diameter of well bore to bottom of seal 10 in.

Diameter of well bore below seal 6 in.

Number of sacks of cement used in well seal 10 sacks

How was cement grout placed? pumped

Was pump installed? No Type HP Depth ft.

Was a drive shoe used? ☐ Yes ☑ No Plugs Size: location ft.

Did any strata contain unusable water? ☐ Yes ☑ No

Type of Water? depth of strata

Method of sealing strata off

Was well gravel packed? ☐ Yes ☑ No Size of gravel:

Gravel placed from ft. to ft.

(10) LOCATION OF WELL:

County Umatilla Driller's well number

¼ ¼ Section 15 T. 5N R. 31 E W.M.

Tax Lot # Lot Blk Subdivision

Address at well location:

(11) WATER LEVEL: Completed well.

Depth at which water was first found 376 ft.

Static level 275 ft. below land surface. Date

Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing 6

Depth drilled 402 ft. Depth of completed well 402 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Soil	0	15	
Clay	15	35	
Basalt BRN SOFT	35	42	
Basalt BRN Hard	42	45	
" BLK	45	57	
" BRN	57	77	
" BLK & BRN	77	102	
" BLK	102	137	
" BRN	137	155	
" BLK	155	240	
" BLK W/S/S	240	245	
" BRN	245	252	
BLK	252	362	
BLK W/S/S	362	374	
BLK	374	382	
BLK W/S/S	382	397	
BLK	397	402	275

Work started 2-1- 1984 Completed 2-5- 1984

Date well drilling machine moved off of well 2-4- 1984

(unbonded) Water Well Constructor Certification (if applicable):

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Date, 19

Bonded Water Well Constructor Certification:

Bond (number) Issued by: Surety Company Name

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Name C.W. Summers Well Drilling (Person, firm or corporation) (Type or print)

Address Rt #3 Box 143-A Milton OR

[Signed] Clarence W. Summers Water Well Constructor

Date 2-27-, 1984

NOTICE TO WATER WELL CONSTRUCTOR
The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310 within 30 days from the date of well completion.

SP*45292-690

RECEIVED
JUN 5 1962
STATE ENGINEER
SALEM, OREGON

UMAT
3860

File Original and First Copy with the STATE ENGINEER, SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON

State Well No. 5N/31-30

State Permit No.

(1) OWNER:
Name Dale Tucker
Address Pendleton Ore. Feldman Rte

(2) LOCATION OF WELL:
County Umatilla Owner's number, if any—
¼ ¼ Section 30 T. 5N R. 31 W.M.
Bearing and distance from section or subdivision corner

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☒ Industrial ☐ Municipal ☐
Irrigation and ☒ Test Well ☐ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED: Threaded ☐ Welded ☐
8" Diam. from 0 ft. to 27 ft. ft. Gage ¼ in
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS: Perforated? ☐ Yes ☒ No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS: Well screen installed ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Slot size Set from ft. to ft.
Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Was well gravel packed? ☐ Yes ☐ No Size of gravel:
Gravel placed from ft. to ft.
Was a surface seal provided? ☒ Yes ☐ No To what depth? 27 ft.
Material used in seal— cement
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? Depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 22 ft. below land surface Date Feb 10, 62
Artesian pressure lbs. per square inch Date

Log Accepted by:
Signed] (Owner) Date 19

(11) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? Tri County Mac
Yield: 60 gal./min. with 80 ft. drawdown after 12 hrs.
" " " "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water 52 Was a chemical analysis made? ☐ Yes ☒ No

(12) WELL LOG: Diameter of well 226, 113-8 inch, 6 inch
Depth drilled ft. Depth of completed well ft.
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top soil sandy	0	6
Gravel medium	6	19
Grey basalt fine hard	19	27
redrock course small		
amount of water	27	36
Grey basalt fine hard	36	96
black basalt course		
and seamy with water	96	226
Well drilled 12 inches		
to 27 ft. 8 in casing set		
and cemented at 27 ft		

Work started Jan 1 1962 Completed Feb 10 1962
moved of Feb 10, 1962

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

Well Driller's Statement:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME (Person, firm, or corporation) (Type or print)
Address
Driller's well number
[Signed] Roy T. French (Well Driller)
License No. 107 Date June 2, 1962

(USE ADDITIONAL SHEETS IF NECESSARY)

NOTICE TO WATER WELL CONTRACTOR

The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310 within 30 days from the date of well completion.

RECEIVED JAN 5 1978 WATER RESOURCES DEPT. SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON
(Please type or print)

(DO NOT write above this line)

RECEIVED JAN 23 1978 WATER RESOURCES DEPT. SALEM, OREGON

State Well No. 5N/31E-34bc

State Permit No. UMAT 3861

(1) OWNER:

Name HOLDMEN RANCHES

Address HOLDMEN ROUTE PENDLETON ORE

(2) TYPE OF WORK (check):

New Well ☑ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☑ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☑ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED: Threaded ☐ Welded ☑

8" Diam. from +2 ft. to 20 ft. Gage .250

" Diam. from ft. to ft. Gage

" Diam. from ft. to ft. Gage

(6) PERFORATIONS: Perforated? ☐ Yes ☑ No.

Type of perforator used

Size of perforations in. by in.

perforations from ft. to ft.

perforations from ft. to ft.

perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☐ Yes ☑ No

Manufacturer's Name

Type Model No.

Diam. Slot size Set from ft. to ft.

Diam. Slot size Set from ft. to ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level

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

Yield: 75 gal./min. with 2/2 ft. drawdown after 1 hrs.

" " " "

" " " "

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

Artesian flow g.p.m.

Temperature of water 68° Depth artesian flow encountered ft.

(9) CONSTRUCTION:

Well seal—Material used PORTLAND CEMENT

Well sealed from land surface to 20 ft.

Diameter of well bore to bottom of seal 10 3/4 in.

Diameter of well bore below seal 6 1/4 in.

Number of sacks of cement used in well seal 8 sacks

How was cement grout placed? GRAVITY

Was a drive shoe used? ☐ Yes ☑ No Plugs Size: location ft.

Did any strata contain unusable water? ☐ Yes ☑ No

Type of water? depth of strata

Method of sealing strata off

Was well gravel packed? ☐ Yes ☑ No Size of gravel:

Gravel placed from ft. to ft.

(10) LOCATION OF WELL:

County UMATILLA Driller's well number

SW ¼ NW ¼ Section 34 T. 5N R. 31E W.M.

Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.

Depth at which water was first found 220 ft.

Static level 67 ft. below land surface. Date 12-8-77

Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing 6 1/4

Depth drilled 490 ft. Depth of completed well 490 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL		From	To	SWL
SOIL	SANDY	0	17	
BASALT	GREY	17	220	
"	RED	220	245	
"	BLACK	245	343	
"	RED	343	346	
"	BLACK	346	437	
"	BLACK w/ BLUE TINT	437	449	
"	BLACK	449	478	
"	RED	478	485	
"	BLACK	485	490	

Work started 12-5 1977 Completed 12-8 1977

Date well drilling machine moved off of well 12-9 1977

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Larry Burd (Drilling Machine Operator) Date 12-9, 1977

Drilling Machine Operator's License No. 933

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Name LARRY BURD WELL DRILLING (Person, firm or corporation) (Type or print)

Address 5543 S.W. Douglas Dr Pendleton

[Signed] Larry Burd (Water Well Contractor)

Contractor's License No. 544 Date 12-9, 1977

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

RECEIVED
SEP 2 1 1963
STATE ENGINEER SALEM, OREGON

UMAT 3862

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM 10, OREGON within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)

State Well No. 5N/31E-34

State Permit No.

(1) OWNER:
Name Holdman Ranches
Address 812 S.E. Byers Ave
Pendleton Oregon

(2) LOCATION OF WELL:
County Umatilla Driller's well number
¼ N.W ¼ Section 34 T. 5N R. 31E W.M.
Bearing and distance from section or subdivision corner

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

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

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED:
Threaded ☐ Welded ☒
6" Diam. from 0 ft. to 27 ft. Gage
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS:
Perforated? ☐ Yes ☒ No
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS:
Well screen installed ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Well seal—Material used in seal Cement
Depth of seal 27 ft. Was a packer used?
Diameter of well bore to bottom of seal in.
Were any loose strata cemented off? ☐ Yes ☐ No Depth
Was a drive shoe used? ☐ Yes ☒ No
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? Depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 30 ft. below land surface Date 8-29-63
Artesian pressure lbs. per square inch Date

(11) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test 25 gal./min. with 35 ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG:
Diameter of well below casing 6"
Depth drilled 220 ft. Depth of completed well 220 ft.
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
topsoil	0	3
hard pan	3	9
rock, med. hard	9	26
black hard rock	26	135
grey hard rock	135	149
Black hard rock	149	151
Brown, med hard rock	151	156
Black rock with clay	156	200
Black rock	200	220

Work started 8-1 1963 Completed 8-29 1963
Date well drilling machine moved off of well 8-30 1963

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

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME TROY GRIFFIN (Person, firm or corporation) (Type or print)
Address 881 HERMISTON AVE. HERMISTON
Drilling Machine Operator's License No. 15
[Signed] Troy Griffin (Water Well Contractor)
Contractor's License No. 65 Date 8-30, 1963

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with the STATE ENGINEER, SALEM, OREGON

RECEIVED MAY 1963 STATE ENGINEER SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON

UMAT 3863

State Well No. 5N/31-34

State Permit No.

(1) OWNER:
Name Gilbert Mitchell
Address Pendleton Ore. Holdover Ate

(2) LOCATION OF WELL:
County Umatilla Owner's number, if any—
¼ ¼ Section 34 T. 5 N R. 31 W.M.
Bearing and distance from section or subdivision corner

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

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

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED: Threaded ☐ Welded ☐
6" Diam. from 0 ft. to 22 ft. Gage 250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS: Perforated? ☐ Yes ☒ No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS: Well screen installed ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.
Was a surface seal provided? ☒ Yes ☐ No To what depth? 22 ft.
Material used in seal— cement cemented 17 to 22 ft
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? Depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 105 ft. below land surface Date 15, 1963
Artesian pressure lbs. per square inch Date

Log Accepted by:
[Signed] (Owner) Date, 19

(11) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test 12 gal./min. with 70 ft. drawdown after 1 hrs.
Artesian flow g.p.m. Date Apr. 15 1963
Temperature of water 48 Was a chemical analysis made? ☐ Yes ☒ No

(12) WELL LOG: Diameter of well 6 inches.
Depth drilled 174 ft. Depth of completed well 174 ft.
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top soil	0	3
medium boulders	3	7
Black basalt soft	7	110
Grey basalt fine Hard	110	154
brown rock soft	154	174

Work started Mar 3 1963 Completed Apr. 15 1963

(13) PUMP: moved off Well Apr. 19, 63
Manufacturer's Name ocala pump
Type: Submersible H.P. 1

Well Driller's Statement:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
NAME Roy T French (Person, firm, or corporation) (Type or print)
Address Pendleton Ore Box 56
~~Driller's well number~~ Opr Lic 209
[Signed] Roy T French (Well Driller)
License No. 107 Date Apr 29, 1963

(USE ADDITIONAL SHEETS IF NECESSARY)

5

Umat 5629 FEB 14 1992 WATER RESOURCES DEPT SALEM, OREGON

5N/3E/30d

STATE OF OREGON
WATER WELL REPORT
(as required by ORS 537.765)

(START CARD) # 13605

(1) OWNER:
Well Number:
Name SHIRLY HEVELL
Address P O BOX 756 HOLDMEN RT
City PENDLETON State OR Zip

(2) TYPE OF WORK:
☐ New Well ☐ Deepen ☑ Recondition ☐ Abandon

(3) DRILL METHOD
☑ Rotary Air ☐ Rotary Mud ☐ Cable
☐ Other

(4) PROPOSED USE:
☑ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval Yes ☐ No ☑ Depth of Completed Well ____ ft.
Explosives used Yes ☐ No ☑ Type ____ Amount ____

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds
12"	0	18	PTD Cem	0		
NA						
6						

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☐ Other
Backfill placed from ____ ft. to ____ ft. Material
Gravel placed from ____ ft. to ____ ft. Size of gravel

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					☐	☐	☐	☐
					☐	☐	☐	☐
	NA				☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:
☐ Perforations Method
☐ Screens Type Material

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
	NA					☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

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

Yield gal/min	Drawdown	Drill stem at	Time
			1 hr.
	NP		

Temperature of water Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL by legal description:
County Umatilla Latitude Longitude
Township 5N N or S. Range 31 E E or W. WM.
Section 30 NW ¼ SW ¼
Tax Lot Lot Block Subdivision
Street Address of Well (or nearest address)

(10) STATIC WATER LEVEL:
110 ft. below land surface. Date 1-24-97
Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:
Depth at which water was first found

From	To	Estimated Flow Rate	SWL
	NA		

(12) WELL LOG:
Ground elevation

Material	From	To	SWL
@ depth finder was lowered to 138 feet			
the drill bit stopped @ 125'			
indicating foreign objects in the well.			
there was no seal in the well. this seal is now in place.			

Date started 1-21-92 Completed 1-24-92

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

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 544
Signed Tony Bunch Date 1-24-92

ORIGINAL & FIRST COPY - WATER RESOURCES DEPARTMENT SECOND COPY - CONSTRUCTOR THIRD COPY - CUSTOMER 9809C.3/1

UMAT 6567

05N/31E/33AC

STATE OF OREGON
WATER WELL REPORT
(as required by ORS 537.765)

(START CARD) # 78002

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

(1) OWNER: Well Number _____
Name Betty J. White Michaels or Louis H. Michaels
Address HCR 34, Box 540
City Pendleton State OR Zip 97801

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

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

(4) PROPOSED USE:
☑ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other _____

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☑ No Depth of Completed Well 500 ft.
Explosives used ☐ Yes ☑ No Type _____ Amount _____

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
10"	0	30	Cement	0	30	16 sacks
6"	30	500				

How was seal placed: Method ☐ A ☐ B ☑ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Gravel placed from _____ ft. to _____ ft. Size of gravel _____

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6"	+1	30	.250	☑	☐	☑	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) 30

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

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

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

Yield gal/min	Drawdown	Drill stem at	Time
40		500	1 hr.

Temperature of water 62° Depth Artesian Flow Found _____
Was a water analysis done? ☐ Yes By whom _____
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other _____
Depth of strata: _____

(9) LOCATION OF WELL by legal description:
County Umatilla Latitude _____ Longitude _____
Township 5N N or S Range 31E E or W. WM.
Section 33 SE 1/4 NE 1/4
Tax Lot 800 Lot _____ Block _____ Subdivision _____
Street Address of Well (or nearest address) HCR 34, Box 540
Pendleton, OR 97801

(10) STATIC WATER LEVEL:
109 ft. below land surface. Date 8-22-95
Artesian pressure _____ lb. per square inch. Date _____

(11) WATER BEARING ZONES:
Depth at which water was first found 317

From	To	Estimated Flow Rate	SWL
317	386	10	109
477	489	30	109

(12) WELL LOG:
Ground Elevation _____

Material	From	To	SWL
Silty soil	0	4	
Brown clay with gravel	4	13	
Gray basalt	13	147	
Brown basalt	147	156	
Gray basalt	156	231	
Brown basalt	231	267	
Gray basalt	267	317	
Black basalt	317	386	WB
Gray basalt	386	477	
Brown basalt with yellow soapstone	477	489	W.B
Gray basalt	489	500	

OCT 25 1995
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 8-18-95 Completed 8-22-95

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

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 1218
Signed Patrick Wallace Date 8-31-95

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

RECEIVED

MAY 23 2001

WATER RESOURCES DEPT.
SALEM, OREGON

UMAT
54201

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)
Instructions for completing this report are on the last page of this form.

WELL I.D. # 416656
START CARD # 130153

(1) LAND OWNER: Well Number _____
Name: HERDMAN LARRY
Address: HARTLE ROAD
City: PENDLETON State: OREGON Zip: 97801

(2) TYPE OF WORK:
[X] New Well [ ] Deepening [ ] Alteration (repair/recondition) [ ] Abandonment

RECEIVED
AUG 16 2001
WATER RESOURCES DEPT.
SALEM, OREGON

(3) DRILL METHOD:
[X] Rotary Air [ ] Rotary Mud [ ] Cable [ ] Auger
[ ] Other _____

(4) PROPOSED USE:
[X] Domestic [ ] Community [ ] Industrial [ ] Irrigation
[ ] Thermal [ ] Injection [ ] Livestock [ ] Other _____

(5) BORE HOLE CONSTRUCTION:
Special Construction approval [ ] Yes [X] No Depth of Completed Well 404 ft.
Explosives used [ ] Yes [X] No Type _____ Amount _____

BORE HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
12"	0	57	BENTONITE	57	0	30 SACK
6"	57	404				

How was seal placed: Method [ ] A [ ] B [X] C [ ] D [ ] E
[ ] Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Gravel placed from _____ ft. to _____ ft. Size of gravel _____

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	8"	+2	57	.250	X	[ ]	X	[ ]
					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]
Liner:					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]

Drive Shoe used [ ] Inside [ ] Outside [X] None
Final location of shoe(s) 57

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

From	To	Slot Size	Number	Diameter	Tele/pipe size	Casing	Liner
						[ ]	[ ]
						[ ]	[ ]
						[ ]	[ ]
						[ ]	[ ]

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

Yield gal/min	Drawdown	Drill stem at	Time
20 gpm		404	1 hr
15 gpm		304	
18 gpm		354	

Temperature of water 62°F Depth Artesian Flow Found _____
Was a water analysis done? [ ] Yes By whom _____
Did any zones contain water not suitable for intended use? [ ] Too little [ ] Salty [ ] Muddy [ ] Odor [ ] Colored [ ] Other _____
Depth of strata: _____

(9) LOCATION OF WELL by legal description:
County UMATILLA Latitude _____ Longitude _____
Township 5 [X] N [ ] S Range 1 [X] E [ ] W WM
Section 15 1/4 _____ 1/4 _____
Tax Lot 400 Lot _____ Block _____ Subdivision _____
Street Address of Well (or nearest address) 300 + FEET WEST OF HARTLE ROAD

(10) STATIC WATER LEVEL:
192 ft. below land surface. Date _____
Artesian pressure _____ lb. per square inch Date _____

(11) WATER BEARING ZONES:
Depth at which water was first found _____

From	To	Estimated Flow Rate	SWL
255	270	5	192
319	324	10	192
340	388	20	192

(12) WELL LOG:
Ground Elevation _____

Material	From	To	SWL
SOIL	0	23'	
BROKEN BROWN	23'	40'	
BLACK BASALT	40'	70'	
BROWN BASALT	70'	95'	
BLACK BASALT	95'	100'	
BROWN WITH SOME CINDERS	100'	110'	
BLACK BASALT	110'	150'	
BROWN BASALT	150'	175'	
BLACK BASALT	175'	230'	
BROWN WITH SOME LIMESTONE	230'	265'	
BLACK BASALT	265'	294'	
BROWN WITH SOME LIMESTONE	294'	299'	
BLACK BASALT	299'	390'	
BLACK SCORIA	390'	395'	
BLACK BASALT	395'	404'	

Date started 04-26-01 Completed 04-30-01

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
WWC Number 1731
Signature _____ Date 05-01-01

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this date is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 244
Signature _____ Date 05-01-01

ORIGINAL – WATER RESOURCES DEPARTMENT FIRST COPY CONSTRUCTOR SECOND COPY – CUSTOMER

Appendix D

Alexin Analytical LABORATORIES, INC.
Professional Laboratory Services
13035 SW Pacific Hwy.
Tigard, OR 97223
Tel.: (503) 639-9311 Fax: (503) 684-1588

ANALYSIS REPORT

ORELAP Accredited Lab#: OR-100013

Reported: 11/11/2015
Sampled: 11/03/15
Received: 11/04/15
Sampled By: Said Amali
Work Order: 5308001

CLIENT
Akana
Attn: Said Amali
6400 SE Lake Rd Ste 270
Portland OR, 97222
Phone: (503) 652-9090

Project # : 15-
PWSID # : -
PO # : -

Project: Rupp ASR Test
Sample Name: Well 3 Groundwater
Source ID: Rupp Ranches
Method: EPA 524.2
Analyst: AGG
Sample Composition:

Volatile Organic Compounds

Regulated VOC's

Laboratory Sample ID :5308001-01 Sample Analyzed: 11/04/2015

Contaminant	Code	MRL (mg/L)	Sample Results (mg/L)	MCL (mg/L)
1,1,1-Trichloroethane	2981	0.0005	ND	0.2000
1,1,2-Trichloroethane	2985	0.0005	ND	0.0050
1,1-Dichloroethylene	2977	0.0005	ND	0.0070
1,2,4-Trichlorobenzene	2378	0.0005	ND	0.0700
1,2-Dichlorobenzene	2968	0.0005	ND	0.6000
1,2-Dichloroethane	2980	0.0005	ND	0.0050
1,2-Dichloropropane	2983	0.0005	ND	0.0050
1,4-Dichlorobenzene	2969	0.0005	ND	0.0750
Benzene	2990	0.0005	ND	0.0050
Carbon tetrachloride	2982	0.0005	ND	0.0050
Chlorobenzene	2989	0.0005	ND	0.1000
cis-1,2-Dichloroethylene	2380	0.0005	ND	0.0700
Ethyl Benzene	2992	0.0005	ND	0.7000
Methylene chloride	2964	0.0005	ND	0.0050
Styrene	2996	0.0005	ND	0.1000
Tetrachloroethylene	2987	0.0005	ND	0.0050
Toluene	2991	0.0005	ND	1.0000
trans-1,2-Dichloroethylene	2979	0.0005	ND	0.1000
Trichloroethylene	2984	0.0005	ND	0.0050
Vinyl chloride	2976	0.0005	ND	0.0050
Xylenes, total	2955	0.0015	ND	10.000

ND = None detected MRL = Minimum Reporting Limit MCL = Maximum Contamination Limit

Approved by: Adriana Gonzalez-Gray
Laboratory Director

Reviewed by: Carrie Seidl
Quality Assurance Director

Alexin Analytical LABORATORIES, INC.
Professional Laboratory Services
13035 SW Pacific Hwy.
Tigard, OR 97223
Tel.: (503) 639-9311 Fax: (503) 684-1588

ANALYSIS REPORT

ORELAP Accredited Lab#: OR-100013

Reported: 11/11/2015
Sampled: 11/03/15
Received: 11/04/15
Sampled By: Said Amali
Work Order: 5308001

CLIENT
Akana
Attn: Said Amali
6400 SE Lake Rd Ste 270
Portland OR, 97222
Phone: (503) 652-9090

Project # : 15-
PWSID # : -
PO # : -

Project: Rupp ASR Test
Sample Name: Well 3 Groundwater
Source ID: Rupp Ranches
Method: EPA 524.2 Analyst: AGG
Sample Composition:

Volatile Organic Compounds

Unregulated VOC's

Laboratory Sample ID : 5308001-01

Contaminant	MRL (mg/L)	Sample Results (mg/L)	Contaminant	MRL (mg/L)	Sample Results (mg/L)
1,1,1,2-Tetrachloroethane	0.0005	ND	Bromoform	0.0005	ND
1,1,2,2-Tetrachloroethane	0.0005	ND	Bromomethane	0.0005	ND
1,1-Dichloroethane	0.0005	ND	Chloroethane	0.0005	ND
1,1-Dichloropropene	0.0005	ND	Chloroform	0.0005	ND
1,2,3-Trichlorobenzene	0.0005	ND	Chloromethane	0.0005	ND
1,2,3-Trichloropropane	0.0005	ND	Dibromochloromethane	0.0005	ND
1,2,4- Trimethylbenzene	0.0005	ND	Dibromomethane	0.0005	ND
1,3,5- Trimethylbenzene	0.0005	ND	Dichlorodifluoromethane	0.0005	ND
1,3-Dichlorobenzene	0.0005	ND	Fluorotrichloromethane	0.0005	ND
1,3-Dichloropropane	0.0005	ND	Hexachlorobutadiene	0.0005	ND
2,2-Dichloropropane	0.0005	ND	Isopropylbenzene	0.0005	ND
2-Chlorotoluene	0.0005	ND	Naphthalene	0.0005	ND
4-Chlorotoluene	0.0005	ND	n-Butylbenzene	0.0005	ND
4-Isopropyltoluene	0.0005	ND	n-Propylbenzene	0.0005	ND
Bromobenzene	0.0005	ND	sec-Butylbenzene	0.0005	ND
Bromochloromethane	0.0005	ND	tert-Butyl methyl ether (MTBE)	0.0005	ND
Bromodichloromethane	0.0005	ND	tert-Butylbenzene	0.0005	ND
cis-1,3-Dichloropropene	0.0005	ND	trans-1 3-Dichloropropene	0.0005	ND

ND = None detected MRL = Minimum Reporting Limit

Special Notes

Approved by: Adriana Gonzalez-Gray
Laboratory Director

Reviewed by: Carrie Seidl
Quality Assurance Director

Alexin Analytical LABORATORIES, INC.
Professional Laboratory Services
13035 SW Pacific Hwy.
Tigard, OR 97223
Tel.: (503) 639-9311 Fax: (503) 684-1588

ANALYSIS REPORT

ORELAP Accredited Lab#: OR-100013

Reported: 11/11/2015
Sampled: 11/03/15
Received: 11/04/15
Sampled By: Said Amali
Work Order: 5308001

CLIENT
Akana
Attn: Said Amali
6400 SE Lake Rd Ste 270
Portland OR, 97222
Phone: (503) 652-9090

Project # : 15-
PWSID # : -
PO # : -

Project: Rupp ASR Test
Sample Name: JSH System RiverWater
Source ID: Rupp Ranches
Method: EPA 524.2 Analyst: AGG
Sample Composition:

Volatile Organic Compounds

Regulated VOC's

Laboratory Sample ID :5308001-02 Sample Analyzed: 11/04/2015

Contaminant	Code	MRL (mg/L)	Sample Results (mg/L)	MCL (mg/L)
1,1,1-Trichloroethane	2981	0.0005	ND	0.2000
1,1,2-Trichloroethane	2985	0.0005	ND	0.0050
1,1-Dichloroethylene	2977	0.0005	ND	0.0070
1,2,4-Trichlorobenzene	2378	0.0005	ND	0.0700
1,2-Dichlorobenzene	2968	0.0005	ND	0.6000
1,2-Dichloroethane	2980	0.0005	ND	0.0050
1,2-Dichloropropane	2983	0.0005	ND	0.0050
1,4-Dichlorobenzene	2969	0.0005	ND	0.0750
Benzene	2990	0.0005	ND	0.0050
Carbon tetrachloride	2982	0.0005	ND	0.0050
Chlorobenzene	2989	0.0005	ND	0.1000
cis-1,2-Dichloroethylene	2380	0.0005	ND	0.0700
Ethyl Benzene	2992	0.0005	ND	0.7000
Methylene chloride	2964	0.0005	ND	0.0050
Styrene	2996	0.0005	ND	0.1000
Tetrachloroethylene	2987	0.0005	ND	0.0050
Toluene	2991	0.0005	ND	1.0000
trans-1,2-Dichloroethylene	2979	0.0005	ND	0.1000
Trichloroethylene	2984	0.0005	ND	0.0050
Vinyl chloride	2976	0.0005	ND	0.0050
Xylenes, total	2955	0.0015	ND	10.000

ND = None detected MRL = Minimum Reporting Limit MCL = Maximum Contamination Limit

Approved by: Adriana Gonzalez-Gray
Laboratory Director

Reviewed by: Carrie Seidl
Carrie Seidl
Quality Assurance Director

Alexin Analytical LABORATORIES, INC.
Professional Laboratory Services
13035 SW Pacific Hwy.
Tigard, OR 97223
Tel.: (503) 639-9311 Fax: (503) 684-1588

ANALYSIS REPORT

ORELAP Accredited Lab#: OR-100013

Reported: 11/11/2015
Sampled: 11/03/15
Received: 11/04/15
Sampled By: Said Amali
Work Order: 5308001

CLIENT
Akana
Attn: Said Amali
6400 SE Lake Rd Ste 270
Portland OR, 97222
Phone: (503) 652-9090

Project # : 15-
PWSID # : -
PO # : -

Project: Rupp ASR Test
Sample Name: JSH System RiverWater
Source ID: Rupp Ranches
Method: EPA 524.2 Analyst: AGG
Sample Composition:

Volatile Organic Compounds

Unregulated VOC's

Laboratory Sample ID : 5308001-02

Contaminant	MRL (mg/L)	Sample Results (mg/L)
1,1,1,2-Tetrachloroethane	0.0005	ND
1,1,2,2-Tetrachloroethane	0.0005	ND
1,1-Dichloroethane	0.0005	ND
1,1-Dichloropropene	0.0005	ND
1,2,3-Trichlorobenzene	0.0005	ND
1,2,3-Trichloropropane	0.0005	ND
1,2,4- Trimethylbenzene	0.0005	ND
1,3,5- Trimethylbenzene	0.0005	ND
1,3-Dichlorobenzene	0.0005	ND
1,3-Dichloropropane	0.0005	ND
2,2-Dichloropropane	0.0005	ND
2-Chlorotoluene	0.0005	ND
4-Chlorotoluene	0.0005	ND
4-Isopropyltoluene	0.0005	ND
Bromobenzene	0.0005	ND
Bromochloromethane	0.0005	ND
Bromodichloromethane	0.0005	ND
cis-1,3-Dichloropropene	0.0005	ND

Contaminant	MRL (mg/L)	Sample Results (mg/L)
Bromoform	0.0005	ND
Bromomethane	0.0005	ND
Chloroethane	0.0005	ND
Chloroform	0.0005	ND
Chloromethane	0.0005	ND
Dibromochloromethane	0.0005	ND
Dibromomethane	0.0005	ND
Dichlorodifluoromethane	0.0005	ND
Fluorotrichloromethane	0.0005	ND
Hexachlorobutadiene	0.0005	ND
Isopropylbenzene	0.0005	ND
Naphthalene	0.0005	ND
n-Butylbenzene	0.0005	ND
n-Propylbenzene	0.0005	ND
sec-Butylbenzene	0.0005	ND
tert-Butyl methyl ether (MTBE)	0.0005	ND
tert-Butylbenzene	0.0005	ND
trans-1 3-Dichloropropene	0.0005	ND

ND = None detected MRL = Minimum Reporting Limit

Special Notes

Approved by: Adriana Gonzalez-Gray
Laboratory Director

Reviewed by: Carrie Seidl
Carrie Seidl
Quality Assurance Director

Alexin Analytical LABORATORIES, INC.
Professional Laboratory Services
13035 SW Pacific Hwy
Tigard, OR 97223
Tel.: (503) 639-9311 Fax: (503) 684-1588

ANALYSIS REPORT

ORELAP Accredited Lab#: OR-100013

Reported: 11/25/2015
Received: 11/04/2015
Sampled By: Said Amali
Work Order: 5308001

CLIENT
Akana
Attn: Said Amali
6400 SE Lake Rd Ste 270
Portland OR, 97222
Phone: (503) 652-9090

Project: Rupp ASR Test
Project # : 15-
PWSID # : -

Sampling Location: Rupp Ranches
Sample Matrix: Water

Lab Number

	Code	Method	Units	Result	MRL	EPA MCL	Secondary Standard*	Analysis Date/ Time
5308001-01	**Sample Name:** Well 3 Groundwater **Sampled:** 11/3/15 8:50							
Metals (Total)								
†*Antimony*	1074	EPA 200.9	mg/L	ND	0.001	0.006		11/12/15 15:22
†*Arsenic*	1005	EPA 200.9	mg/L	0.007	0.003	0.01		11/05/15 12:32
†*Barium*	1010	EPA 200.8	mg/L	0.0197	0.0001	2		11/09/15 00:00 **SUB-5**
†*Beryllium*	1075	EPA 200.8	mg/L	ND	0.0001	0.004		11/09/15 00:00 **SUB-5**
Boron		EPA 200.7	mg/L	ND	0.05	-		11/18/15 00:00 **SUB-5**
†*Cadmium*	1015	SM 3113B	mg/L	ND	0.0005	0.005		11/16/15 15:21
Calcium	1016	SM3111D	mg/L	19.4	0.2	-		11/12/15 15:02
†*Chromium*	1020	EPA 200.8	mg/L	0.0019	0.0004	0.1		11/09/15 00:00 **SUB-5**
Iron	1028	SM3111B	mg/L	ND	0.050	-	0.3	11/05/15 14:28
Magnesium	1031	SM 3111B	mg/L	19.1	0.400	-		11/11/15 14:48
Manganese	1032	SM3111B	mg/L	ND	0.025	-	0.05	11/05/15 15:49
†*Mercury*	1035	EPA 245.1	mg/L	ND	0.0005	0.002		11/11/15 12:15
Potassium	1042	SM 3111B	mg/L	6.4	0.50	-		11/11/15 10:22
†*Selenium*	1140	EPA 200.9	mg/L	ND	0.005	0.05		11/16/15 17:12
Silica	1049	EPA 370.1	mg/L	42**	1.0	-		11/05/15 14:00
Sodium	1052	SM3111B	mg/L	38.6	0.5	-	20	11/11/15 10:40
†*Thallium*	1085	EPA 200.8	mg/L	ND	0.0001	0.002		11/09/15 00:00 **SUB-5**
Inorganics								
Alkalinity, Total (CaCO3)	1067	EPA 310.1	mg/L	195	2	-		11/05/15 13:45
Bicarbonate		SM4500-CO2D	mg/L	190	2	-		11/09/15 11:01
Carbonate	-	SM4500-CO2D	mg/L	ND	2.00	-		11/09/15 11:01
Chloride	1017	EPA 300.0	mg/L	4.9	0.50	-	250	11/04/15 14:32
†*Cyanide*	1024	SM 4500-CN E	mg/L	ND	0.020	0.2		11/13/15 12:10
†*Fluoride*	1025	EPA 300.0	mg/L	0.42	0.10	4		11/04/15 14:32
†*Nitrate as N*	1040	EPA 300.0	mg/L	3.70	0.100	10		11/04/15 14:32
†*Nitrite as N*	1041	EPA 300.0	mg/L	0.0131	0.0100	1		11/04/15 14:32
†*Nitrate + Nitrite*		Calculation	mg/L	3.72		-		11/04/15 14:32
Sulfate	1055	EPA 300.0	mg/L	11	1.0	-	250	11/04/15 14:32

This report shall not be reproduced, except in full, without the written approval of the laboratory.

Alexin Analytical LABORATORIES, INC.
Professional Laboratory Services
13035 SW Pacific Hwy
Tigard, OR 97223
Tel.: (503) 639-9311 Fax: (503) 684-1588

ANALYSIS REPORT

ORELAP Accredited Lab#: OR-100013

Reported: 11/25/2015
Received: 11/04/2015
Sampled By: Said Amali
Work Order: 5308001

CLIENT
Akana
Attn: Said Amali
6400 SE Lake Rd Ste 270
Portland OR, 97222
Phone: (503) 652-9090

Project: Rupp ASR Test
Project # : 15-
PWSID # : -

Sampling Location: Rupp Ranches
Sample Matrix: Water

Lab Number

	Code	Method	Units	Result	MRL	EPA MCL	Secondary Standard*	Analysis Date/ Time
5308001-01 **Sample Name:** Well 3 Groundwater **Sampled:** 11/3/15 8:50								
Inorganics								
Total Dissolved Solids		EPA 160.1	mg/L	271	1.00	-		11/05/15 08:00
Total Organic Carbon	2920	SM5310-C	mg/L	2.66	0.50	-		11/06/15 12:31

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Alexin Analytical LABORATORIES, INC.
Professional Laboratory Services
13035 SW Pacific Hwy
Tigard, OR 97223
Tel.: (503) 639-9311 Fax: (503) 684-1588

ANALYSIS REPORT

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Project # : 15-
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Sampling Location: Rupp Ranches
Sample Matrix: Water

Lab Number

Lab Number **5308001-01** | **Sample Name** **Well 3 Groundwater** | **Sampled: 11/3/15 8:50** | **Sample Composition:**

Synthetic Organic Chemicals	Code	Method	Units	Result	MRL	EPA MCL	Analysis Date	
Regulated Analyte								
† *1,2-Dibromo-3-chloropropane*	2931	EPA 504.1	mg/L	ND	0.00002	0.0002	11/11/2015	SUB-5
† *1,2-Dibromoethane*	2946	EPA 504.1	mg/L	ND	0.00002	0.00005	11/11/2015	SUB-5
† *2,4,5-TP (Silvex)*	2110	EPA 515.3	mg/L	ND	0.005	0.05	11/16/2015	SUB-5
† *2,4-D*	2105	EPA 515.3	mg/L	ND	0.001	0.07	11/16/2015	SUB-5
† *Alachlor*	2051	EPA 525.2	mg/L	ND	0.0002	0.002	11/16/2015	SUB-5
† *Atrazine*	2050	EPA 525.2	mg/L	ND	0.0003	0.003	11/16/2015	SUB-5
† *Benzo (a) pyrene*	2306	EPA 525.2	mg/L	ND	0.00004	0.0002	11/16/2015	SUB-5
† *Bis(2-ethylhexyl) adipate*	2035	EPA 525.2	mg/L	ND	0.004	0.4	11/16/2015	SUB-5
† *Bis(2-ethylhexyl) phthalate*	2039	EPA 525.2	mg/L	ND	0.002	0.006	11/16/2015	SUB-5
† *Carbofuran*	2046	EPA 531.1	mg/L	ND	0.004	0.04	11/13/2015	SUB-5
† *Chlordane*	2959	EPA 508	mg/L	ND	0.00025	0.002	11/11/2015	SUB-5
† *Dalapon*	2031	EPA 515.3	mg/L	ND	0.005	0.2	11/16/2015	SUB-5
† *Dinoseb*	2041	EPA 515.3	mg/L	ND	0.0005	0.007	11/16/2015	SUB-5
† *Diquat*	2032	EPA 549.2	mg/L	ND	0.002	0.02	11/09/2015	SUB-5
† *Endothall*	2033	EPA 548.1	mg/L	ND	0.01	0.1	11/10/2015	SUB-5
† *Endrin*	2005	EPA 508	mg/L	ND	0.00001	0.002	11/11/2015	SUB-5
† *Glyphosate*	2034	EPA 547	mg/L	ND	0.05	0.7	11/09/2015	SUB-5
† *Heptachlor*	2065	EPA 508	mg/L	ND	0.00001	0.0004	11/11/2015	SUB-5
† *Heptachlor Epoxide*	2067	EPA 508	mg/L	ND	0.00001	0.0002	11/11/2015	SUB-5
† *Hexachlorobenzene*	2274	EPA 525.2	mg/L	ND	0.0001	0.001	11/16/2015	SUB-5
† *Hexachlorocyclopentadiene*	2042	EPA 525.2	mg/L	ND	0.005	0.05	11/16/2015	SUB-5
† *Lindane*	2010	EPA 508	mg/L	ND	0.00001	0.0002	11/11/2015	SUB-5
† *Methoxychlor*	2015	EPA 508	mg/L	ND	0.0001	0.04	11/11/2015	SUB-5
† *Oxamyl (Vydate)*	2036	EPA 531.1	mg/L	ND	0.004	0.2	11/13/2015	SUB-5
† *Pentachlorophenol*	2326	EPA 515.3	mg/L	ND	0.0001	0.001	11/16/2015	SUB-5
† *Picloram*	2040	EPA 515.3	mg/L	ND	0.005	0.5	11/16/2015	SUB-5
† *Polychlorinated biphenyls*	2383	EPA 508	mg/L	ND	0.00025	0.0005	11/11/2015	SUB-5
† *Simazine*	2037	EPA 525.2	mg/L	ND	0.0004	0.004	11/16/2015	SUB-5
† *Toxaphene*	2020	EPA 508	mg/L	ND	0.0003	0.003	11/11/2015	SUB-5
Unregulated Analyte								
† *3-Hydroxycarbofuran*	2066	EPA 531.1	mg/L	ND	0.004	-	11/13/2015	SUB-5
† *Aldicarb*	2047	EPA 531.1	mg/L	ND	0.004	-	11/13/2015	SUB-5

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Work Order: 5308001

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Akana
Attn: Said Amali
6400 SE Lake Rd Ste 270
Portland OR, 97222
Phone: (503) 652-9090

Project: Rupp ASR Test
Project # : 15-
PWSID # : -

Sampling Location: Rupp Ranches
Sample Matrix: Water

Lab Number

Synthetic Organic Chemicals	Code	Method	Units	Result	MRL	EPA MCL	Analysis Date	
†*Aldicarb Sulfone*	2044	EPA 531.1	mg/L	ND	0.004	-	11/13/2015	SUB-5
†*Aldicarb sulfoxide*	2043	EPA 531.1	mg/L	ND	0.004	-	11/13/2015	SUB-5
†*Aldrin*	2356	EPA 508	mg/L	ND	0.00001	-	11/11/2015	SUB-5
†*Baygon*		EPA 531.1	mg/L	ND	0.004	-	11/13/2015	SUB-5
†*Butachlor*	2076	EPA 525.2	mg/L	ND	0.0003	-	11/16/2015	SUB-5
†*Carbaryl*	2021	EPA 531.1	mg/L	ND	0.004	-	11/13/2015	SUB-5
†*Dicamba*	2440	EPA 515.3	mg/L	ND	0.005	-	11/16/2015	SUB-5
†*Dieldrin*	2070	EPA 508	mg/L	ND	0.00001	-	11/11/2015	SUB-5
†*Methiocarb*		EPA 531.1	mg/L	ND	0.004	-	11/13/2015	SUB-5
†*Methomyl*	2022	EPA 531.1	mg/L	ND	0.004	-	11/13/2015	SUB-5
†*Metolachlor*	2045	EPA 525.2	mg/L	ND	0.0004	-	11/16/2015	SUB-5
†*Metribuzin*	2595	EPA 525.2	mg/L	ND	0.0004	-	11/16/2015	SUB-5
†*Propachlor*	2077	EPA 525.2	mg/L	ND	0.0004	-	11/16/2015	SUB-5

Lab Number **5308001-01** | **Sample Name** **Well 3 Groundwater** | **Sampled: 11/3/15 8:50** | **Sample Composition:**

Asbestos	Code	Method	Units	Result	MRL	EPA MCL	Analysis Date	
TEM Water Amphibole		EPA 100.2	IFL>10-ur	ND	0.119	7	11/06/2015	SUB-8
TEM Water Chrysotile		EPA 100.2	IFL>10-ur	ND	0.119	7	11/06/2015	SUB-8
TEM Water Total		EPA 100.2	IFL>10-ur	ND	0.119	7	11/06/2015	SUB-8

5308001-01 **Sample Name: Well 3 Groundwater** **Sampled:** 11/3/15 8:50

	Method	Result	Analysis Date/ Time
Microbiological Analysis			
†*Total Coliforms*	SM 9223B (colilert-18) 21st Ed.	Absent	11/4/15 12:28
†*E. coli*	SM 9223B (colilert-18) 21st Ed.	Absent	11/4/15 12:28

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Project: Rupp ASR Test
Project # : 15-
PWSID # : -

Sampling Location: Rupp Ranches
Sample Matrix: Water

Lab Number
5308001-01 **Sample Name: Well 3 Groundwater** **Sampled:** 11/3/15 8:50
Sample Type:

	Method	Units	Result	MRL	Date/ Time Analysis Begun
Microbiological Analysis					
Total Coliforms	SM 9223B (colilert-18) 21st Ed.	MPN/100 mL	<1	1	11/04/15 12:23 **R-1**
E. coli	SM 9223B (colilert-18) 21st Ed.	MPN/100 mL	<1	1	11/04/15 12:23 **R-1**

Analyzed: 11/05/15 09:30 Analyzed by: VG

R-1 Sample was received and set up past 8 hour holding time.
SUB-5 This analysis was subcontracted to Neilson Research Corporation ORELAP ID# OR100016
SUB-8 This analysis was subcontracted to Lab/Cor, Portland. ORELAP ID# OR 4010.
ND = None detected at the MRL **MRL** = Minimum Reporting Limit **MCL** = Maximum Contamination Limit
†All procedures for this analysis conform to NELAC standards.

*This is a secondary standard and has no contaminant level. This is a guideline that is associated with aesthetic effect such as staining of plumbing fixtures, tastes, and odors.

**The Silica content of natural water most commonly is in the 1-30 mg/L range, although concentrations as high as 100 mg/L are not unusual.

Approved by: Adriana Gonzalez-Gray
Laboratory Director

Approved by: Steve Williams
Microbiology Technical Director

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Project: Rupp ASR Test
Project # : 15-
PWSID # : -

Sampling Location: Rupp Ranches
Sample Matrix: Water

Lab Number

5308001-02 **Sample Name:** JSH System RiverWater
Sampled: 11/3/15 14:18

	Code	Method	Units	Result	MRL	EPA MCL	Secondary Standard*	Analysis Date/ Time
Metals (Total)								
†*Antimony*	1074	EPA 200.9	mg/L	ND	0.001	0.006		11/12/15 15:22
†*Arsenic*	1005	EPA 200.9	mg/L	ND	0.003	0.01		11/05/15 12:32
†*Barium*	1010	EPA 200.8	mg/L	0.0238	0.0001	2		11/09/15 00:00 **SUB-5**
†*Beryllium*	1075	EPA 200.8	mg/L	ND	0.0001	0.004		11/09/15 00:00 **SUB-5**
Boron		EPA 200.7	mg/L	ND	0.05	-		11/18/15 00:00 **SUB-5**
†*Cadmium*	1015	SM 3113B	mg/L	ND	0.0005	0.005		11/16/15 15:21
Calcium	1016	SM3111D	mg/L	19.6	0.2	-		11/12/15 15:02
†*Chromium*	1020	EPA 200.8	mg/L	ND	0.0004	0.1		11/09/15 00:00 **SUB-5**
Iron	1028	SM3111B	mg/L	0.057	0.050	-	0.3	11/05/15 14:28
Magnesium	1031	SM 3111B	mg/L	7.94	0.200	-		11/11/15 14:48
Manganese	1032	SM3111B	mg/L	ND	0.025	-	0.05	11/05/15 15:49
†*Mercury*	1035	EPA 245.1	mg/L	ND	0.0005	0.002		11/11/15 12:15
Potassium	1042	SM 3111B	mg/L	1.2	0.50	-		11/11/15 10:22
†*Selenium*	1140	EPA 200.9	mg/L	ND	0.005	0.05		11/16/15 17:12
Silica	1049	EPA 370.1	mg/L	6.0**	1.0	-		11/05/15 14:00
Sodium	1052	SM3111B	mg/L	5.2	0.1	-	20	11/11/15 10:40
†*Thallium*	1085	EPA 200.8	mg/L	ND	0.0001	0.002		11/09/15 00:00 **SUB-5**
Inorganics								
Alkalinity, Total (CaCO3)	1067	EPA 310.1	mg/L	78	2	-		11/05/15 13:45
Bicarbonate		SM4500-CO2D	mg/L	77	2	-		11/09/15 11:01
Carbonate	-	SM4500-CO2D	mg/L	ND	2.00	-		11/09/15 11:01
Chloride	1017	EPA 300.0	mg/L	2.5	0.50	-	250	11/04/15 14:49
†*Cyanide*	1024	SM 4500-CN E	mg/L	ND	0.020	0.2		11/13/15 12:10
†*Fluoride*	1025	EPA 300.0	mg/L	0.17	0.10	4		11/04/15 14:49
†*Nitrate as N*	1040	EPA 300.0	mg/L	0.299	0.100	10		11/04/15 14:49
†*Nitrite as N*	1041	EPA 300.0	mg/L	ND	0.0100	1		11/04/15 14:49
†*Nitrate + Nitrite*		Calculation	mg/L	0.299		-		11/04/15 14:49
Sulfate	1055	EPA 300.0	mg/L	12	1.0	-	250	11/04/15 14:49

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Phone: (503) 652-9090

Project: Rupp ASR Test
Project # : 15-
PWSID # : -

Sampling Location: Rupp Ranches
Sample Matrix: Water

Lab Number

	Code	Method	Units	Result	MRL	EPA MCL	Secondary Standard*	Analysis Date/ Time
5308001-02 **Sample Name:** JSH System RiverWater **Sampled:** 11/3/15 14:18								
Inorganics								
Total Dissolved Solids		EPA 160.1	mg/L	108	1.00	-		11/05/15 08:00
Total Organic Carbon	2920	SM5310-C	mg/L	2.18	0.50	-		11/06/15 12:31

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PWSID # : -

Sampling Location: Rupp Ranches
Sample Matrix: Water

Lab Number

Lab Number	Sample Name	Sampled: 11/3/15 14:18	Sample Composition:
5308001-02	**JSH System RiverWater**		

Synthetic Organic Chemicals	Code	Method	Units	Result	MRL	EPA MCL	Analysis Date	
Regulated Analyte								
† *1,2-Dibromo-3-chloropropane*	2931	EPA 504.1	mg/L	ND	0.00002	0.0002	11/11/2015	SUB-5
† *1,2-Dibromoethane*	2946	EPA 504.1	mg/L	ND	0.00002	0.00005	11/11/2015	SUB-5
† *2,4,5-TP (Silvex)*	2110	EPA 515.3	mg/L	ND	0.005	0.05	11/16/2015	SUB-5
† *2,4-D*	2105	EPA 515.3	mg/L	ND	0.001	0.07	11/16/2015	SUB-5
† *Alachlor*	2051	EPA 525.2	mg/L	ND	0.0002	0.002	11/16/2015	SUB-5
† *Atrazine*	2050	EPA 525.2	mg/L	ND	0.0003	0.003	11/16/2015	SUB-5
† *Benzo (a) pyrene*	2306	EPA 525.2	mg/L	ND	0.00004	0.0002	11/16/2015	SUB-5
† *Bis(2-ethylhexyl) adipate*	2035	EPA 525.2	mg/L	ND	0.004	0.4	11/16/2015	SUB-5
† *Bis(2-ethylhexyl) phthalate*	2039	EPA 525.2	mg/L	ND	0.002	0.006	11/16/2015	SUB-5
† *Carbofuran*	2046	EPA 531.1	mg/L	ND	0.004	0.04	11/16/2015	SUB-5
† *Chlordane*	2959	EPA 508	mg/L	ND	0.00025	0.002	11/11/2015	SUB-5
† *Dalapon*	2031	EPA 515.3	mg/L	ND	0.005	0.2	11/16/2015	SUB-5
† *Dinoseb*	2041	EPA 515.3	mg/L	ND	0.0005	0.007	11/16/2015	SUB-5
† *Diquat*	2032	EPA 549.2	mg/L	ND	0.002	0.02	11/09/2015	SUB-5
† *Endothall*	2033	EPA 548.1	mg/L	ND	0.01	0.1	11/10/2015	SUB-5
† *Endrin*	2005	EPA 508	mg/L	ND	0.00001	0.002	11/11/2015	SUB-5
† *Glyphosate*	2034	EPA 547	mg/L	ND	0.05	0.7	11/09/2015	SUB-5
† *Heptachlor*	2065	EPA 508	mg/L	ND	0.00001	0.0004	11/11/2015	SUB-5
† *Heptachlor Epoxide*	2067	EPA 508	mg/L	ND	0.00001	0.0002	11/11/2015	SUB-5
† *Hexachlorobenzene*	2274	EPA 525.2	mg/L	ND	0.0001	0.001	11/16/2015	SUB-5
† *Hexachlorocyclopentadiene*	2042	EPA 525.2	mg/L	ND	0.005	0.05	11/16/2015	SUB-5
† *Lindane*	2010	EPA 508	mg/L	ND	0.00001	0.0002	11/11/2015	SUB-5
† *Methoxychlor*	2015	EPA 508	mg/L	ND	0.0001	0.04	11/11/2015	SUB-5
† *Oxamyl (Vydate)*	2036	EPA 531.1	mg/L	ND	0.004	0.2	11/16/2015	SUB-5
† *Pentachlorophenol*	2326	EPA 515.3	mg/L	ND	0.0001	0.001	11/16/2015	SUB-5
† *Picloram*	2040	EPA 515.3	mg/L	ND	0.005	0.5	11/16/2015	SUB-5
† *Polychlorinated biphenyls*	2383	EPA 508	mg/L	ND	0.00025	0.0005	11/11/2015	SUB-5
† *Simazine*	2037	EPA 525.2	mg/L	ND	0.0004	0.004	11/16/2015	SUB-5
† *Toxaphene*	2020	EPA 508	mg/L	ND	0.0003	0.003	11/11/2015	SUB-5
Unregulated Analyte								
† *3-Hydroxycarbofuran*	2066	EPA 531.1	mg/L	ND	0.004	-	11/16/2015	SUB-5
† *Aldicarb*	2047	EPA 531.1	mg/L	ND	0.004	-	11/16/2015	SUB-5

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Sampling Location: Rupp Ranches
Sample Matrix: Water

Lab Number

Synthetic Organic Chemicals	Code	Method	Units	Result	MRL	EPA MCL	Analysis Date	
†*Aldicarb Sulfone*	2044	EPA 531.1	mg/L	ND	0.004	-	11/16/2015	SUB-5
†*Aldicarb sulfoxide*	2043	EPA 531.1	mg/L	ND	0.004	-	11/16/2015	SUB-5
†*Aldrin*	2356	EPA 508	mg/L	ND	0.00001	-	11/11/2015	SUB-5
†*Baygon*		EPA 531.1	mg/L	ND	0.004	-	11/16/2015	SUB-5
†*Butachlor*	2076	EPA 525.2	mg/L	ND	0.0003	-	11/16/2015	SUB-5
†*Carbaryl*	2021	EPA 531.1	mg/L	ND	0.004	-	11/16/2015	SUB-5
†*Dicamba*	2440	EPA 515.3	mg/L	ND	0.005	-	11/16/2015	SUB-5
†*Dieldrin*	2070	EPA 508	mg/L	ND	0.00001	-	11/11/2015	SUB-5
†*Methiocarb*		EPA 531.1	mg/L	ND	0.004	-	11/16/2015	SUB-5
†*Methomyl*	2022	EPA 531.1	mg/L	ND	0.004	-	11/16/2015	SUB-5
†*Metolachlor*	2045	EPA 525.2	mg/L	ND	0.0004	-	11/16/2015	SUB-5
†*Metribuzin*	2595	EPA 525.2	mg/L	ND	0.0004	-	11/16/2015	SUB-5
†*Propachlor*	2077	EPA 525.2	mg/L	ND	0.0004	-	11/16/2015	SUB-5

Lab Number **5308001-02** **Sample Name** **JSH System RiverWater** **Sampled: 11/3/15 14:18** **Sample Composition:**

Asbestos	Code	Method	Units	Result	MRL	EPA MCL	Analysis Date	
TEM Water Amphibole		EPA 100.2	IFL>10-ur	ND	0.190	7	11/06/2015	SUB-8
TEM Water Chrysotile		EPA 100.2	IFL>10-ur	ND	0.190	7	11/06/2015	SUB-8
TEM Water Total		EPA 100.2	IFL>10-ur	ND	0.190	7	11/06/2015	SUB-8

5308001-02 **Sample Name: JSH System RiverWater** **Sampled:** 11/3/15 14:18

	Method	Result	Analysis Date/ Time
Microbiological Analysis			
†*Total Coliforms*	SM 9223B (colilert-18) 21st Ed.	**Present**	11/4/15 12:28
†*E. coli*	SM 9223B (colilert-18) 21st Ed.	**Present**	11/4/15 12:28

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6400 SE Lake Rd Ste 270
Portland OR, 97222
Phone: (503) 652-9090

Project: Rupp ASR Test
Project # : 15-
PWSID # : -

Sampling Location: Rupp Ranches
Sample Matrix: Water

Lab Number
5308001-02 **Sample Name: JSH System RiverWater** **Sampled:** 11/3/15 14:18
Sample Type:

	Method	Units	Result	MRL	Date/ Time Analysis Begun	
Microbiological Analysis						
Total Coliforms	SM 9223B (colilert-18) 21st Ed.	MPN/100 mL	64	1	11/04/15 12:23	**R-1**
E. coli	SM 9223B (colilert-18) 21st Ed.	MPN/100 mL	1	1	11/04/15 12:23	**R-1**

Analyzed: 11/05/15 09:30 Analyzed by: VG

R-1 Sample was received and set up past 8 hour holding time.
SUB-5 This analysis was subcontracted to Neilson Research Corporation ORELAP ID# OR100016
SUB-8 This analysis was subcontracted to Lab/Cor, Portland. ORELAP ID# OR 4010.
ND = None detected at the MRL **MRL** = Minimum Reporting Limit **MCL** = Maximum Contamination Limit
†All procedures for this analysis conform to NELAC standards.

*This is a secondary standard and has no contaminant level. This is a guideline that is associated with aesthetic effect such as staining of plumbing fixtures, tastes, and odors.

**The Silica content of natural water most commonly is in the 1-30 mg/L range, although concentrations as high as 100 mg/L are not unusual.

Approved by: Adriana Gonzalez-Gray
Laboratory Director

Approved by: Steve Williams
Microbiology Technical Director

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Alexin Analytical LABORATORIES, INC.
Professional Laboratory Services
13035 SW Pacific Hwy
Tigard, OR 97223
Tel.: (503) 639-9311 Fax: (503) 684-1588

ANALYSIS REPORT

ORELAP Accredited Lab#: OR-100013

Reported: 12/01/2015
Received: 11/04/2015
Sampled By: Said Amali
Work Order: 5308001

CLIENT
Akana
Attn: Said Amali
6400 SE Lake Rd Ste 270
Portland OR, 97222
Phone: (503) 652-9090

Project: Rupp ASR Test
Project # : 15-
PWSID # : -

Sampling Location: Rupp Ranches
Sample Matrix: Water

Lab Number

	Code	Method	Units	Result	MRL	EPA MCL	Analysis Date/ Time
5308001-01	**Sample Name:** Well 3 Groundwater **Sampled:** 11/3/15 8:50						
Metals (Total)							
Uranium	4006	EPA 200.8	mg/L	0.00440	0.00200	0.03	11/13/15 11:25 **SUB-9**
Radiological Analysis							
Gross Alpha	4002	E900.0	pCi/L	ND	3.00	15	11/19/15 19:12 **SUB-9**
Gross Beta	4100	EPA 900.0	pCi/L	5.82	4.00	-	11/19/15 19:12 **SUB-9**
Radium-226	4020	EPA 903.0	pCi/L	ND	0.980	-	11/20/15 11:46 **SUB-9**
†*Radium 226 + Radium 228*		A7500-RA	pCi/L	ND	1.88	-	11/20/15 11:46
Radium-228	4030	EPA 904.0	pCi/L	ND	0.900	-	11/19/15 13:31 **SUB-9**

SUB-9 This analysis was subcontracted to Summit Environmental Laboratories. ORELAP ID# OH 200001.
ND = None detected at the MRL **MRL** = Minimum Reporting Limit **MCL** = Maximum Contamination Limit
†All procedures for this analysis conform to NELAC standards.

Approved by: _____
Adriana Gonzalez-Gray
Laboratory Director

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Professional Laboratory Services
13035 SW Pacific Hwy
Tigard, OR 97223
Tel.: (503) 639-9311 Fax: (503) 684-1588

ANALYSIS REPORT

ORELAP Accredited Lab#: OR-100013

Reported: 12/01/2015
Received: 11/04/2015
Sampled By: Said Amali
Work Order: 5308001

CLIENT
Akana
Attn: Said Amali
6400 SE Lake Rd Ste 270
Portland OR, 97222
Phone: (503) 652-9090

Project: Rupp ASR Test
Project # : 15-
PWSID # : -

Sampling Location: Rupp Ranches
Sample Matrix: Water

Lab Number

	Code	Method	Units	Result	MRL	EPA MCL	Analysis Date/ Time
5308001-02 **Sample Name:** JSH System RiverWater **Sampled:** 11/3/15 14:18							
Metals (Total)							
Uranium	4006	EPA 200.8	mg/L	ND	0.00200	0.03	11/13/15 11:25 **SUB-9**
Radiological Analysis							
Gross Alpha	4002	E900.0	pCi/L	ND	3.00	15	11/19/15 19:12 **SUB-9**
Gross Beta	4100	EPA 900.0	pCi/L	ND	4.00	-	11/19/15 19:12 **SUB-9**
Radium-226	4020	EPA 903.0	pCi/L	ND	0.980	-	11/20/15 11:47 **SUB-9**
†*Radium 226 + Radium 228*		A7500-RA	pCi/L	ND	1.88	-	11/20/15 11:47
Radium-228	4030	EPA 904.0	pCi/L	ND	0.900	-	11/19/15 13:31 **SUB-9**

SUB-9 This analysis was subcontracted to Summit Environmental Laboratories. ORELAP ID# OH 200001.
ND = None detected at the MRL **MRL** = Minimum Reporting Limit **MCL** = Maximum Contamination Limit
†All procedures for this analysis conform to NELAC standards.

Approved by: _____
Adriana Gonzalez-Gray
Laboratory Director

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Alexin Analytical LABORATORIES, INC.

Professional Laboratory Services

Chain of Custody Record

Laboratory Job Number: 5308001-01-1

13035 SW Pacific Hwy Tigard, OR 97223 ph: 503.639.9311 fax: 503.684.1588 email:mail@alexinlabs.com

Client Contact Information	Results Reporting Information	Invoicing Information
Company/Client Name: Akana	Project Manager: Said Amali	Accounts Payable Contact:
Address: 6400 SE Lake Rd Ste 270	Mailing Address: -	Mailing Address:
City/State/Zip: Portland OR 97222	City/State/Zip:	City/State/Zip:
phone: 503 652 9090	phone:	phone:
fax or email:	fax or email: said.amali@akana.us	fax or email:

SAMPLING INFORMATION

Sampling Location: Rupp Ranches P.O. #: PWSID #:

Sampled By: Said Amali Project Name: Rupp ASR Test Project #: 15- Permit #:

Send results to OR State Health Division? (Please circle) Yes No

Lab ID (Lab use only)	Sample Identification (Please enter a unique ID per line for each separate sample)	Date Collected	Time Collected (Begin-End if comp.)	Sample Matrix*	# of cont. rec'd	Analysis Requested**	SEE ATTACHED	Sample Specific Notes/Field Data (for each WW sample, specify Grab / Composite; for each DW sample, specify Raw / Treated, Source / Distribution, Single / Combined WHERE APPLICABLE)
	Well 3 Groundwater	11/3/15	8:50 am	W			X	Field pH 7.53
	JSH System River Water *	11/3/15	2:18 pm	W			X	" 7.87
	* 1VOA w/bubble on VOC. CS 11/4/15							

Relinquished By (print):	Company:	Date/Time:	Signature:	Received By:	Company:	Date/Time:	Signature:
Said Amali	Akana	11/4/15 9:20am	[signature]				
Relinquished By (print):	Company:	Date/Time:	Signature:	Received By:	Company:	Date/Time:	Signature:

The most current revision of SOP-10-003 was used when these samples were collected ☐

Received by Laboratory Log-In Staff: [signature] Date/Time: 11/4/15 7:57 Temp. on receipt: 3.4 °C Containers Intact? (Y) N On ice? (Y) N ID: TRM-10- 003

* Drinking water (DW), effluent (EFF), ground water (GW), influent (INF), non-aqueous liquid (NAL), paint chips, raw water (RW), sludge, soil, solid, source water (SOURCE), spring, stormwater (SW), surface water, wastewater (WW), well water (WELL)

** Analyses for SOC, Radionuclide, Radon, and Asbestos are subcontracted out to other accredited laboratories.