Application for a Permit to Use

# Groundwater

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OREGON WATER RESOURCES DEPARTMENT
Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem, Oregon 97301-1266
503-986-0900
www.oregon.gov/OWRD

## SECTION 1: APPLICANT INFORMATION AND SIGNATURE

**Applicant**

| NAME | | | | PHONE (HM) |
|---|---|---|---|---|
| Jarrod Penttila | | | | 541.706.2163 |
| PHONE (WK) | CELL | | | FAX |
| 541.706.2163 | 541.706.2163 | | | |
| ADDRESS | | | | |
| 1500 SW Chandler Avenue | | | | |
| CITY | STATE | ZIP | E-MAIL* | |
| Bend | OR | 97702 | Jarrod.Penttila@OSUCascades.com | |

**Organization**

| NAME | | | PHONE | FAX |
|---|---|---|---|---|
| Oregon State University-Cascades | | | 541.706.2163 | |
| ADDRESS | | | | CELL |
| 1500 SW Chandler Avenue | | | | 541.706.2163 |
| CITY | STATE | ZIP | E-MAIL* | |
| Bend | OR | 97702 | Jarrod.Penttila@OSUCascades.com | |

**Agent** – The agent is authorized to represent the applicant in all matters relating to this application.

| AGENT / BUSINESS NAME | | | PHONE | FAX |
|---|---|---|---|---|
| Shane M. Cochran, R.G. | | | 541.382.4707 | |
| ADDRESS | | | | CELL |
| 62915 NE 18th Street, Suite 1 | | | | 541.280.3315 |
| CITY | STATE | ZIP | E-MAIL* | |
| Bend | OR | 97701 | scochran@wallacegroup-inc.com | |

Note: Attach multiple copies as needed

* By providing an e-mail address, consent is given to receive all correspondence from the Department electronically. (Paper copies of the proposed and final order documents will also be mailed.)

**By my signature below I confirm that I understand:**

- I am asking to use water specifically as described in this application.
- Evaluation of this application will be based on information provided in the application.
- I cannot use water legally until the Water Resources Department issues a permit.
- Oregon law requires that a permit be issued before beginning construction of any proposed well, unless the use is exempt. Acceptance of this application does not guarantee a permit will be issued.
- If I get a permit, I must not waste water.
- If development of the water use is not according to the terms of the permit, the permit can be cancelled.
- The water use must be compatible with local comprehensive land-use plans.
- Even if the Department issues a permit, I may have to stop using water to allow senior water-right holders to get water to which they are entitled.

**I (we) affirm that the information contained in this application is true and accurate.**

| Applicant Signature | Print Name and Title if applicable | Date |
|---|---|---|
| JarrodPenttila | Jarrod Penttila - Const Proj Manager | 5/5/2020 |
| | | |



For Department Use: App. Number: _____

## SECTION 2: PROPERTY OWNERSHIP

Please indicate if you own all the lands associated with the project from which the water is to be diverted, conveyed, and used.

- [x] YES, there are no encumbrances.
- [ ] YES, the land is encumbered by easements, rights of way, roads or other encumbrances.

- [ ] NO, I have a recorded easement or written authorization permitting access.
- [ ] NO, I do not currently have written authorization or easement permitting access.
- [ ] NO, written authorization or an easement is not necessary, because the only affected lands I do not own are state-owned submersible lands, and this application is for irrigation and/or domestic use only (ORS 274.040).
- [ ] NO, because water is to be diverted, conveyed, and/or used only on federal lands.

**Affected Landowners:** List the names and mailing addresses of all owners of any lands that are not owned by the applicant and that are crossed by the proposed ditch, canal or other work, even if the applicant has obtained written authorization or an easement from the owner. (*Attach additional sheets if necessary).*

**Legal Description:** You must provide the legal description of: 1. The property from which the water is to be diverted, 2. Any property crossed by the proposed ditch, canal or other work, and 3. Any property on which the water is to be used as depicted on the map.

## SECTION 3: WELL DEVELOPMENT

| | | IF LESS THAN 1 MILE: | |
|---|---|---|---|
| WELL NO. | NAME OF NEAREST SURFACE WATER | DISTANCE TO NEAREST SURFACE WATER | ELEVATION CHANGE BETWEEN NEAREST SURFACE WATER AND WELL HEAD |
| DESC 61926 | Deschutes River | 0.3 mile | 75 feet |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Please provide any information for your existing or proposed well(s) that you believe may be helpful in evaluating your application. For existing wells, describe any previous alteration(s) or repair(s) not documented in the attached well log or other materials *(attach additional sheets if necessary).*

See appended Water Supply Well Report and Pumping-Test Letter

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## SECTION 3: WELL DEVELOPMENT, continued

**Total maximum rate requested:** 1,000 gpm (each well will be evaluated at the maximum rate unless you indicate well-specific rates and annual volumes in the table below).

**The table below must be completed for each source to be evaluated or the application will be returned.** If this is an existing well, the information may be found on the applicable well log. *(If a well log is available, please submit it in addition to completing the table.)* If this is a proposed well, or well-modification, consider consulting with a licensed well driller, geologist, or certified water right examiner to obtain the necessary information.

| | | | | | | | | | | PROPOSED USE | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OWNER'S WELL NAME OR NO. | PROPOSED | EXISTING | WELL ID (WELL TAG) NO.* OR WELL LOG ID** | FLOWING ARTESIAN | CASING DIAMETER | CASING INTERVALS (IN FEET) | PERFORATED OR SCREENED INTERVALS (IN FEET) | SEAL INTERVALS (IN FEET) | MOST RECENT STATIC WATER LEVEL & DATE (IN FEET) | SOURCE AQUIFER*** | TOTAL WELL DEPTH | WELL-SPECIFIC RATE (GPM) | ANNUAL VOLUME (ACRE-FEET) |
| Production Well | ☐ | ☑ | DESC 61926 | ☐ | 10" | | 400'-515' | 0-70' | 248.45' | Deschutes Formation | 512' | 1,000 | 1,606 |
| Injection Well | ☑ | ☐ | | ☐ | 14" | | 350-500' | 0-330' | | Deschutes Formation | 500' | 1,000 | 1,606 |
| | ☐ | ☐ | | ☐ | | | | | | | | | |
| | ☐ | ☐ | | ☐ | | | | | | | | | |
| | ☐ | ☐ | | ☐ | | | | | | | | | |
| | ☐ | ☐ | | ☐ | | | | | | | | | |
| | ☐ | ☐ | | ☐ | | | | | | | | | |
| | ☐ | ☐ | | ☐ | | | | | | | | | |

* Licensed drillers are required to attach a Department-supplied Well Tag, with a unique Well ID or Well Tag Number to all new or newly altered wells. Landowners can request a Well ID for existing wells that do not have one. The Well ID is intended to serve as a unique identification number for each well.

** A well log ID (e.g. MARI 1234) is assigned by the Department to each log in the agency's well log database. A separate well log is required for each subsequent alteration of the well.

*** Source aquifer examples: Troutdale Formation, gravel and sand, alluvium, basalt, bedrock, etc.



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## SECTION 4: SENSITIVE, THREATENED OR ENDANGERED FISH SPECIES PUBLIC INTEREST INFORMATION

This information must be provided for your application to be accepted as complete. The Water Resources Department will determine whether the proposed use will impair or be detrimental to the public interest with regard to sensitive, threatened or endangered fish species if your proposed groundwater use is determined to have the potential for substantial interference with nearby surface waters.

To answer the following questions, use the map provided in Attachment 3 or the link below to determine whether the proposed point of appropriation (POA) is located in an area where the Upper Columbia, the Lower Columbia, and/or the Statewide public interest rules apply.

For more detailed information, click on the following link and enter the TRSQQ or the Lat/Long of a POA and click on "Submit" to retrieve a report that will show which section, if any, of the rules apply:
https://apps.wrd.state.or.us/apps/misc/lkp_trsqq_features/

If you need help to determine in which area the proposed POA is located, please call the customer service desk at (503) 986-0801.

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**Upper Columbia - OAR 690-033-0115 thru -0130**

Is the well or proposed well located in an area where the Upper Columbia Rules apply?

☑ Yes ☐ No

**If yes, you are notified** that the Water Resources Department will consult with numerous federal, state, local and tribal governmental entities so it may determine whether the proposed use is consistent with the "Columbia River Basin Fish and Wildlife Program" adopted by the Northwest Power Planning Council in 1994 for the protection and recovery of listed fish species. The application may be denied, heavily conditioned, or if appropriate, mitigation for impacts may be needed to obtain approval for the proposed use.

**If yes, and if the Department determines that proposed groundwater use has the potential for substantial interference with nearby surface waters:**

- I understand that the permit, if issued, will not allow use during the time period April 15 to September 30, except as provided in OAR 690-033-0140.
- I understand that the Department of Environmental Quality will review my application to determine if the proposed use complies with existing state and federal water quality standards.
- I understand that I will install and maintain water use measurement and recording devices as required by the Water Resources Department, and comply with recording and reporting permit condition requirements.

**Lower Columbia - OAR 690-033-0220 thru -0230**

Is the well or proposed well located in an area where the Lower Columbia rules apply?

☐ Yes ☐ No

**If yes, and the proposed groundwater use is determined to have the potential for substantial interference with nearby surface waters you are notified** that the Water Resources Department will determine, by reviewing recovery plans, the Columbia River Basin Fish and Wildlife Program, and regional restoration programs applicable to threatened or endangered fish species, in coordination with state and federal agencies, as

appropriate, whether the proposed use is detrimental to the protection or recovery of a threatened or endangered fish species and whether the use can be conditioned or mitigated to avoid the detriment.

If a permit is issued, it will likely contain conditions to ensure the water use complies with existing state and federal water quality standards; and water use measurement, recording and reporting required by the Water Resources Department. The application may be denied, or if appropriate, mitigation for impacts may be needed to obtain approval of the proposed use.

**If yes, you will be required to provide the following information, if applicable.**

☐ Yes ☐ No The proposed use is for more than **one** cubic foot per second (448.8 gpm) and is not subject to the requirements of OAR 690, Division 86 (Water Management and Conservation Plans).

**If yes,** provide a description of the measures to be taken to assure reasonably efficient water use:

_____

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**Statewide - OAR 690-033-0330 thru -0340**

Is the well or proposed well located in an area where the Statewide rules apply?

☑ Yes ☐ No

**If yes, and the proposed groundwater use is determined to have the potential for substantial interference with nearby surface waters you are notified** that the Water Resources Department will determine whether the proposed use will occur in an area where endangered, threatened or sensitive fish species are located. If so, the Water Resources Department, Department of Fish and Wildlife, Department of Environmental Quality, and the Department of Agriculture will recommend conditions required to achieve "no loss of essential habitat of threatened and endangered (T&E) fish species," or "no net loss of essential habitat of sensitive (S) fish species." If conditions cannot be identified that meet the standards of no loss of essential T E fish habitat or no net loss of essential S fish habitat, the agencies will recommend denial of the application unless they conclude that the proposed use would not harm the species.

## SECTION 5: WATER USE

| USE | PERIOD OF USE | ANNUAL VOLUME (ACRE-FEET) |
|---|---|---|
| non-consumptive, low-temp.-geothermal-heat exchange | indefinitely | 1,606 (non-consumptive) |
| | | |
| | | |

**For irrigation use only:**
Please indicate the number of primary and supplemental acres to be irrigated (*must match map*).

Primary: _____Acres Supplemental: _____Acres

If you listed supplemental acres, list the Permit or Certificate number of the underlying primary water right(s):

_____

Indicate the maximum total number of acre-feet you expect to use in an irrigation season: _____

- If the use is **municipal or quasi-municipal**, attach **Form M**
- If the use is **domestic**, indicate the number of households: ____ **(Exempt Uses:** Please note that 15,000 gallons per day for single or group **domestic** purposes and 5,000 gallons per day for a single **industrial or commercial** purpose are exempt from permitting requirements.)



For Department Use: App. Number: _____

- If the use is **mining**, describe what is being mined and the method(s) of extraction (*attach additional sheets if necessary*): _____

## SECTION 6: WATER MANAGEMENT

**A. Diversion and Conveyance**
What equipment will you use to pump water from your well(s)?

☑ Pump (give horsepower and type): TBD
☐ Other means (describe): _____

Provide a description of the proposed means of diversion, construction, and operation of the diversion works and conveyance of water. NA

**B. Application Method**
What equipment and method of application will be used? (e.g., drip, wheel line, high-pressure sprinkler) (*attach additional sheets if necessary*)
NA

**C. Conservation**
Please describe why the amount of water requested is needed and measures you propose to: prevent waste; measure the amount of water diverted; prevent damage to aquatic life and riparian habitat; prevent the discharge of contaminated water to a surface stream; prevent adverse impact to public uses of affected surface waters (*attach additional sheets if necessary*).
nonconsumptive

## SECTION 7: PROJECT SCHEDULE

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a) Date construction will begin: Summer 2020
b) Date construction will be completed: Winter 2021
c) Date beneficial water use will begin: Spring 2021

## SECTION 8: RESOURCE PROTECTION

In granting permission to use water the state encourages, and in some instances requires, careful control of activities that may affect adjacent waterway or streamside area. See instruction guide for a list of possible permit requirements from other agencies. Please indicate any of the practices you plan to undertake to protect water resources.

☐ Water quality will be protected by preventing erosion and run-off of waste or chemical products.
Describe: NA

☑ Excavation or clearing of banks will be kept to a minimum to protect riparian or streamside areas.
**Note:** If disturbed area is greater than one acre, applicant should contact the Oregon Department of Environmental Quality to determine if a 1200C permit is required.
Describe planned actions and additional permits required for project implementation: _____
DEQ UIC Application, OWRD Low-Temp.-Geothermal-Injection Well application

☐ Other state and federal permits or contracts required and to be obtained, if a water right permit is granted:
List: NA



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## SECTION 9: WITHIN A DISTRICT

☐ Check here if the point of appropriation (POA) or place of use (POU) are located within or served by an irrigation or other water district.

| Irrigation District Name | Address | |
|---|---|---|
| City | State | Zip |

## SECTION 10: REMARKS

Use this space to clarify any information you have provided in the application *(attach additional sheets if necessary)*.

OSU-Cascades in Bend, Oregon, has set a goal to become a net zero energy campus, where the actual annual delivered energy is less than or equal to the on-site exported energy. The Long Range Development Plan ("LRDP") proposed several coordinated approaches to energy management and supply:

•Geo-exchange system for thermal energy, providing heating and cooling where necessary and appropriate.
•Central utility plant with boilers fueled by either natural gas or biomass to supplement the thermal energy supplied by the geo-exchange system.

The LRDP also includes conceptual water, wastewater and storm water system plans and ideas, with a focus on reducing the demand for potable water. While the university plans to be connected to the City of Bend's water and sewer systems, innovative systems will be designed and implemented to drive down potable water demand, while also reducing discharge of sewage effluent into the municipal sewer.

OSU is working with consultants to design and construct an open loop geo-exchange system to support the growing campus. A production well has already been drilled producing ~1200GPM of ~50 F of suitable ground water.





For Department Use: App. Number: _____

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# Minimum Requirements Checklist

Minimum Requirements (OAR 690-310-0040, OAR 690-310-0050 & ORS 537.140)

## Include this checklist with the application

**Check that each of the following items is included.** The application will be returned if all required items are not included. If you have questions, please call the Water Rights Customer Service Group at (503) 986-0900.

Please submit the original application and signatures to the Water Resources Department. Applicants are encouraged to keep a copy of the completed application.

- [x] SECTION 1: Applicant Information and Signature
- [x] SECTION 2: Property Ownership
- [x] SECTION 3: Well Development
- [x] SECTION 4: Sensitive, Threatened or Endangered Fish Species Public Interest Information
- [x] SECTION 5: Water Use
- [x] SECTION 6: Water Management
- [x] SECTION 7: Project Schedule
- [x] SECTION 8: Resource Protection
- [x] SECTION 9: Within a District
- [x] SECTION 10: Remarks

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**Include the following additional items:**

- [x] Land Use Information Form with approval and signature of local planning department (*must be an original*) or signed receipt.
- [x] Provide the legal description of: (1) the property from which the water is to be diverted, (2) any property crossed by the proposed ditch, canal or other work, and (3) any property on which the water is to be used as depicted on the map.
- [x] Fees - Amount enclosed: $ 2,910.00
  See the Department's Fee Schedule at www.oregon.gov/owrd or call (503) 986-0900.
- [x] Map that includes the following items:
  - [x] Permanent quality and drawn in ink
  - [x] Even map scale not less than 4" = 1 mile (example: 1" = 400 ft, 1" = 1320 ft, etc.)
  - [x] North Directional Symbol
  - [x] Township, Range, Section, Quarter/Quarter, Tax Lots
  - [x] Reference corner on map
  - [x] Location of each diversion, by reference to a recognized public land survey corner (distances north/south and east/west)
  - [x] Indicate the area of use by Quarter/Quarter and tax lot identified clearly.
  - NA [ ] Number of acres per Quarter/Quarter and hatching to indicate area of use if for primary irrigation, supplemental irrigation, or nursery
  - NA [ ] Location of main canals, ditches, pipelines or flumes (if well is outside of the area of use)

Note: In addition to a groundwater application, a standard reservoir application is required to store groundwater in a reservoir. If an applicant proposes to divert water from a reservoir, a surface water application is also required.

# Water-Use Permit Application Processing

**1. Completeness Determination**

The Department evaluates whether the application and accompanying map contain all of the information required under OAR 690-310-0040 and OAR 690-310-0050. The Department also determines whether the proposed use is prohibited by statute. If the Department determines that the application is incomplete, all fees have not been paid, or the use is prohibited by statute, the application and all fees submitted are returned to the applicant.

**2. Initial Review**

The Department reviews the application to determine whether water is available during the period requested, whether the proposed use is restricted or limited by rule or statute, and whether other issues may preclude approval of or restrict the proposed use. An Initial Review (IR) containing preliminary determinations is mailed to the applicant. The applicant has 14 days from the mailing date to withdraw the application from further processing and receive a refund of all fees paid minus $260. The applicant may put the application on hold for up to 180 days and may request additional time if necessary.

**3. Public Notice**

Within 7 days of the mailing of the initial review, the Department gives public notice of the application in the weekly notice published by the Department at www.oregon.gov/owrd. The public comment period is 30 days from publication in the weekly notice.

**4. Proposed Final Order Issued**

The Department reviews any comments received, including comments from other state agencies related to the protection of sensitive, threatened or endangered fish species. Within 60 days of completion of the IR, the Department issues a Proposed Final Order (PFO) explaining the proposed decision to deny or approve the application. A PFO proposing approval of an application will include a draft permit, and may request additional information or outstanding fees required prior to permit issuance.

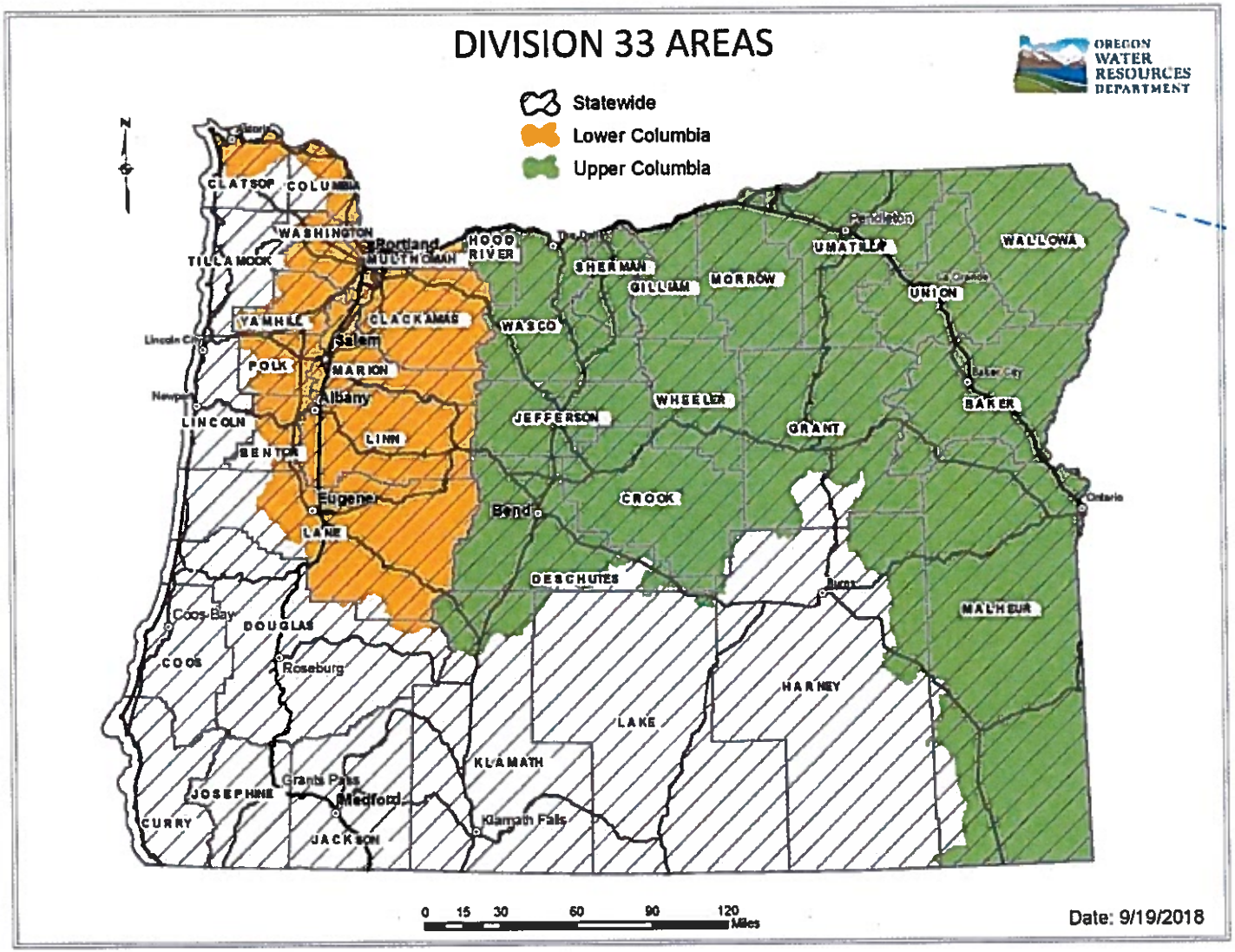
**5. Public Notice**

Within 7 days of issuing the PFO, the Department gives public notice in the weekly notice. Notice includes information about the application and the PFO. Protest must be received by the Department within 45 days after publication of the PFO in the weekly notice. Anyone may file a protest. The protest filing fee is $410.00 for the applicant and $810.00 for non-applicants. Protests are filed on approximately 10 percent of Proposed Final Orders. If a protest is filed the Department will attempt to settle the protest but will schedule a contested case hearing if necessary.

**6. Final Order Issued**

If no protests are filed, the Department can issue a Final Order within 60 days of the close of the period for receiving protest. If the application is approved, a permit is issued. The permit specifies the details of the authorized use and any terms, limitations or conditions that the Department deems appropriate

**Figure 1: Map of Division 33 Areas**






For more detailed information, click on the following link and enter the TRSQQ or the Lat/Long of a POA and click on "Submit" to retrieve a report that will show which section, if any, of the Division 33 rules apply: https://apps.wrd.state.or.us/apps/misc/lkp_trsqq_features/

# Land Use Information Form

OREGON WATER RESOURCES DEPARTMENT
**Oregon Water Resources Department**
725 Summer Street NE, Suite A
Salem, Oregon 97301-1266
503-986-0900
www.oregon.gov/OWRD



## NOTE TO APPLICANTS

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

**This form is NOT required if:**

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

## NOTE TO LOCAL GOVERNMENTS

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

# Land Use Information Form

OREGON WATER RESOURCES DEPARTMENT
**Oregon Water Resources Department**
725 Summer Street NE, Suite A
Salem, Oregon 97301-1266
503-986-0900
www.oregon.gov/OWRD

**Applicant**

| NAME | | | | PHONE (HM) |
|---|---|---|---|---|
| Oregon State University-Cascades | | | | 541.706.2163 |
| PHONE (WK) 541.706.2163 | CELL 541.706.2163 | | | FAX |
| ADDRESS 1500 SW Chandler Avenue | | | | |
| CITY Bend | STATE OR | ZIP 97702 | E-MAIL* Jarrod.Penttila@OSUCascades.com | |

## A. Land and Location

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

| Township | Range | Section | ¼ ¼ | Tax Lot # | Plan Designation (e.g., Rural Residential/RR-5) | Water to be: | Proposed Land Use: |
|---|---|---|---|---|---|---|---|
| 18 S. | 12 E. | 6 | SE of NW | 111 & 2000 | Mixed Urban | ☐ Diverted ☐ Conveyed ☑ Used | non-consumptive geo.-therm. heat pump |
| | | | | | | ☐ Diverted ☐ Conveyed ☐ Used | |
| | | | | | | ☐ Diverted ☐ Conveyed ☐ Used | |
| | | | | | | ☐ Diverted ☐ Conveyed ☐ Used | |

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

Nonconsuptive use in Deschutes County, Bend, Oregon.

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## B. Description of Proposed Use

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

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

Source of water: ☐ Reservoir/Pond ☑ Groundwater ☐ Surface Water (name) ____

Estimated quantity of water needed: 2.7 ☑ cubic feet per second ☐ gallons per minute ☐ acre-feet

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

Briefly describe: Non-consumptive water use for low-temperature-geothermal-heat-exchanger.

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

# For Local Government Use Only

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

## Please check the appropriate box below and provide the requested information

☒ Land uses to be served by the proposed water uses (including proposed construction) are allowed outright or are not regulated by your comprehensive plan. Cite applicable ordinance section(s): OSU-Cascades Master Plan PZ-18-0004; Ordinance 2309

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

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

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

n/a

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| | | |
|---|---|---|
| NAME Karen Swenson | | TITLE: Senior Planner |
| SIGNATURE DocuSigned by: Karen Swenson | PHONE: 5413885567 | DATE: 4/15/2020 \| 09:18:31 PDT |
| GOVERNMENT City of Bend | | |

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

---

## Receipt for Request for Land Use Information

Applicant name: _____

City or County: _____ Staff contact: _____

Signature: _____ Phone: _____ Date: _____

**This page left intentionally blank.**

After Recording Return to:
Oregon State University
Att'n: Director of Real Property
3015 S.W. Western Boulevard
Corvallis, OR 97333

Until Further Notice, Send Tax Statements to:
Oregon State University
Att'n: Director of Real Property
3015 S.W. Western Boulevard
Corvallis, OR 97333

Deschutes County Official Records **2018-014246**
D-D
Stn=7 PG **04/09/2018 01:44:00 PM**
$30.00 $11.00 $10.00 $21.00 $6.00 **$78.00**

I, Nancy Blankenship, County Clerk for Deschutes County, Oregon, certify that the instrument identified herein was recorded in the Clerk records.
Nancy Blankenship - County Clerk

RECEIVED
MAY 12 2020
OWRD

FIRST AMERICAN NCS-878755-ORI

## BARGAIN & SALE DEED

**DESCHUTES COUNTY, A POLITICAL SUBDIVISION OF THE STATE OF OREGON**, Grantor, conveys to **THE STATE OF OREGON, ACTING BY AND THOUGH THE BOARD OF TRUSTEES OF OREGON STATE UNIVERSITY**, Grantee, the following real property located in the County of Deschutes, State of Oregon and legally described as:

See Exhibit A attached

free of encumbrances except as specifically set forth on Exhibit B attached.

The true and actual consideration for this conveyance is: $1.00.

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSON'S RIGHTS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010. THIS INSTRUMENT DOES NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY THAT THE UNIT OF LAND BEING TRANSFERRED IS A LAWFULLY ESTABLISHED LOT OR PARCEL, AS DEFINED IN ORS 92.010 OR 215.010, TO VERIFY THE APPROVED USES OF THE LOT OR PARCEL, TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES, AS DEFINED IN ORS 30.930, AND TO INQUIRE ABOUT THE RIGHTS OF NEIGHBORING PROPERTY OWNERS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010.

EXECUTED this 6 day of APRIL, 2018.

OFFICIAL STAMP
TAMI JO GEORGE
NOTARY PUBLIC-OREGON
COMMISSION NO. 967017

GRANTOR:

BOARD OF COUNTY COMMISSIONERS OF
DESCHUTES COUNTY, OREGON

By: James Lewis
Name: James Lewis
Title: Property Manager for Deschutes County
and Authorized Signatory

STATE OF OREGON )
) ss.
County of Deschutes )

Before me, a Notary Public, personally appeared James Lewis, the above-named Property Manager for Deschutes County and Authorized Signatory for the BOARD OF COUNTY COMMISSIONERS OF DESCHUTES COUNTY, OREGON and acknowledged the foregoing instrument on behalf of Deschutes County, Oregon.

Dated this 6TH day of April, 2018.

OFFICIAL STAMP
TAMI JO GEORGE
NOTARY PUBLIC-OREGON
COMMISSION NO. 967017
MY COMMISSION EXPIRES OCTOBER 4, 2021

OFFICIAL STAMP
TAMI JO GEORGE
NOTARY PUBLIC-OREGON
COMMISSION NO. 967017
MY COMMISSION EXPIRES OCTOBER 4, 2021

RECEIVED
MAY 12 2020
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**Exhibit A**

Legal Description - Deschutes County Demolition Landfill

A parcel of land lying in Section Six (6), Township Eighteen (18) South, Range Twelve (12) East, Willamette Meridian, Deschutes County, Oregon, said parcel being more particularly described as follows:

Beginning at the West 1/4 corner of said Section 6, thence along the West boundary of the Northwest 1/4 of said Section 6 North 00°36'35" East 27.75 feet to the TRUE POINT OF BEGINNING; thence continuing along said West boundary North 00°36'35" East 1000.70 feet to a point on the South Right-Of-Way of Simpson Avenue as described in Dedication Deed 2012-018731 Deschutes County Official Records; thence leaving said West boundary and along said South Right-Of-Way and Dedication Deed South 89°40'51" East 97.02 feet; and North 73°17'42" East 198.10 feet; thence leaving said Dedication Deed and along said South Right-Of-Way South 89°40'51" East 1394.85 feet; and 53.02 feet along the arc of a 1313.24 foot radius curve to the left, the chord of which bears North 89°09'46" East 53.01 feet to the Northwest corner of that property described in Volume 383, Page 2759, and Volume 339, Page 2841 Deschutes County Official Records; thence leaving said South Right-Of-Way and along the West line of said property described in Volume 383, Page 2759 and Volume 339, Page 2841 South 05°21'46" East 344.64 feet; and 164.18 feet along the arc of a 206.52 foot radius curve to the left, the chord of which bears South 28°08'15" East 159.89 feet; and South 50°54'44" East 401.11 feet; and 61.51 feet along the arc of a 289.27 foot radius curve to the right, the chord of which bears South 44°49'14" East 61.39 feet to the Southwest corner of said property described in Volume 383, Page 2759; thence leaving said West line of said Volume 339, Page 2841 continuing along the South Line of said Volume 383, Page 2759 North 51°21'52" East 35.21 feet to the East line of said Volume 383, Page 2759 thence North 4°25'20" West 552.35 feet; and North 41°48'23" East 208.21 feet to a point on the Northwest line of that property described in Volume 383, Page 2756; thence leaving said East line and along the Northwest line of said Volume 383, Page 2756 North 41°48'23" East 155.97 feet; and North 27°56'07" East 93.42 feet to the Northwest corner of said Volume 383, Page 2756 also being a point on the South Right-Of-Way of Simpson Avenue; thence along the North line of said Volume 383, Page 2756 and along said South Right-Of-Way North 76°49'47" East 71.43 feet to a point of intersection of the North-South centerline of said Section 6 said point being on the North line of said Volume 339, Page 2841; thence along said North line of Volume 339, Page 2841 and along said South Right-Of-Way North 76°49'47" East 6.27 feet; thence 278.39 feet along the arc of a 1233.24 foot radius curve to the right, the chord of which bears North 83°17'48" East 277.80 feet to a point of a non-tangent line; thence North 00°14'12" West 10.00 feet; thence North 89°45'48" East 18.48 feet; thence leaving said South Right-Of-Way of Simpson Avenue and along the East line of said Volume 383, Page 2756 the following courses: South 00°10'08" West 75.12 feet; and South 19°28'17" East 213.30 feet; and South 06°12'55" East 147.20 feet; and South 01°15'17" West 138.86 feet; and South 07°05'26" East 270.11 feet; and South 32°25'27" East 82.74 feet; and South 06°50'42" East 156.42 feet; and South 14°44'53" East 119.08 feet; and South 12°00'01" East 318.12 feet; and South 12°59'44" West 128.49 feet to the Southeast corner of said Volume 339, Page 2841 said point being on the North line of Lot 19, Century Washington Center, Phases I, II, III, & IV, Deschutes County, Oregon; thence leaving said Southeast corner along the North line of said Lot 19 South 76°20'18" East 77.98 feet to the Northeast corner of said Lot 19 said corner being the Northeast Corner of that property described in Volume 2014, Page 01969 Deschutes County Official Records said point also being a point of non-tangent curvature lying on the Westerly Right-Of-Way of Century Drive; thence leaving said Northeast corner and along the East line of said Lot 19, said Volume 2014, Page 01969, and said Right-Of-Way 15.00 feet along the arc of a 1859.86 foot radius curve to the left, the chord of which bears South 12°15'27" West 15.00 feet; thence leaving said East line of said Lot 19 and said Right-Of-Way along the South line of said Volume 2014, Page 01969 the following courses: North 76°20'18" West 68.80 feet, and South 55°58'21" West 13.53 feet, and North 76°20'18" West 191.31 feet, and North 76°06'18" West 349.49 feet to a point of intersection of the North-South centerline of said Section 6; thence leaving said South line and along said North-South centerline North 00°41'16" West 25.83 feet to the most Southwest corner of said Volume 339, Page 2841; thence along said North-South centerline and most Southerly West line of said Volume 339, Page 2841 North 00°41'16" West 182.75 feet to the Southeast corner of the Northwest 1/4 of said Section 6; thence leaving said North-South centerline of said Section 6 and said most Southerly West line

of Volume 339, Page 2841 along the South line of said Northwest 1/4 and South line of Volume 339, Page 2841 North 89°48'24" West 274.28 feet to the most West Southwest corner of said Volume 339, Page 2841, said point being on said South line of said Northwest 1/4, said point also being the Southwest corner of said property described in Volume 339, Page 2841; thence leaving said point along said South boundary North 89°48'24" West 60.51 feet to a point on the North line of that property described in Volume 2014, Page 00910 Deschutes County Official Records; thence leaving said South boundary along said North line South 01°03'20" East 20.00 feet; and North 89°48'24" West 991.18 feet; and North 00°16'18" West 20.00 feet to a point on the South boundary of said Northwest 1/4; thence leaving said South boundary and continuing along said North Line North 06°03'46" East 27.90 feet; and North 89°48'24" West 1240.78 feet to the TRUE POINT OF BEGINNING.

**Exhibit B**

Permitted Exceptions

1. Subject property has been under public ownership and is tax exempt. Any changes in ownership before delivery of assessment roll may result in tax liability. Account No. 119732, 177290, 176621 and 151708.

2. The premises described herein fall within the boundaries of Central Oregon Irrigation District and are subject to rules and regulations, including levies, assessments, water and irrigation rights and easements for ditches and canals thereof.

3. The rights of the public in and to that portion of the premises herein described lying within the limits of street, roads and highways.

4. Easement, including terms and provisions contained therein:

| | |
|---|---|
| Recording Information: | July 25, 1991 in Book 240, Page 2254 |
| In Favor of: | Pacificorp, a corporation dba Pacific Power & Light Company |
| For: | Underground Right of way |
| Affects: | Tax Lot 111 |

5. Sewer Service Agreement, including terms and provisions thereof.

   Recorded: December 1, 1992 in Book 284, Page 391
   (Affects Tax Lot 111)

6. Easement, including terms and provision contained therein:

| | |
|---|---|
| Recording Information: | January 17, 1997 in Book 435, Page 1499 |
| In Favor of: | Pacificorp, a corporation dba Pacific Power & Light Company |
| For: | Underground right of way |
| Affects: | Tax Lot 110 |

7. Recordation of Legal Description, Site Plat and Facility Description of the Demolition Landfill, including terms and provisions thereof.

   Recorded: August 27, 2008 as Instrument No. 2008-35439

   Re-Recorded October 13, 2016 in Instrument No. 2016-42275

8. Findings of Facts and Order, including terms and provisions thereof.

   Recorded: April 20, 2010 as Instrument No. 2010-15613

9. Survey prepared by Sun Country Engineering & Surveying, Inc., dated February 16, 2018 last revised March 8, 2018, under Job No. 8584-ALTA, shows the following: (A) Gravel roadway on the southerly portion of the subject property crosses the boundary line by an undisclosed distance onto the subject property; (B) Multiple sections of fence around the subject property cross the boundary lines by undisclosed distances, ownership unknown; (C) Portion of the roadway on the southerly side of the subject property falls outside the easement area.

CERTIFICATE OF APPROVAL OF CONVEYANCE
(ORS 93.808)

The State of Oregon, acting by and through the Board of Trustees of Oregon State University, hereby approves and accepts, pursuant to ORS 93.808, the conveyance by bargain and sale deed from Deschutes County, a Political Subdivision of the State of Oregon to the State of Oregon, acting by and through the Board of Trustees of Oregon State University of the real property described in the deed to which this Certificate is attached.

Dated this 6 day of April, 2018.

The State of Oregon, acting by and through the
Board of Trustees of Oregon State University

By: Edward J. Ray
Name: Edward J. Ray
Title: President

ACKNOWLEDGEMENT

STATE OF OREGON )
) ss.
County of Benton )

On this 6 day of April, 2018, Edward J. Ray personally appeared before me and acknowledged that he executed this instrument in his capacity as President of Oregon State University, acting by and through the Board of Trustees of Oregon State University, and further acknowledged that he signed this instrument as his voluntary act and deed.

OFFICIAL STAMP
LESLIE PAIGE OLSEN
NOTARY PUBLIC-OREGON
COMMISSION NO. 938697
MY COMMISSION EXPIRES MAY 10, 2019

Notary Public for Oregon

My Commission expires 5-10-19

RECEIVED
MAY 12 2020
OWRD

RECEIVED

MAY 12 2020

7061-21530884HH

**RECORDING COVER SHEET** (Please print or type)
This cover sheet was prepared by the person presenting the instrument for recording. The information on this sheet is a reflection of the attached instrument and was added for the purpose of meeting first page recording requirements in the State of Oregon, and does NOT affect the instrument. ORS 205.234

Deschutes County Official Records 2016-08316
D-D
Stn=4 BN 03/04/2016 02:31:47 PM
$45.00 $11.00 $10.00 $6.00 $21.00 $93.00

I, Nancy Blankenship, County Clerk for Deschutes County, Oregon, certify that the instrument identified herein was recorded in the Clerk records.
Nancy Blankenship - County Clerk

After recording return to:
First American Title
395 SW Bluff Drive, Suite 100
Bend, OR 97702

**AFTER RECORDING RETURN TO:** ORS 205.234(1)(c)
The State of Oregon acting by and through the Board of
Trustees of Oregon State University Attn: Real Estate Office
3015 SW Western Blvd.
Corvallis, OR 97333

**1. TITLE(S) OF THE TRANSACTION(S)** ORS 205.234(1)(a)
Statutory Warranty Deed

**2. DIRECT PARTY(IES) / GRANTOR(S)** ORS 205.234(1)(b)
4-R Equipment, LLC, an Oregon limited liability company

**3. INDIRECT PARTY(IES) / GRANTEE(S)** ORS 205.234(1)(b)
The State of Oregon acting by and through the Board of Trustees of Oregon State University

**4. TRUE and ACTUAL CONSIDERATION**
Amount in dollars or other value/property ORS 205.234(1)(d)
$ 7,963,000.00 ☐ Other Value ☐ Other Property
Other value/property is Whole ☐ or Part ☐ of the consideration

**5. SEND TAX STATEMENTS TO:** ORS 205.234(1)(e)
The State of Oregon acting by and through the Board of
Trustees of Oregon State University,c/o Real Estate Office
3015 SW Western Blvd., Corvallis, OR 97333

**6. SATISFACTION of ORDER or WARRANT**
Check one if applicable: ORS 205.234(1)(f)
☐ FULL ☐ PARTIAL

**7. The amount of the monetary obligation imposed by the order or warrant:** ORS 205.234(1)(f)
$

**8. If this instrument is being Re-Recorded, complete the following statement:** ORS 205.244(2)
Re-recorded at the request of First American Title
to correct Legal Description of Parcel 2 (only) as shown on Exhibit A and to replace with corrected Parcel 2 Legal Description
previously recorded in
Book/Volume _____ and Page _____, or as Fee Number 2016-03332.

Recorded by First American Title as an accommodation only. No liability is accepted for the condition of title or validity, sufficiency, or effect of this document.

After recording return to:
First American Title
395 SW Bluff Drive, Suite 100
Bend, OR 97702

THIS SPACE RESERVED FOR RECORDER'S USE

Deschutes County Official Records **2016-003332**
D-D
Stn=2 PG **01/29/2016 02:06:43 PM**
$35.00 $11.00 $10.00 $6.00 $21.00 **$83.00**

I, Nancy Blankenship, County Clerk for Deschutes County, Oregon, certify that the instrument identified herein was recorded in the Clerk records.
Nancy Blankenship - County Clerk

After recording return to:
The State of Oregon acting by and through the Board of Trustees of Oregon State
Attn Real Estate Office, 3015 SW Western Blvd.
Corvallis, OR 97333

Until a change is requested all tax statements shall be sent to the following address:
The State of Oregon acting by and through the Board of Trustees of Oregon State
Attn Real Estate Office, 3015 SW Western Blvd.
Corvallis, OR 97333

File No.: 7061-2153088 (HH)
Date: January 25, 2016



# STATUTORY WARRANTY DEED

**4-R Equipment, LLC, an Oregon limited liability company**, Grantor, conveys and warrants to **The State of Oregon, acting by and through the Board of Trustees of Oregon State University ,** Grantee, the following described real property free of liens and encumbrances, except as specifically set forth herein:

**LEGAL DESCRIPTION:** Real property in the County of Deschutes, State of Oregon, described as follows:

**See Attached Exhibit " A"**

**Subject to:**

**See "Subject To" items attached hereto as Exhibit B and by this reference incorporated herein.**

The true considëration for this conveyance is **$7,963,000.00.** (Here comply with requirements of ORS 93.030)

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSON'S RIGHTS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010. THIS INSTRUMENT DOES NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY THAT THE UNIT OF LAND BEING TRANSFERRED IS A LAWFULLY ESTABLISHED LOT OR PARCEL, AS DEFINED IN ORS 92.010 OR 215.010, TO VERIFY THE APPROVED USES OF THE LOT OR PARCEL, TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES, AS DEFINED IN ORS 30.930, AND TO INQUIRE ABOUT THE RIGHTS OF NEIGHBORING PROPERTY OWNERS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010.

Dated this 28 day of January, 2016.

4-R Equipment, LLC

By: Ronald J. Robinson Jr
Name: Ronald J. Robinson, Jr.
Title: Manager

STATE OF Oregon )
)ss.
County of Deschutes )

This instrument was acknowledged before me on this 28 day of January, 2016 by Ronald J. Robinson, Jr. as Manager of 4-R Equipment, LLC, on behalf of the Limited Liabilty Company.

Notary Public for Oregon
My commission expires: July 2, 2016

OFFICIAL SEAL
HEATHER L HARPOLE
NOTARY PUBLIC-OREGON
COMMISSION NO. 469678
MY COMMISSION EXPIRES JULY 02, 2016

Date: **September 13, 2013**

File No.: **7061-2153088 ( HH)**

# EXHIBIT 'A'

**LEGAL DESCRIPTION:**

PARCEL 1:

That land as described in Exhibit A as Parcel 2 of Bargain and Sale Deed, recorded February 13, 2013 in Instrument No. 2013-06507, Deschutes County Official Records.

EXCLUDING THEREFROM: Beginning from the Northwest corner of the Northeast quarter of the Southwest quarter (NE1/4SW1/4) of Section 6, Township 18 South, Range 12 East; thence along the North line of said NE1/4SW1/4, South 89°39'11" East, 991.04 feet; thence leaving said North line, South 0°31'48" East, 20.00 feet; thence along a line parallel to and 20.00 feet South of said North line of NE1/4SW1/4, North 89°39'11" West, 991.18 feet to the West line of said NE1/4SW1/4; thence leaving said parallel line, along said West line, North 0°07'54" West, 20.00 feet to the point of beginning.

ALSO EXCLUDING THEREFROM: Beginning from the Northerly most corner of Lot 19, Century Washington Center, Phases I, II, III and IV; thence North 0°31'48" West, 66.62 feet; thence South 89°39'11" East, 168.84 feet to the West line of said land described in Exhibit A of Statutory Bargain and Sale Deed, recorded May 19, 1994 in Book 339, Page 2841, Deschutes County Official Records; thence along said West line, South 0°31'48" East, 108.00 feet to the North line of said Lot 19; thence leaving said West line, along the North line of said Lot 19, North 75°56'04" West, 174.45 feet to the point of beginning.

PARCEL 2:

A parcel of land in the Northwest quarter of the Southwest quarter of Section 6, Township 18 South, Range 12 East, Willamette Meridian, in Deschutes County, Oregon, being a portion of Government Lot 5 in said Section 6, and more particularly described as Parcel I in Exhibit A to the Bargain and Sale Deed recorded December 20, 1996 in Book 432, Page 3000, and re-recorded on January 15th, 1997, in Book 435, Page 898, Deschutes County Official Records.

TOGETHER WITH: Beginning from the West quarter corner of Section 6, Township 18 South, Range 12 East, Willamette Meridian; thence along the West line of Government Lot 5, North 0°45'09" East, 27.75 feet; thence leaving said West line, along a line parallel to and 27.75 feet North of the South line of said Lot 5, South 89°39'11" East, 1240.59 feet; thence leaving said parallel line, South 6°12'01" West, 27.90 feet to the Southeast corner of said Lot 5; thence along the South line of said Lot 5, North 89°39'11" West, 1237.94 feet to the point of beginning.

PARCEL 3:

Tract D OF BROKEN TOP, PHASES 1C AND 1D, Deschutes County, Oregon.

EXCEPTING THEREFROM that portion dedicated in the document entitled "Dedication Deed" recorded April 10, 2012 in Instrument No. 2012-013237, Deschutes County, Oregon.



Initials: _____

Date: **January 20, 2016** File No.: **7061-2153088 ( HH)**

## EXHIBIT 'B'



SUBJECT TO:

THE FOLLOWING EXCEPTIONS AFFECT PARCEL 1:

1. Conditions of Approval Agreement and the terms and conditions thereof:
   Between: Deschutes County
   And: 4-R Equipment, LLC
   Recording Information: November 20, 1996 in Book 430, Page 145

2. All lots subject to the City of Bend solar ordinance as set forth on the official plat of Century Washington Center, Phase I, II, II and IV

3. Excavation and removal of vegetation shall be prohibited on natural slopes in excess of 12% until the applicable lot development has been approved by the City of Bend, as set forth on the official plat of Century Washington Center, Phase I, II, II and IV.

4. Covenants, conditions, restrictions and/or easements; but deleting any covenant, condition or restriction indicating a preference, limitation or discrimination based on race, color, religion, sex, handicap, family status, or national origin to the extent such covenants, conditions or restrictions violate Title 42, Section 3604(c), of the United States Codes:
   Recording Information: December 27, 1999 in Instrument No. 1999-61163

5. Assessments of Century Washington Center Owners' Association, Inc., as set forth in Declaration recorded December 27, 1999 in Instrument No. 1999-61163.

6. Covenants, conditions, restrictions and/or easements; but deleting any covenant, condition or restriction indicating a preference, limitation or discrimination based on race, color, religion, sex, handicap, family status, or national origin to the extent such covenants, conditions or restrictions violate Title 42, Section 3604(c), of the United States Codes:
   Recording Information: February 04, 2002 in Instrument No. 2002-07013

7. Findings of Fact and Order, including terms and provisions thereof.
   Recorded: April 20, 2010 in Instrument No. 2010-15613

THE FOLLOWING EXCEPTIONS AFFECT PARCEL 2:

8. Easement, including terms and provisions contained therein:
   Recording Information: June 25, 1992 in Book 269, Page 909
   In Favor of: Deschutes County, a political subdivision of the State of Oregon
   For: Construction and Roadway Slope

Initials: RRJ _____

9. Agreement, including the terms and conditions thereof:
   Between: 4-R Equipment, LLC
   And: Broken Top Homeowner's Association & Broken Top, Inc.
   Recording Information: February 10, 1998 in Book 479, Page 2015

10. Conditions of Approval Agreement and the terms and conditions thereof:
   Between: 4-R Equipment, LLC
   And: Deschutes County, a political subdivision of the State of Oregon
   Recording Information: March 24, 1998 in Book 485, Page 2788

11. Easement, including terms and provisions contained therein:
   Recording Information: December 30, 1999 in Volume 1999, Page 61996
   In Favor of: City of Bend, an Oregon Municipal corporation
   For: Water Line and Facilities

12. Public Facilities Improvement Agreement and the terms and conditions thereof:
   Between: 4-R Equipment, LLC
   And: City of Bend, an Oregon Municipal corporation
   Recording Information: June 30, 2000 in Volume 2000, Page 25968

13. Memorandum, including terms and provisions thereof.
   Recorded: August 27, 2008 in Instrument No. 2008-35439
   (Includes Additional Property)

14. Findings of Fact and Order, including terms and provisions thereof.
   Recorded: April 20, 2010 in Instrument No. 2010-15613

THE FOLLOWING EXCEPTIONS AFFECT PARCEL 3:

15. Utility easements and slope easements as set forth and dedicated in the declaration of the official plat of Broken Top Phases 1C and 1D.

16. Easement, including terms and provisions contained therein:
   Recording Information: December 30, 1999 in Volume 1999, Page 61996
   In Favor of: City of Bend, an Oregon Municipal corporation
   For: Water Line and Facilities

17. Public Facilities Improvement Agreement and the terms and conditions thereof:
   Between: 4-R Equipment, LLC
   And: City of Bend, an Oregon Municipal corporation
   Recording Information: June 30, 2000 in Volume 2000, Page 25968

18. Order No. 2010-01, including terms and provisions thereof.
   Recorded: April 20, 2010 in Instrument No. 2010-15613

Initials: RJR

# CERTIFICATE OF APPROVAL OF CONVEYANCE
## (ORS 93.808)

THE STATE OF OREGON, acting by and through the Board of Trustees of Oregon State University, hereby approves and accepts, pursuant to ORS 93.808, the conveyance by statutory warranty deed from 4-R Equipment, LLC, an Oregon limited liability company to The State of Oregon, acting by and through the Board of Trustees of Oregon State University of the real property described in the deed to which this Certificate is attached.

Dated this 26th day of January, 2016.

The State of Oregon, acting by and through the Board of Trustees of Oregon State University

By: Edward J. Ray
Name: Edward J. Ray
Title: President

ACKNOWLEDGMENT

STATE OF OREGON )
) ss.
County of Benton )

On this 26th day of January, 2016, Edward J. Ray personally appeared before me and acknowledged that he executed this instrument in his capacity as President for Oregon State University, and further acknowledged that he signed this instrument as his voluntary act and deed.

OFFICIAL STAMP
KEIKO S WHITE
NOTARY PUBLIC-OREGON
COMMISSION NO. 920219
MY COMMISSION EXPIRES SEPTEMBER 22, 2017

Keiko S White
Notary Public for Oregon

My Commission expires 9/22/2017

OREGON DEPARTMENT OF REVENUE

# Certification of Charges Paid
(2015 Oregon Laws Chapter 96)

Certification #
Accts 119730,151710,
182367, 190593

All charges against the real property have been paid for the property that is the subject of the deed between:

Grantor
4-R Equipment, LLC

Grantee
State of Oregon, acting by and through the Board of Trustess of Oregon State University

Signed on (date)

and for consideration of
$ 7,963,000.00

Assessor's signature
Greg Rose

Date
1/21/16

150-310-411 (Rev. 10-15)

RECEIVED
MAY 12 2020
OWRD

State of Oregon )
) ss.,
County of Deschutes )

I certify that the foregoing Deed Record has been compared with the original, and that it is a correct transcript therefrom and of the whole of such original, as the same appears on record at the Count Clerk's office in Deschutes County, Oregon.

March 3rd, 2016

Nancy Blankenship, Deschutes County Clerk

By Tracy Moore

Tracy Moore, Deputy Clerk

**Parametrix**
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

595 SW BLUFF DRIVE, SUITE B | BEND, OR 97702 | P 541.508.7710

**PARCEL 2:**

TAX LOT 181206C002100

A parcel of land lying in the Northwest quarter of the Southwest quarter of Section 6, Township 18 South, Range 12 East, Willamette Meridian, in Deschutes County, Oregon, being a portion of Government Lot 6 in said Section 6, and more particularly described as Parcel 1 in Exhibit A to the Bargain and Sale Deed recorded December 20, 1996 in Book 432, Page 3000, and re-recorded on January 15th, 1997, in Book 435, Page 898, Deschutes County Official Records.

TOGETHER WITH: That land described in a re-recorded Bargain and Sale Deed recorded December 9, 2008 in Instrument No. 2008-48310, Deschutes County Official Records, said deed being originally recorded June 9, 2008 in Instrument No. 2008-24739, Deschutes County Official Records.

ALSO TOGETHER WITH: Beginning from the west quarter corner of Section 6, Township 18 South, Range 12 East, Willamette Meridian; thence along the west line of Government Lot 5 of said Section 6, North 0°45'09" East, 27.75 feet; thence leaving said west line, along a line parallel to and 27.75 feet north of the south line of said Lot 5, South 89°39'11" East, 1240.59 feet; thence leaving said parallel line, South 6°12'01" West, 27.90 feet to the southeast corner of said Lot 5; thence along said south line of Lot 5, North 89°39'11" West, 1237.94 feet to the point of beginning.

This description contains 29.79 acres, more or less.

Herein bearings are based upon the Central Oregon Coordinate System.



The screen and 12-inch diameter casing overlap five feet from 412 feet to 417 feet bgs. On December 16, 2019, Jensen Drilling installed a ROBBCO 9CLE submersible pump with a Tesla 200-horsepower motor, rated for 1,200 gallons per minutes (gpm) at 400 feet bgs. The pump was set at the top of the screened interval, 412 feet bgs, with the top of the pump intake at approximately 407 feet bgs. This elevation offered an allowable drawdown of 157 feet from the static water level (248.45 feet bgs) to top of the pump intake. After installation of the screen and pump, the well sat idle for three days. On December 19, 2019, the "static" water level was 248.45 feet bgs.

Between March 2 and March 9, 2020, the well was reconstructed to prevent water fowling of the low-temperature-geothermal-heat-exchange system. The 12-inch, low-carbon-black-steel casing was removed and replaced with a 10-inch diameter, 0.250-inch wall thickness, 304-stainless-steel liner, that extends and couples to the telescoping screen at 412.5 feet bgs. Prior to the drillers de-mobilizing from the site, the 16-inch, low-carbon-outer casing was removed.

**SCOPE OF WORK**

TWG was commissioned to:

- Assist in groundwater well design based on drill cutting samples;
- Monitor the groundwater pumping test;
- Collect two groundwater samples; and
- Provide this summary letter.



**GEOLOGIC SETTING**

The project is located on the west side of Bend, Oregon, in the south portion of the upper Deschutes River Basin. The upper Deschutes Basin encompasses approximately 4,500-square miles and marks the northwest boundary of the High Lava Plains physiographic province of central Oregon. The upper Deschutes Basin is bounded by the crest of the High Cascade Range to the west; Newberry Volcano to the east; the drainage divide between the Deschutes and Klamath and/or Fort Rock Basins to the south; and on the north by Jefferson Creek, the Metolius River, Trout Creek, and the Deschutes River (Gannett, et al., 2001). The geologic history of the upper Deschutes Basin is dominated by bimodal arc and back-arc volcanism. Pleistocene age pyroclastic flows and airfall deposits (Tumalo Tuff, Bend Pumice, and Desert Springs Tuff) with Pleistocene age basalt interflows (nearby vents and/or Newberry of origin) overly the regionally extensive Deschutes Formation (early Pliocene to late Miocene), which include sedimentary strata, pyroclastic deposits, and few lava flows (Sherrod et. al., 2004).



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Underlying the Deschutes Formation are older, low permeability volcanic and sedimentary rocks of the John Day, Mescal, and Clarno formations (Gannett, et al., 2001).

Groundwater within the study area is hosted in volcanic flows, pyroclastic deposits and interbedded sedimentary units under unconfined or semi-confined water table conditions. The groundwater zone penetrated by the test well includes alternating layers of fractured basalt, red cinder, scoria, and pumice, with interbeds of sandstone and conglomerate underlying basalt.

**PUMPING TEST**

The test well was to be pumped at three increasing rates or "steps" (1,000, 1,100 and 1,200 gpm). During pumping, transducer (set at 364.82 feet bgs) readings were monitored for drawdown rates and to prevent calving of the pump. The initial step-drawdown pumping test was run for approximately 30 minutes at 1,000 gpm and an additional 30 minutes at 1,100 gpm before restarting. The pumping test was restarted due to erratic transducer readings (e.g., approximate four-foot variance in readings over one-minute intervals) likely due to pump circulation interference within the polyvinyl chloride (PVC) transducer housing. To troubleshoot the problem, the transducer was lifted approximately 60 feet and the test was restarted.

The final step-drawdown pumping test was started at 1,100 gpm and ran for approximately 30 minutes. During the 1,100 gpm steady-state rate, drawdown minimum and maximum were 10.3 feet and 11.5 feet, respectively. After the approximate 30 minutes at 1,100 gpm, the pumping rate was increased to 1,200 gpm for approximately 2 hours 30 minutes. At the 1,200 gpm steady-state rate, drawdown minimum and maximum were 11.9 feet and 13.3 feet, respectively. During the 1,200 gpm steady-state rate, the groundwater temperature minimum and maximum were 10.17 degrees Celsius ($^0$C) and 10.28 $^0$C, respectively. After the three hours, the pump was shut off. The water level was monitored and the well recharged to the test well's initial static level in approximately two minutes. See **Figure 2** (attached) for the graphic representation of the drawdown and recovery curve.

**LABORATORY ANALYTICAL WATER QUALITY DATA**

One water quality sample was collected at the beginning and one at the end of the pumping test, for laboratory analytical testing and recommendations on the potential for mineral scale and biofouling of the system. The two samples were collected from a spigot placed in-line with the flow meter and discharge pipe. Samples were collected and shipped on ice to Water Systems Engineering, Inc., located in Ottawa, Kansas under chain-of-custody (COC)



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documentation. Sample analyses and recommendations were requested per the OSU-Cascades, Specifications for Groundwater Open Loop and Vertical Closed Loop Geo-Exchange Tests, Section 7.2.1 and 7.2.2 (**Appendix A**).

**LIMITATIONS**

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of our profession practicing in the same locality, under similar conditions and at the date the services are provided. Our findings, conclusions and recommendations are based on information provided by Jensen Drilling Company (Client) and a limited number of field observations and related data. It is possible that conditions could vary between or beyond the points explored or data evaluated. Wallace Group makes no other representation, guarantee or warranty, express or implied, regarding the services, communication (oral or written), report, opinion or instrument of service provided.

This report may be used only by Jensen Drilling Company, OSU Cascades, their representatives, and applicable regulatory agencies, only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than two (2) years from the date of the report. Use of this report beyond a two-year period will require a review by Wallace Group to evaluate the report's applicability to the current project and any changed site conditions.

We trust this letter will meet the Clients requirements at this time. If you have questions, or we can be of further service, please do not hesitate to contact our Bend office at 541.382.4707

**REFERENCES**

Gannett, M.W., Lite, K.E., Jr., Morgan, D.S., and Collins, C.A., 2001, Ground-water hydrology of the upper Deschutes Basin, Oregon: U.S. Geological Survey Water Resources Investigations Report 00-4162, 77p.

Integral Group, July 3, 2019. *Specifications for Groundwater Open Loop and Vertical Closed Loop Geo-Exchange Tests.* Project No. 151906.000

Sherrod, David R., Taylor, Edward M., Ferns, Mark L., Scott, William E., Conrey, Richard M., and Smith, Gary A., 2004, *Geologic Map of the Bend 30- x 60-Minute Quadrangle, Central Oregon. United States Geological Survey.*





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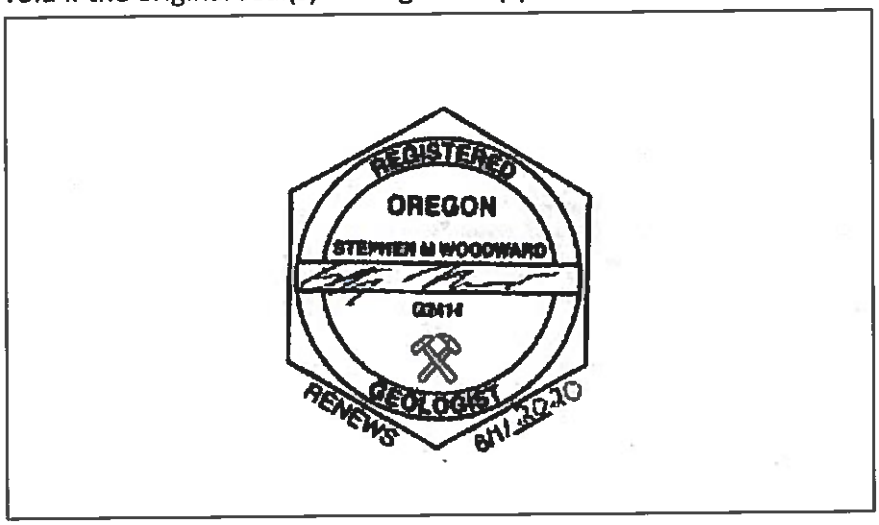
Enclosed:

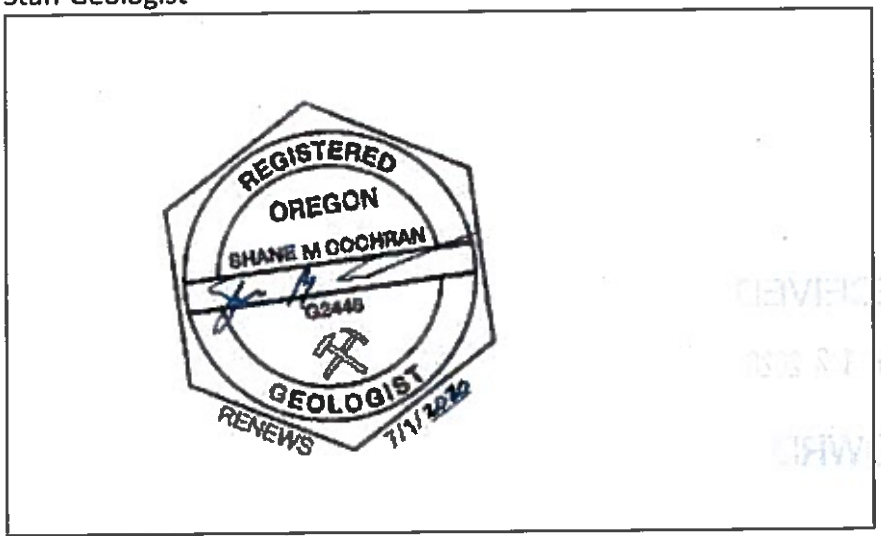
| | |
|---|---|
| **Figure 1** | Site Map: OSU-Cascade Campus Test Well |
| **Figure 2** | OSU-Cascades Test Well: Pumping Test Drawdown and Recharge Curve |
| **Figure 3** | Well Log: OSU Cascades Geo-Exchange Pilot Study |
| **Appendix A** | Water Systems Engineering, Inc., Water Quality Laboratory Analytical Report and Recommendations |

**PROFESSIONAL AUTHENTICITY**

This report has been authored and reviewed by the undersigned, respectively. This report is void if the original seal(s) and signature(s) are not included.




Stephen M. Woodward, R.G.
Staff Geologist




Shane M. Cochran, R.G.
Project Geologist





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# FIGURES

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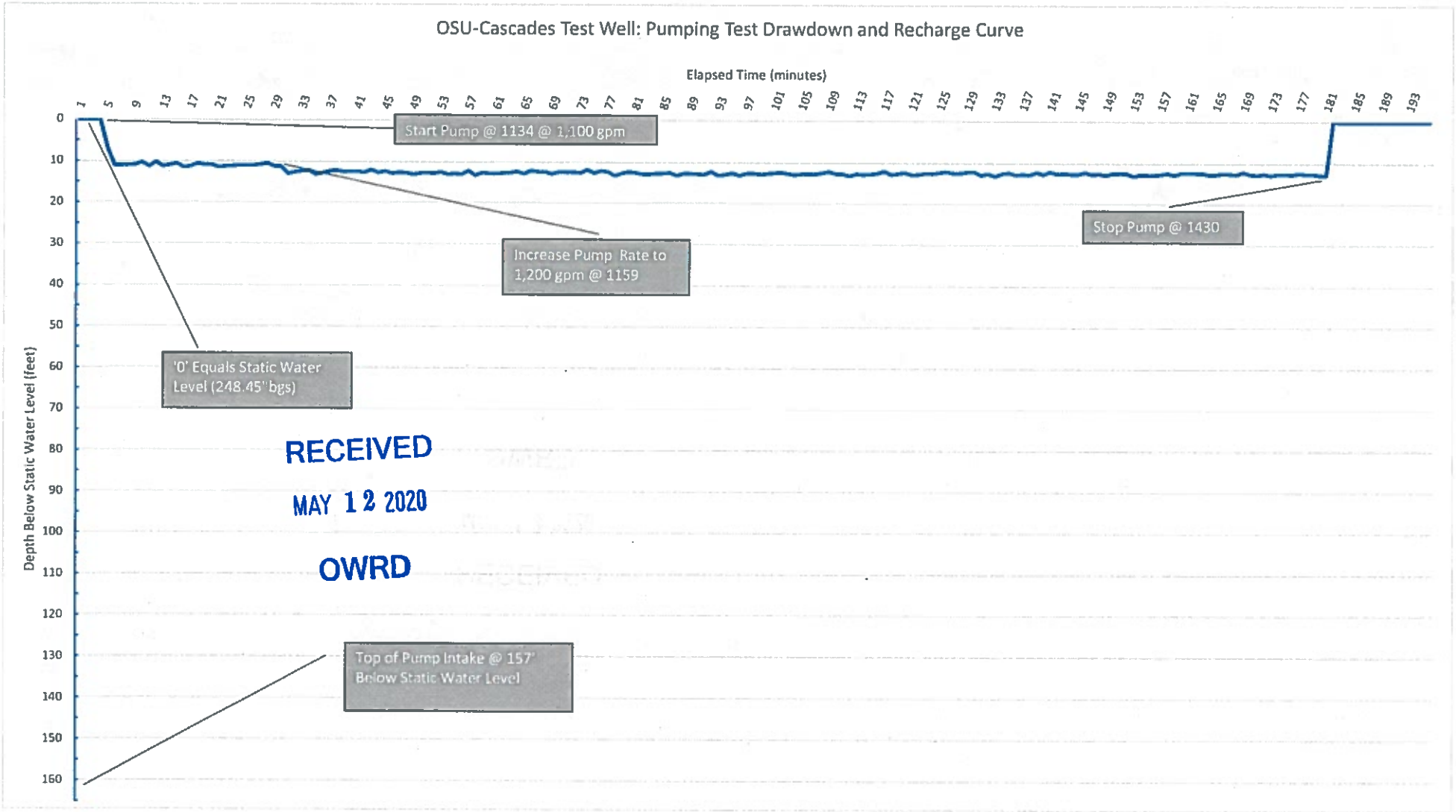
**SITE MAP**
**OSU-CASCADES CAMPUS TEST WELL**
**1500 SW CHANDLER AVENUE**
**BEND, OREGON**

| | |
|---|---|
| PROJECT No: | 11095 (3) |
| DRAWN: | January 21, 2019 |
| DRAWN BY: | KAK |
| CHECKED BY: | SC |
| FILE NAME: | 11095 (3) Figure 1 |

FIGURE
1

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# KEY TO SYMBOLS

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(541) 382-4707

CLIENT Jensen Drilling
PROJECT NAME OSU Cascades Geo-Exchange Pilot Study
PROJECT NUMBER 11095-3
PROJECT LOCATION Bend, Oregon

## LITHOLOGIC SYMBOLS
## (Unified Soil Classification System)

- BASALT: Basalt
- PUMICE: Pumice
- SW: USCS Well-graded Sand
- TUFF: Tuff

## SAMPLER SYMBOLS

- Grab Sample



## WELL CONSTRUCTION SYMBOLS

- 16" Diameter Bentonite Surface Seal
- Capped Riser
- 10" Diameter Stainless Steel (S.S.) Casing In Existing Formation
- Bottom Of Hole
- Screened Interval In Existing Formation

## ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
MC - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
FINES - PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)
OC - ORGANIC CONTENT (%)

TV - TORVANE
PID - PHOTOIONIZATION DETECTOR
UCCS - UNCONFINED COMPRESSION
ppm - PARTS PER MILLION
Water Level at Time of Drilling, or as Shown
Water Level at End of Drilling, or as Shown
Water Level After 24 Hours, or as Shown

Figure: 3

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# WELL NUMBER Geo Well 1



CLIENT Jensen Drilling
PROJECT NAME OSU Cascades Geo-Exchange Pilot Study
PROJECT NUMBER 11095-3
PROJECT LOCATION Bend, Oregon
DATE STARTED 10/28/19 COMPLETED 11/21/19
GROUND ELEVATION
DRILLING CONTRACTOR Jensen Drilling Co.
GROUND WATER LEVELS:
DRILLING METHOD Dual Rotary/Air Rotary
AT TIME OF DRILLING 270.00 ft
LOGGED BY SMW CHECKED BY SC
24HRS AFTER DRILLING 248.00 ft
NOTES

| DEPTH (ft) | SAMPLE TYPE NUMBER | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | WELL DIAGRAM |
|---|---|---|---|---|---|
| 0 | | | | | Top of 10" S.S. casing above ground surface (AGS) |
| 5 | GB S-1 | SW | | WELL GRADED SAND, moist, brown, fine to coarse grained, subrounded | |
| 10 | | | | 10.0 | |
| 15 | GB S-2 | | | PUMICE, white, sand, moist | |
| 20 | | | | 20.0 | |
| 25 | GB S-3 | | | TUFF, welded | |
| 30 | | | | | |
| 35 | GB S-4 | | | | |
| 40 | | | | | 16" diameter surface seal (bentonite) to 70' BGS |



TWG-BORING LOGS - WALLACE GROUP DATA TEMPLATE.GDT - 3/13/20 08:45 - L:\GINT PRO - FILES\BENTLEY\GINT\PROJECTS\11095-3 OSU CASCADES GEO-EXCHANGE.GPJ

Figure: 3.1

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# WELL NUMBER Geo Well 1



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PROJECT NUMBER 11095-3
PROJECT LOCATION Bend, Oregon

| DEPTH (ft) | SAMPLE TYPE NUMBER | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|---|
| 40 | | | | TUFF, welded *(continued)* |
| 45 | GB S-5 | | | |
| 50 | | | | 50.0 SCORIA, red and black, with basalt |
| 55 | GB S-6 | | | |
| 60 | | | | |
| 65 | GB S-7 | | | |
| 70 | | | | |
| 75 | GB S-8 | | | |
| 80 | | | | |
| 85 | GB S-9 | | | |

WELL DIAGRAM: 10" diameter S.S casing from AGS to 412.5' below ground surface (BGS)





Figure: 3.2

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# WELL NUMBER Geo Well 1



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PROJECT NAME OSU Cascades Geo-Exchange Pilot Study
PROJECT NUMBER 11095-3
PROJECT LOCATION Bend, Oregon

| DEPTH (ft) | SAMPLE TYPE NUMBER | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | WELL DIAGRAM |
|---|---|---|---|---|---|
| 90 | | | | SCORIA, red and black, with basalt *(continued)* | |
| | | | | 90.0 | |
| | | | | WELL GRADED SAND, black, fine to medium grained | |
| 95 | GB S-10 | | | | |
| 100 | | | | 100.0 | |
| | | | | BASALT, weathered/cemented gravels | |
| 105 | GB S-11 | | | | |
| 110 | | | | 110.0 | |
| | | | | SCORIA, red, black basalt interbeds, bright red 110-150' bgs | |
| 115 | GB S-12 | | | | |
| 120 | | | | | |
| 125 | GB S-13 | | | | |
| 130 | | | | | |





Figure: 3.3

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# WELL NUMBER Geo Well 1



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PROJECT NAME OSU Cascades Geo-Exchange Pilot Study
PROJECT NUMBER 11095-3
PROJECT LOCATION Bend, Oregon

| DEPTH (ft) | SAMPLE TYPE NUMBER | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | WELL DIAGRAM |
|---|---|---|---|---|---|
| 135 | GB S-14 | | | SCORIA, red, black basalt interbeds, bright red 110-150' bgs *(continued)* | |
| 140 | | | | | |
| 145 | GB S-15 | | | | |
| 150 | | | | | |
| 155 | GB S-16 | | | | |
| 160 | | | | | |
| 165 | GB S-17 | | | | |
| 170 | | | | | |
| 175 | GB S-18 | | | | |





Figure: 3.4

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CLIENT Jensen Drilling
PROJECT NAME OSU Cascades Geo-Exchange Pilot Study
PROJECT NUMBER 11095-3
PROJECT LOCATION Bend, Oregon

| DEPTH (ft) | SAMPLE TYPE NUMBER | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | WELL DIAGRAM |
|---|---|---|---|---|---|
| 180 | | | | SCORIA, red, black basalt interbeds, bright red 110-150' bgs *(continued)* | |
| 185 | GB S-19 | | | | |
| 190 | | | | | |
| 195 | GB S-20 | | | | |
| 200 | | | | | |
| 205 | GB S-21 | | | | |
| 210 | | | | | |
| 215 | GB S-22 | | | | |
| 220 | | | | 220.0 BASALT, black, hard | |





Figure: 3.5

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**CLIENT** Jensen Drilling **PROJECT NAME** OSU Cascades Geo-Exchange Pilot Study

**PROJECT NUMBER** 11095-3 **PROJECT LOCATION** Bend, Oregon

| DEPTH (ft) | SAMPLE TYPE NUMBER | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | WELL DIAGRAM |
|---|---|---|---|---|---|
| 225 | GB S-23 | | | BASALT, black, hard *(continued)* | |
| 230 | | | | 230.0<br>BASALT, red to dark red, scoria, with black | |
| 235 | GB S-24 | | | | |
| 240 | | | | | |
| 245 | GB S-25 | | | | |
| 250 | | | | 250.0<br>SANDY BASALT, interbedded, black | |
| 255 | GB S-26 | | | | |
| 260 | | | | 260.0<br>BASALT, and scoria, red and black, vesicular | |
| 265 | GB S-27 | | | | |





Figure: 3.6

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# WELL NUMBER Geo Well 1



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PROJECT NAME OSU Cascades Geo-Exchange Pilot Study
PROJECT NUMBER 11095-3
PROJECT LOCATION Bend, Oregon

| DEPTH (ft) | SAMPLE TYPE NUMBER | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | WELL DIAGRAM |
|---|---|---|---|---|---|
| 270 | | | | BASALT, and scoria, red and black, vesicular *(continued)* | |
| | | | | 270.0 ▽ BASALT, dark gray, very hard | |
| 275 | GB S-28 | | | | |
| 280 | | | | | |
| 285 | GB S-29 | | | | |
| 290 | | | | | |
| 295 | GB S-30 | | | | |
| 300 | | | | | |
| 305 | GB S-31 | | | | |
| 310 | | | | | |





Figure: 3.7

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# WELL NUMBER Geo Well 1



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PROJECT NUMBER 11095-3
PROJECT LOCATION Bend, Oregon

| DEPTH (ft) | SAMPLE TYPE NUMBER | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | WELL DIAGRAM |
|---|---|---|---|---|---|
| 315 | GB S-32 | | | BASALT, dark gray, very hard *(continued)* | |
| 320 | | | | | |
| 325 | GB S-33 | | | | |
| 330 | | | | | |
| 335 | GB S-34 | | | | |
| 340 | | | | 340.0 BASALT, interbedded, dark gray to dark red, with scoria | |
| 345 | GB S-35 | | | | |
| 350 | | | | | |
| 355 | GB S-36 | | | | |
| 360 | | | | | |





Figure: 3.8

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# WELL NUMBER Geo Well 1



CLIENT Jensen Drilling
PROJECT NAME OSU Cascades Geo-Exchange Pilot Study
PROJECT NUMBER 11095-3
PROJECT LOCATION Bend, Oregon

| DEPTH (ft) | SAMPLE TYPE NUMBER | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | WELL DIAGRAM |
|---|---|---|---|---|---|
| 360 | | | | BASALT, interbedded, dark gray to dark red, with scoria *(continued)* | |
| 365 | GB S-37 | | | | |
| 370 | | | | | |
| 375 | GB S-38 | | | | |
| 380 | | | | 380.0 BASALT, dark gray, very hard | |
| 385 | GB S-39 | | | | |
| 390 | | | | | |
| 395 | GB S-40 | | | | |
| 400 | | | | 400.0 SCORIA, red, soft to medium hard, lightly welded | |
| 405 | GB S-41 | | | | |





Figure: 3.9

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# WELL NUMBER Geo Well 1



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PROJECT NUMBER 11095-3
PROJECT LOCATION Bend, Oregon

| DEPTH (ft) | SAMPLE TYPE NUMBER | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | WELL DIAGRAM |
|---|---|---|---|---|---|
| 410 | | | | SCORIA, red, soft to medium hard, lightly welded *(continued)* | |
| | GB S-42 | | | | |
| 415 | | | | 415.0 BASALT, dark gray to red, with scoria interbeds | |
| 420 | GB S-43 | | | | 12" diameter telescoping screen, 0.1" wound openings, 412.5' to 512' BGS |
| 425 | | | | | |
| 430 | | | | | |
| 435 | GB S-44 | | | | |
| 440 | | | | | |
| 445 | GB S-45 | | | | |
| 450 | | | | | |





Figure: 3.10

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# WELL NUMBER Geo Well 1



**CLIENT** Jensen Drilling **PROJECT NAME** OSU Cascades Geo-Exchange Pilot Study

**PROJECT NUMBER** 11095-3 **PROJECT LOCATION** Bend, Oregon

| DEPTH (ft) | SAMPLE TYPE NUMBER | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | WELL DIAGRAM |
|---|---|---|---|---|---|
| | | | | BASALT, dark gray to red, with scoria interbeds *(continued)* | |
| 455 | GB S-46 | | | | |
| 460 | | | | | |
| 465 | GB S-47 | | | | |
| 470 | | | | | |
| 475 | GB S-48 | | | | |
| 480 | | | | | |
| 485 | GB S-49 | | | | |
| 490 | | | | 490.0 BASALT, dark gray, very hard | |
| | GB S-50 | | | | |
| 495 | | | | 495.0 BASALT, dark gray, with 50% red scoria | |





Figure: 3.11

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# WELL NUMBER Geo Well 1



CLIENT Jensen Drilling
PROJECT NAME OSU Cascades Geo-Exchange Pilot Study
PROJECT NUMBER 11095-3
PROJECT LOCATION Bend, Oregon

| DEPTH (ft) | SAMPLE TYPE NUMBER | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | WELL DIAGRAM |
|---|---|---|---|---|---|
| 500 | GB S-51 | | | BASALT, dark gray, with 50% red scoria *(continued)* | |
| 505 | | | | | |
| 510 | GB S-52 | | | | bottom of screen at 512' BGS |
| 515 | | | | | |
| | | | | 517.0 | |

Bottom of borehole at 517.0 feet.





Figure: 3.12

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# APPENDIX A

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**Water Systems Engineering, Inc.**

Date: January 15, 2020

Lab Report No. 21717



Shane Cochran
Wallace Group, Inc.
62915 NE 18th Street, Suite 1
Bend, OR 97701

Project Description: OSU Test Well 0920 and 1320; samples dated 12/19/19
Complete Well Profile (1)

**Test Description:**

The Complete Well Profile analysis is designed for comparative analysis of two samples, typically one static and one pumping sample. The Complete Well Profile utilizes a series of inorganic chemical and microbiological tests to identify fouling and corrosion issues with potential impacts on the operation of the sampled well. The tests include a number of inorganic chemical parameters such as pH, total dissolved solids/conductivity, hardness, alkalinity, oxidation reduction potential (ORP), bicarbonate, carbonates, silica, sodium, potassium, chloride, iron, manganese, phosphate, nitrate, sulfate, and total organic carbon (TOC). Biological assessment is designed to quantify the total bacterial population, identify two dominant populations of bacteria, assess anaerobic conditions, and identify the presence of iron related bacteria and sulfate reducing organisms. Also included are tests for Adenosine triphosphate (ATP), heterotrophic plate count (HPC), total coliform and E. coli coliform, and a microscopic evaluation.

**Testing Procedures:**

All laboratory testing procedures are performed according to the guidelines set forth in *Standard Methods for the Examination of Water and Wastewater* as established by the American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF). Corrosion analyses are performed in accordance with the guidelines as set forth by the National Association of Corrosion Engineers (NACE). In general, these methods are approved by both the Environmental Protection Agency (EPA) and AWWA for the reporting of water and/or wastewater data.

Sample collection and shipment is the responsibility of the customer, performed according to protocol and procedures defined by the laboratory in advance of the sampling event with regards to the specific project and nature of the problem.

**Disclaimer:**

The data and interpretations presented are based on an evaluation of the samples and submitted data. Conclusions reached in this report are based upon the data available at the time of submittal and the accuracy of the report depends upon the validity of information submitted. Any recommendations presented are based on laboratory and field evaluations of similar fouling occurrences within potable water systems. Further investigative efforts, such as efficiency testing, site inspection, video survey, or other evaluation methods may offer additional insight into the system's condition and the degree of fouling present.

Client: Wallace Group, Inc.
Date: January 15, 2020
Lab Report No. 21717



Re: OSU Test Well 0920 and 1320; samples dated 12/19/19
Complete Well Profile (1)

| ND - Not Detected<br>NA - Not Applicable<br>* as $CaCO_3$ | **OSU Test Well 0920** | **OSU Test Well 1320** | **Detection Limits** |
|---|---|---|---|
| pH Value | 7.76 | 7.66 | NA |
| Phenolphthalein Alkalinity* | ND | ND | 4 mg/l |
| Total Alkalinity* | 40 | 44 | 4 mg/l |
| Hydroxide Alkalinity | ND | ND | 4 mg/l |
| Carbonate Alkalinity | ND | ND | 4 mg/l |
| Bicarbonate Alkalinity | 40 | 44 | 4 mg/l |
| Total Dissolved Solids | 82 | 76 | 1.0 mg/l |
| Conductivity (µm or µS/cm) | 114 | 105 | NA |
| ORP (mV) | 343.6 | 339.1 | NA |
| Langelier Saturation Index (at 16°C) | - 1.49 | - 1.54 | NA |
| Total Hardness* | 40 | 32 | 4 mg/l |
| Carbonate Hardness | 40 | 32 | 4 mg/l |
| Non Carbonate Hardness | ND | ND | 4 mg/l |
| Calcium* | 16 | 16 | 4 mg/l |
| Magnesium* | 24 | 16 | 4 mg/l |
| Sodium (as Na) | 7.66 | 7.04 | 0.02 mg/l |
| Potassium (as K) | 1.40 | 1.40 | 0.1 mg/l |
| Phosphate (as $PO_4$) | 0.34 | 0.35 | 0.06 mg/l |
| Chlorides (as Cl) | 8.4 | 8.8 | 2 mg/l |
| Nitrate (Nitrogen) | ND | ND | 0.3 mg/l |
| Chlorine (as Cl) | ND | ND | 0.02 mg/l |
| Dissolved Iron (as $Fe^{2+}$) | ND | ND | 0.02 mg/l |
| Suspended Iron (as $Fe^{3+}$) | 0.05 | 0.05 | 0.02 mg/l |
| Iron Total (as Fe) | 0.05 | 0.05 | 0.02 mg/l |
| Iron (resuspended) | 0.08 | 0.06 | 0.02 mg/l |
| Copper (as Cu) | ND | ND | 0.04 mg/l |
| Manganese (as Mn) | ND | ND | 0.1 mg/l |
| Sulfate (as $SO_4$) | ND | ND | 2 mg/l |
| Silica (as $SiO_2$) | 36.8 | 35.4 | 1.0 mg/l |
| Tannin/Lignin | ND | ND | 0.1 mg/l |
| Total Organic Carbon (C) | 0.0 | 0.0 | 0.0 mg/l |

**Biological Analysis:**

| | OSU Test Well 0920 | OSU Test Well 1320 | Detection Limit |
|---|---|---|---|
| Plate Count (colonies/ml) | 150 | 139 | NA |
| Anaerobic Growth (%) | <10 | 15 | NA |
| Sulfate Reducing Bacteria | Negative | Negative | NA |
| Fe/Mn Oxidizing Bacteria | Negative | Negative | NA |
| ATP (cells per ml) Initial | 30,000 | 20,000 | NA |
| ATP (cells per ml) 24 Hour | 45,000 | 89,000 | NA |
| Bacterial Identification | *Acinetobacter johnsonii* | *Pseudomonas stutzeri* | NA |
| Bacterial Identification | *Pseudomonas fluorescens* | *Pseudomonas fluorescens* | NA |

**Microscopic Evaluation:**

0920: Very low visible bacterial activity, low crystalline debris with moderate iron oxide.

1320: Very low visible bacterial activity, very low crystalline debris with low iron oxide.

**Observations:**

When received in the lab, the samples from the OSU test well were clear of visual turbidity with minor accumulations of black particulate present. The samples each exhibited a neutral pH and relatively low levels of total dissolved solids and conductivity.

High oxidation-reduction potentials (ORP) were recorded for both samples. Elevated ORPs generally reflect oxidative conditions which can serve to oxidize available metals such as iron and manganese.

The Langelier Saturation Index (LSI) is a calculation used to identify the saturation of a water chemistry with respect to calcium carbonate. The LSI is useful in indicating the potential for chemical corrosion as well as the likelihood of calcium carbonate-based scale. Positive LSI values typically indicate a chemical environment which is saturated with respect to calcium carbonate with an elevated potential for the development of calcium scale. Negative LSI values reflect an undersaturated geochemical environment which typically favors corrosion within the system. Calculation of the LSI yielded strongly negative values for the two samples indicative of an elevated potential for corrosion to occur. The negative LSI values within the samples are a result of the neutral pH and low calcium presence.

Calcium levels within both samples were low. Magnesium, elevated by comparison in the casing sample, remained equal to the calcium level in the second sample. Elevated levels of magnesium in relation to calcium and a high ORP can indicate a potential for the development of magnesium hydroxide in areas were aeration occurs within the well.

Dissolved iron was not present in either sample. Suspended iron and total iron values were in general, low, yet reflect mobilization of iron within the well casing. Resuspended iron, a total iron test that accounts for both chemically oxidized and biologically mobilized iron, was also low in both samples despite observable iron noted during microscopic evaluation. Manganese, a mineral which is often viewed similarly to iron in its function as a fouling mechanism, was not detected.

Total organic carbon (TOC) and tannin and lignin are evaluated as a reflection of the presence or concentration of organic material and humic substances. Neither of these parameters were identified in either sample.

Heterotrophic plate growth in the two samples was limited, coinciding with reported low levels of visible microbial activity. Adenosine triphosphate (ATP) testing, a means of quantifying the bacterial population that is not agar dependent, reported minor levels in each of the samples. Growth in ATP levels over a twenty-four hour period under ideal environmental conditions is expected and was considered typical in both samples. As a point of reference, ATP values typically fall within the range of 10,000 to 70,000 cells per milliliter (cpm) for active, potable well systems.

Testing for iron and manganese oxidizing bacteria was negative in both samples.

Anaerobic bacterial growth, reported as a function of the total population, was less than ten percent in the first sample and increased to fifteen percent in the second sample. Anaerobic growth is used as a measure of population maturity as well as flow disruption. Testing for sulfate reducing bacteria (SRB's), a group of anaerobic bacteria known for hydrogen sulfide ($H_2S$) gas production, was negative.

Microscopic evaluation of the samples noted very low levels of visible microbial activity present. Crystalline debris and iron oxide were identified n each sample with higher levels of accumulation present in the first sample. No accumulations of biomass, larger microorganisms, or stalked bacteria were reported.

The dominant species identified within the samples included multiple soil related organisms. A brief description of the dominant species is presented below.

*Acinetobacter johnsonii* is a nonmotile, gram negative coccobacillus. It grows under aerobic conditions, is catalase positive and oxidase negative. They are important soil organisms and widely dispersed in nature. *Acinetobacter* species are commonly identified in environmental sites with hydrocarbon contamination, as well as being isolated from both humans and animals. Most *Acinetobacter* are considered opportunistic pathogens, being involved in nosocomial infections, including bacteremia, urinary tract infections and wound infections.

*Pseudomonas fluorescens* is a common gram-negative, rod-shaped, aerobic bacterium. Pseudomonas fluorescens inhabit soil, plants, and water surfaces. It is an obligate aerobe but certain strains are capable of using nitrate instead of oxygen as a final electron acceptor during cellular respiration. *Pseudomonas fluorescens* are considered non-pathogenic.

*Pseudomonas stutzeri* is a gram-negative, rod-shaped soil bacterium that is highly motile. As a member of the genus *Pseudomonas*, it is a prolific slime former; however, it's known to produce a particularly dense, almost leathery form of biomass. It is also considered a denitrifying bacterium.

**Interpretations:**

It was requested that the generated data be evaluated with regards to the potential for mineral scale development, biofouling occurrence, and the impacts on both on the well, conveyance lines, and industrial systems.

The main concern identified within the testing was the corrosion potential of the water. As a reflection of the level of aggressiveness, the use of less reactive materials such as PVC or stainless steel should be considered. The use of low carbon steel, high-strength-low-alloy steel, galvanized metal, or other less noble metals would result in the mobilization of iron and subsequent development of iron oxide scale and iron oxide entrained biomass. Similarly, associated components including column pipe, pump, monitoring equipment and conveyance lines should utilize similar metallurgy to reduce the potential for dissimilar metals corrosion.

The oxidative nature of the water will aid in the development of metallic oxides and aerobic microbial populations. Based on the current test data, iron oxide and magnesium hydroxide are the most likely mineral assemblages expected. The development of biomass (biofilm) within the well will encourage the accumulation of mineral scale as well as the entrainment of mobilized sediment and other particulate.

As with all well systems, regular operation is encouraged. Wells that sit out of service or idle, or that become stagnant generally have higher rates of fouling. If the well sits off-line for an extended time period either prior to employment as a water supply or during its operational life cycle, it should be operated and pumped to waste prior to supplying the system. This is designed to flush any detritus or biomass from the well and limit introduction into the system.

Within industrial systems, it is likely that the water will require buffering and corrosion control. As industrial systems generally have specific requirements for water and make-up water, each component should be individually evaluated.

If you have questions regarding the analysis and the interpretations, please contact our office.

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