

LL 1725

LL 1725

LL 1725

NAME	DATE	DATE
TARGET HILL Canyon Fording	ISSUED 4-3-2018	EXPIRES 4-4-2023
ADDRESS		
3506 THORNTON RD	DENIED	
	WITHDRAWN	
PHONE		

DATE	FEES PAID	RECEIPT #
12/27/17	1,150.00	125557

FEES REFUNDED		

Waiting for
report date -
from K. Lindsay

then finish memo

1-9-2018

Up to 10,000 Ac/Ft.

RECHARGE

to 12-31-2023

Main River

1/4, 1/4 Section 36, Township 4 North, Range 22 E, N.M.

M. P. Gilliam

Neto Silverwater

AVAILABLE FOR ISSUANCE 1-24-2018

RT. TO G.W. AFTER P.M.

RELATED FILES

Comments:

JK 1/2/2018

LL 1725

LL 1725

	DATE	DATE
NAME <u>TABLE MILE Canyon Farming</u>	ISSUED <u>4-3-2018</u>	EXPIRES <u>4-4-2023</u>
ADDRESS <u>75906 THREVEILLE ROAD</u>	DENIED	
	WITHDRAWN	
PHONE		

DATE	FEES PAID	RECEIPT #
<u>12/27/17</u>	<u>1150.00</u>	<u>125557</u>
FEES REFUNDED		

PUBLIC NOTICE DATE 1-9-2018AVAILABLE FOR ISSUANCE 1-24-2018AMOUNT 2785 cfs up to 10,000 ACF.

RT. TO G.W. AFTER P.N.

USE AGRICULTURE RECHARGEDURATION ISSUE TO 12-31-2023SOURCE COLUMBIA RIVERP.O.D. LOCATED NW 1/4, S6 1/4 SECTION 36, TOWNSHIP 4 NORTH, RANGE 22 E, N. 4.COUNTY PERMIAN & GRILLIAN

RELATED FILES

WATERMASTER Greta J. J. J. J. J.

Comments:

JL 1/2/2018

Oregon Water Resources Department



Final Order

Limited License Application LL-1725

Appeal Rights

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

Requested Water Use

On December 27, 2017, the Water Resources Department received completed application LL-1725 from Greg Harris; Threemile Canyon Farms Inc. for the use of 27.85 Cubic feet per second from the Columbia River, located in the NW ¼, SE ¼, Section 36, Township 4 North, Range 22, W.M., for aquifer recharge testing, for the period of issuance through December 31, 2023.

Authorities

The Department may approve a limited license pursuant to its authority under ORS 537.143, 537.144 and OAR 690-340-0030.

ORS 537.143(2) authorizes the Director to revoke the right to use water under a limited license if it causes injury to any water right or a minimum perennial streamflow.

A limited license will not be issued for more than five consecutive years for the same use, as directed by ORS 537.143(8).

Findings of Fact

1. The forms, fees, and map have been submitted, as required by OAR 690-340-0030(1).
2. The Department provided public notice of the application, on January 9, 2018, as required by OAR 690-340-0030(2).
3. This limited license request is limited to an area within a single drainage basin as required by OAR 690-340-0030(3).
4. The Department has determined that there is water available for the requested use.
5. The Department has determined that the proposed source has not been withdrawn from further appropriation per ORS 538.200.

6. The Department can allow issue a limited license for no longer than five years (ORS 537.143).
7. Because this use is from surface water and has the potential to impact fish, the Department finds that fish screening is required to protect the public interest.
8. Because the use requested is longer than 120 days and because the use is in an area that has sensitive, threatened or endangered fish species, the use is subject to the Department's rules under OAR 690-033. These rules aid the Department in determining whether a proposed use will impair or be detrimental to the public interest with regard to sensitive, threatened, or endangered fish species. The Oregon Department of Fish and Wildlife (ODFW) commented on March 8, 2018. These comments pertain to the period that water may be diverted, and flow restrictions that could impose restrictions on diversion amounts and timing of diversions. Oregon Department of Environmental Quality (ODEQ) comments are pertaining to water quality, monitoring and an approved work and monitoring plan. Based on the comments received, the Department has added conditions in the final order below.
8. Pursuant to OAR 690-340-0030(4)(5), conditions have been added with regard to notice and water-use measurement.
9. Morrow and Gilliam counties have indicated that the proposed use is compatible with the applicable acknowledged comprehensive land-use plan. A copy of the land use compatibility is in the file.

Conclusions of Law

The proposed water use will not impair or be detrimental to the public interest pursuant to OAR 690-340-0030(2), as limited in the order below.

Order

Therefore, pursuant to ORS 537.143, ORS 537.144, and OAR 690-340-0030, application **LL-1725** is approved as conditioned below.

1. The period, rate, and volume of use for **LL-1725** shall be from April 5, 2018, through April 4, 2023, for the use of 27.85 cubic feet per second, up to 10,000 acre feet total, from the Columbia River for the purpose of Aquifer Recharge testing. The season of use shall be October 1 through April 14 of each year. The season of use and rate of diversion may further limited by the following conditions.
2. The licensee shall give notice to the Watermaster in the district where use is to occur not less than 15 days or more than 60 days in advance of using the water under the limited license. The notice shall include the location of the diversion, the quantity of water to be diverted and the intended use and place of use.
3. Before water use may begin under this limited license, the licensee shall install a totalizing flow meter at each point of diversion and at the entry point to each recharge test well. The totalizing flow meter must be installed and maintained in good working order. In addition the licensee shall maintain a record of all water use, including the total number of hours of pumping, the total quantity pumped, and the categories of beneficial use to which the water is

applied. During the period of the limited license, the record of use shall be submitted to the Department annually, and shall be submitted to the Watermaster upon request. This record shall include the amount of water diverted from the Columbia River, and the amount delivered to each recharge well.

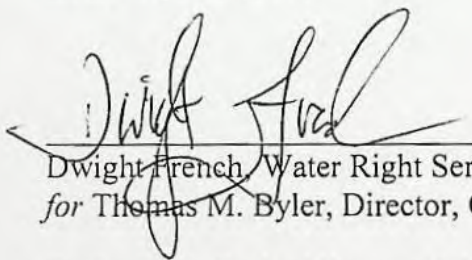
4. The licensee shall adhere to the current, approved work plan and monitoring plan. A revised, superseding plan may be submitted to the Department at any time. The Department may deny, condition or approve that plan.
5. The licensee shall comply with all ODEQ water quality requirements. If monitoring data or other information result in identification of potential water quality concerns, ODEQ may seek modifications to the monitoring and test plan and/or require a permit of its own to address the water quality concerns prior to resumption of artificial groundwater recharge testing.
6. The licensee is required to provide a written annual report by January 15 of each year. This report will detail recharge testing from the preceding year. Reporting shall include, but not be limited to, results and analysis of testing efforts that relate to water quality, water quantity, and operations. Water level data shall be submitted in a Department-specified digital format. The licensee shall consult with ODEQ and OWRD to identify additional specific reporting elements. The first report is due in January 2019. The annual report shall be sealed and signed by a professional(s) registered or allowed, under Oregon law, to practice geology.
7. Ongoing surveys indicate the importance of maintaining water levels in the Ives/Pierce Island complex below Bonneville Dam to provide for ESA-listed chum salmon spawning, incubation, and emergence. As tail water elevations below Bonneville Dam are directly correlated with the amount of chum spawning habitat available, the Federal Columbia River Power System Biological Opinion set targets for chum salmon spawning, incubation, and emergence from November through early April. The volume of unregulated flow into the Columbia River upstream of Bonneville Dam is critical in meeting the spawning elevations. Therefore, in accordance with the Biological Opinion, and to ensure spawning habitat is available, ODFW recommends the permittee divert water only during November 1 – December 31, or until a stage height set by the Action Agencies for that year has been determined, when the 7-day rolling average of the mean daily gage height, or tail water elevation, below Bonneville Dam is equal to or greater than a height of 11.5 feet or the height set by the Action Agencies. After a stage height is set by the Action Agencies (usually late December), ODFW recommends the permittee divert water only when the 7-day rolling average of the mean daily gage height, or tail water elevation, below Bonneville Dam is equal to or greater than the stage height set. The permittee should contact the Army Corps of Engineers representative of the Technical Management Team to identify when the stage height is set (contact information can be found on the meeting agendas here: <http://www.nwd-wc.usace.army.mil/tmt/>). To monitor mean daily stage at this location, the permittee will use the official project tail water elevation gage (USGS gage station #14128870 Columbia River below Bonneville Dam, OR). Real-time data from this station is available online at the United States Geological Survey website: http://waterdata.usgs.gov/or/nwis/dv/?site_no=14128870&agency_cd=USGS&referred_module=sw. ODFW recommends the permittee maintain a spreadsheet of the 7-day rolling average of the mean daily gage height for the period when the permittee is withdrawing water from November 1 – April 14, which will be available to WRD upon request. ODFW

recommends any mitigation provided to compensate for withdrawals made when the stage height is below 11.5 feet or that set by the Action Agencies for the period November 1 through April 14 be protected instream at a point or reach above Bonneville Dam located at approximately River Mile 146.

8. The Director may revoke the right to use water for any reason described in ORS 537.143(2), and OAR 690-340-0030(6). Such revocation may be prompted by field regulatory activities or by any other information.
9. Use of water under a limited license shall not have priority over any water right exercised according to a permit or certificate, and shall be subordinate to all other authorized uses that rely upon the same source.
10. The licensee shall install, operate and maintain an approved fish screen at the point of diversion. If Oregon Department of Fish and Wildlife (ODFW) determines, the screen is not functioning properly, and is unsuccessful in working with the water user to meet ODFW standards, ODFW may request that OWRD regulate the use of water until OWRD receives notification from ODFW that the fish screen is functioning properly.
11. A copy of this limited license shall be kept at the place of use, and be available for inspection by the Watermaster or other state authority.

NOTE: This water-use authorization is temporary. Applicants are advised that issuance of this final order does not guarantee that any permit for the authorized use will be issued in the future; any investments should be made with that in mind.

Issued April 3, 2018


Dwight French, Water Right Services Division Administrator
for Thomas M. Byler, Director, Oregon Water Resources Department

Enclosures - limited license, fish screen criteria

cc: Kenneth C. Thiemann, District 5 Watermaster
Bill Duke, ODFW
Phil Richerson, DEQ
Hydrographics
File

If you need further assistance, please contact the Water Rights Section at the address, phone number, or fax number below. When contacting the Department, be sure to reference your limited license number for fastest service.

Remember, this limited license does not provide a secure source of water. Water use can be revoked at any time. Such revocation may be prompted by field regulatory activities or many other reasons.

Water Rights Section
Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem OR 97301-1271
Phone: (503) 986-0817 Fax: (503) 986-0901

FISH SCREENING CRITERIA FOR WATER DIVERSIONS

This summary describes ODFW fish screening criteria for all fish species.

Screen material openings for ditch (gravity) and pump screens must provide a minimum of 27% open area:

Perforated plate: Openings shall not exceed 3/32 or 0.0938 inches (2.38 mm).

Mesh/Woven wire screen: Square openings shall not exceed 3/32 or 0.0938 inches (2.38 mm) in the narrow direction, e.g., 3/32 inch x 3/32 inch open mesh.

Profile bar screen/Wedge wire: Openings shall not exceed 0.0689 inches (1.75 mm) in the narrow direction.

Screen area must be large enough to prevent fish impact. Wetted screen area depends on the water flow rate and the approach velocity.

Approach velocity: The water velocity perpendicular to and approximately three inches in front of the screen face.

Sweeping velocity: The water velocity parallel to the screen face.

Bypass system: Any pipe, flume, open channel or other means of conveyance that transports fish back to the body of water from which the fish were diverted.

Active pump screen: Self cleaning screen that has a proven cleaning system.

Passive pump screen: Screen that has no cleaning system other than periodic manual cleaning.

Screen approach velocity for ditch and active pump screens shall not exceed 0.4 fps (feet per second) or 0.12 mps (meters per second). The wetted screen area in square feet is calculated by dividing the maximum water flow rate in cubic feet per second (1 cfs = 449 gpm) by 0.4 fps.

Screen sweeping velocity for ditch screens shall exceed the approach velocity. Screens greater than 4 feet in length must be angled at 45 degrees or less relative to flow. An adequate bypass system must be provided for ditch screens to safely and rapidly collect and transport fish back to the stream.

Screen approach velocity for passive pump screens shall not exceed 0.2 fps or 0.06 mps. The wetted screen area in square feet is calculated by dividing the maximum water flow rate by 0.2 fps. Pump rate should be less than 1 cfs.

For further information please contact:

Statewide Fish Screening Coordinator
Oregon Dept. Fish and Wildlife
3406 Cherry Avenue NE
Salem, OR 97303
(503) 947-6229



Oregon
Kate Brown, Governor

Water Resources Department
725 Summer St NE, Suite A
Salem, OR 97301
(503) 986-0900
Fax (503) 986-0904

MEMORANDUM

PREPARED FOR: LL -1725 application file

PREPARED BY: Jen Woody, Hydrogeologist

SUBJECT: Threemile Canyon Farms Inland Area AR Limited License Application is complete

DATE: 3/27/2018

Background

Application LL -1725 proposes an Artificial Groundwater Recharge (AR) project at Threemile Canyon Farms's Inland Area wells. It will utilize up to five basalt irrigation wells for AR testing, with one dedicated observation well. No recovery is contemplated at this time; the goal is to mitigate declining groundwater levels.

OWRD, ODEQ and ODFW have reviewed and commented on the application, which was originally submitted on 12/27/2017. It was determined to be incomplete on 2/26/2018 from both ODEQ and OWRD's perspective. Application amendments were submitted by email on 3/12/2018. ODEQ and OWRD reviewed the resubmission and found the application complete on 3/27/2018. ODFW comments were also received regarding Columbia River diversion on 3/8/2018.

The application meets the minimum requirements for AR testing under 690-350-0120.

Recommended AR-related conditions:

1. The licensee shall adhere to the current, approved work plan and monitoring plan. A revised, superseding plan may be submitted to the Department at any time. The Department may deny, condition or approve that plan.
2. The licensee shall comply with all ODEQ water quality requirements. If monitoring data or other information result in identification of potential water quality concerns, ODEQ may seek modifications to the monitoring and test plan and/or require a permit of its own to address the water quality concerns prior to resumption of artificial groundwater recharge testing.
3. Before water use may begin under this license, the licensee shall install a totalizing flow meter at each point of diversion and at the entry point to each recharge test well. The totalizing flow meters must be installed and maintained in good working order. In addition the licensee shall maintain a record of all water use, including the total number of hours of diversion, the total volume diverted, and the categories of beneficial use to which the water is applied. During the period of the limited license, the record of use shall be available for review by the Department upon request, and shall be submitted to the Department annually and to Watermaster upon request. This record shall include the amount of water diverted from the Columbia River, and the amount delivered to each recharge well.
4. The licensee is required to provide a written annual report by January 15th of each year. This report will detail recharge testing from the preceding year. Reporting shall include, but is not limited to, results and analysis of testing

efforts that relate to water quality, water quantity, and operations. Water level data shall be submitted in a Department-specified digital format. The licensee shall consult with ODEQ and OWRD to identify additional specific reporting elements. The first report is due in January 2019. The annual report shall be sealed and signed by a professional(s) registered or allowed, under Oregon law, to practice geology.

5. ODFW comments should be addressed with conditions, see attached email from Bill Duke at ODFW.

ODFW comments from William Duke, William.B.Duke@state.or.us , on 03/08/2018:

ODFW recommends the following conditions be applied to the LL-1725

Water may only be diverted as per Div. 33 between Oct. 1 and April 14.

The Oregon Department of Fish and Wildlife has determined that a fish screen is necessary at the new point of diversion to prevent fish from entering the diversion and that the diversion is currently equipped with an appropriate fish screen. Condition: The water user shall operate and maintain an approved fish screen at the point of diversion. If Oregon Department of Fish and Wildlife (ODFW) determines the screen is not functioning properly, and is unsuccessful in working with the water user to meet ODFW standards, ODFW may request that OWRD regulate the use of water until OWRD receives notification from ODFW that the fish screen is functioning properly.

Chum Flow (Upper Columbia Basin and Lower Columbia Basin through Ives Island)

Ongoing surveys indicate the importance of maintaining water levels in the Ives/Pierce Island complex below Bonneville Dam to provide for ESA-listed chum salmon spawning, incubation, and emergence. As tailwater elevations below Bonneville Dam are directly correlated with the amount of chum spawning habitat available, the Federal Columbia River Power System Biological Opinion set targets for chum salmon spawning, incubation, and emergence from November through early April. The volume of unregulated flow into the Columbia River upstream of Bonneville Dam is critical in meeting the spawning elevations. Therefore, in accordance with the Biological Opinion, and to ensure spawning habitat is available, ODFW recommends the permittee divert water only during November 1 – December 31, or until a stage height set by the Action Agencies for that year has been determined, when the 7-day rolling average of the mean daily gage height, or tailwater elevation, below Bonneville Dam is equal to or greater than a height of 11.5 feet or the height set by the Action Agencies. After a stage height is set by the Action Agencies (usually late December), ODFW recommends the permittee divert water only when the 7-day rolling average of the mean daily gage height, or tailwater elevation, below Bonneville Dam is equal to or greater than the stage height set. The permittee should contact the Army Corps of Engineers representative of the Technical Management Team to identify when the stage height is set (contact information can be found on the meeting agendas here: <http://www.nwd-wc.usace.army.mil/tmt/>). To monitor mean daily stage at this location, the permittee will use the official project tailwater elevation gage (USGS gage station #14128870 Columbia River below Bonneville Dam, OR). Real-time data from this station is available online at the United States Geological Survey website:

http://waterdata.usgs.gov/or/nwis/dv/?site_no=14128870&agency_cd=USGS&referred_module=sw. ODFW recommends the permittee maintain a spreadsheet of the 7-day rolling average of the mean daily gage height for the period when the permittee is withdrawing water from November 1 – April 14, which will be available to WRD upon request. ODFW recommends any mitigation provided to compensate for withdrawals made when the stage height is below 11.5 feet or that set by the Action Agencies for the period November 1 through April 14 be protected instream at a point or reach above Bonneville Dam located at approximately River Mile 146.

WOODY Jennifer L * WRD

From: RICHERSON Phil <Phil.Richerson@state.or.us>
Sent: Monday, March 19, 2018 3:14 PM
To: WOODY Jennifer L * WRD
Subject: RE: Inland AR LL application amendments

Hello Jen,
Thank you for linking me to the documents. I have reviewed them and they adequately address DEQ's comments provided on the initial submittal.
Thanks,
Phil

~~~~~

Phil Richerson  
UIC Senior Hydrogeologist  
Oregon Dpt Environmental Quality  
800 SE Emigrant, #330  
Pendleton, OR 97801  
541.278.4604  
[Phil.Richerson@state.or.us](mailto:Phil.Richerson@state.or.us)

**From:** WOODY Jennifer L \* WRD <[Jennifer.L.Woody@oregon.gov](mailto:Jennifer.L.Woody@oregon.gov)>  
**Sent:** Friday, March 16, 2018 11:30 AM  
**To:** RICHERSON Phil <[Phil.Richerson@state.or.us](mailto:Phil.Richerson@state.or.us)>  
**Subject:** Inland AR LL application amendments

Hi Phil,  
I think Kevin Lindsey's email attachment are too large to get through to you. I've uploaded the new documents here:

<http://filepickup.wrd.state.or.us/files/Uploads/for%20Phil/>

Please let me know if they address DEQ's deficiency comments.  
Thanks very much,  
Jen

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Jen Woody, R.G.  
Hydrogeologist  
Oregon Water Resources Department  
725 Summer St. NE, Suite A  
Salem, OR 97301  
503-986-0855



## WOODY Jennifer L \* WRD

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**From:** William Duke <William.B.Duke@state.or.us>  
**Sent:** Thursday, March 08, 2018 3:04 PM  
**To:** WOODY Jennifer L \* WRD  
**Cc:** STEVENSON Anna P; FAUCERA Danette L; Molly Reid  
**Subject:** RE: Limited License 1725 Threemile Canyon Farms

Hi Jen,

ODFW recommends the following conditions be applied to the LL-1725

Water may only be diverted as per Div. 33 between Oct. 1 and April 14.

The Oregon Department of Fish and Wildlife has determined that a fish screen is necessary at the new point of diversion to prevent fish from entering the diversion and that the diversion is currently equipped with an appropriate fish screen.

Condition: The water user shall operate and maintain an approved fish screen at the point of diversion. If Oregon Department of Fish and Wildlife (ODFW) determines the screen is not functioning properly, and is unsuccessful in working with the water user to meet ODFW standards, ODFW may request that OWRD regulate the use of water until OWRD receives notification from ODFW that the fish screen is functioning properly.

### **Chum Flow** (Upper Columbia Basin and Lower Columbia Basin through Ives Island)

Ongoing surveys indicate the importance of maintaining water levels in the Ives/Pierce Island complex below Bonneville Dam to provide for ESA-listed chum salmon spawning, incubation, and emergence. As tailwater elevations below Bonneville Dam are directly correlated with the amount of chum spawning habitat available, the Federal Columbia River Power System Biological Opinion set targets for chum salmon spawning, incubation, and emergence from November through early April. The volume of unregulated flow into the Columbia River upstream of Bonneville Dam is critical in meeting the spawning elevations. Therefore, in accordance with the Biological Opinion, and to ensure spawning habitat is available, ODFW recommends the permittee divert water only during November 1 – December 31, or until a stage height set by the Action Agencies for that year has been determined, when the 7-day rolling average of the mean daily gage height, or tailwater elevation, below Bonneville Dam is equal to or greater than a height of 11.5 feet or the height set by the Action Agencies. After a stage height is set by the Action Agencies (usually late December), ODFW recommends the permittee divert water only when the 7-day rolling average of the mean daily gage height, or tailwater elevation, below Bonneville Dam is equal to or greater than the stage height set. The permittee should contact the Army Corps of Engineers representative of the Technical Management Team to identify when the stage height is set (contact information can be found on the meeting agendas here: <http://www.nwd-wc.usace.army.mil/tmt/>). To monitor mean daily stage at this location, the permittee will use the official project tailwater elevation gage (USGS gage station #14128870 Columbia River below Bonneville Dam, OR). Real-time data from this station is available online at the United States Geological Survey website:

[http://waterdata.usgs.gov/or/nwis/dv/?site\\_no=14128870&agency\\_cd=USGS&referred\\_module=sw](http://waterdata.usgs.gov/or/nwis/dv/?site_no=14128870&agency_cd=USGS&referred_module=sw). ODFW recommends the permittee maintain a spreadsheet of the 7-day rolling average of the mean daily gage height for the period when the permittee is withdrawing water from November 1 – April 14, which will be available to WRD upon request. ODFW recommends any mitigation provided to compensate for withdrawals made when the stage height is below 11.5 feet or that set by the Action Agencies for the period November 1 through April 14 be protected instream at a point or reach above Bonneville Dam located at approximately River Mile 146.

Thanks  
Bill



**From:** WOODY Jennifer L \* WRD [mailto:Jennifer.L.Woody@oregon.gov]  
**Sent:** Thursday, March 01, 2018 8:13 AM  
**To:** Reid, Molly <mreid@eaest.com>; WOODY Jennifer L <Jennifer.L.WOODY@state.or.us>; IVERSON Justin T \* WRD <Justin.T.Iverson@oregon.gov>  
**Cc:** DUKE William B <William.B.Duke@state.or.us>; Harris, Greg <GHarris@rdoffutt.com>; Lindsey, Kevin <klindsey@eaest.com>; Travis, Jonathon <jtravis@eaest.com>; SAUTER Jerry K \* WRD <Jerry.K.Sauter@oregon.gov>  
**Subject:** RE: Limited License 1725 Threemile Canyon Farms

Hi all,

I attach the Division 33 notice that went out regarding this application on January 5, 2018. Bill Duke was cc'd on this notice. Additionally, you can view the January 9<sup>th</sup>, 2018 public notice here:

[http://apps.wrd.state.or.us/apps/misc/wrd\\_notice\\_view/?notice\\_id=21](http://apps.wrd.state.or.us/apps/misc/wrd_notice_view/?notice_id=21).

The application can be accessed here:

[http://apps.wrd.state.or.us/apps/misc/wrd\\_notice\\_view/?notice\\_id=21](http://apps.wrd.state.or.us/apps/misc/wrd_notice_view/?notice_id=21)

Bill, I'm available to discuss at your convenience.

Best,  
Jen

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Jen Woody, R.G.  
Hydrogeologist  
Oregon Water Resources Department  
725 Summer St. NE, Suite A  
Salem, OR 97301  
503-986-0855

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**From:** Reid, Molly [mailto:mreid@eaest.com]  
**Sent:** Wednesday, February 28, 2018 10:32 AM  
**To:** WOODY Jen L; IVERSON Justin T \* WRD  
**Cc:** DUKE William B; Harris, Greg; Lindsey, Kevin; Travis, Jonathon  
**Subject:** Limited License 1725 Threemile Canyon Farms

Jen: I spoke with Bill Duke, District Biologist, with Oregon Department of Fish and Wildlife this morning. He reports he has not received any information concerning LL1725. Could you please send the information to him as soon as possible so that we can move forward with this application? Thanks.

**Molly Reid**  
Senior Water Resources Consultant



EA Engineering, Science, and Technology, Inc., PBC  
8019 W. Quinault Ave, Suite 201  
Kennewick, WA 99336  
Direct Line: (509) 591-0490  
Cell: (541) 310-7264  
[mreid@eaest.com](mailto:mreid@eaest.com)





EA Engineering, Science, and Technology, Inc., PBC

8019 West Quinault Avenue, Suite 201  
Kennewick, WA 99336  
Telephone: 509-591-0264  
[www.eaest.com](http://www.eaest.com)

## MEMORANDUM

**TO:** Jen Woody, OWRD

**Cc:** Greg Harris, TMCF

**FROM:** Kevin Lindsey, Jon Travis, and Molly Reid

**DATE:** March 12, 2018

**SUBJECT:** Response to Comments in Memorandum dated 2/26/2018, RE LL-1725 Application

The purpose of this memorandum, prepared on behalf of Threemile Canyon Farms (TMCF), is to provide you with responses to OWRD and ODEQ comments on the afore named Limited License application, as presented in your memorandum dated 2/26/2018.

Attached to this memo you will find revised application materials prepared as needed to respond to comments in the afore named memo. Below you will find a summary of these revisions and additional responses to comments received as appropriate.

With respect to OWRD comments:

- With respect to the 10,000 acre-foot annual aquifer recharge request, that is simply a planning level maximum target volume given to the project to mitigate for the observed declines. The revised cover letter (attached) contains a brief statement to that effect. Final annual aquifer recharge volumes to meet the mitigate target may indeed be less than that volume, and any final permits/authorizations resulting from the LL would reflect that.
- A comprehensive Inland Project hydrograph is now in Attachment D, labeled figure D-5.
- The example aquifer test data now included as both log-log and semi-log plots, labeled figures D-6 and D-7, respectively.
- Figure D-4 now includes all Inland Project wells.
- Understood RE UIC registration. That will be done once source water treatment investigation is successfully completed.
- With the completion of source water characterization and treatment, late in 2018 or more likely in 2019, we anticipate a detailed discussion surrounding acceptable treatment/filtration before the project proceeds to any injection testing.

With respect to ODEQ comments:

- Question 1a: The proposed recharge season sampling in Attachments C and E are the same. Concerning historical source water samples and planned source water sampling, we concur that sampling and analysis in the proposed injection windows is appropriate.





- Question 1b: Proposed recharge season sampling more clearly identified in Attachment C, and to that end we have revised the schedule as shown in Attachment C, and Tables C-1 and C-3.
- Comment 2, Frequency: Attachment C text and Tables C-1 and C-3 have been edited to clarify timing of sampling, during all phases of the project (source water and treatment characterization and the different subsequent ASR test phases).
- Comment 2, Location: Attachment C text and Tables C-1 and C-3 have been edited to reflect sampling of the injection well and the nearest downgradient well. Also note, initial source water and treatment characterization work may be carried out at several locations identified in consultation with OWRD and ODEQ, and results of this initial effort, including recommendations concerning treatment for AR injection testing, will be reviewed in consultation with OWRD and ODEQ to gain concurrence on what AR testing should encompass, including treatment.
- Question 2: Concerning the location, frequency, and analyte lists for source water and receiving water:
  - The proposed sampling locations for source water and treatment characterization will include several existing treatment/filtration systems that TMCF currently operates. Following receipt of that data, we will revisit source water and treatment sampling in consultation with OWRD and ODEQ, changing that program as needed prior to any AR testing.
  - Sampling frequency for all project phases is revised/revisited in the edited Attachment C, including its tables.
  - Proposed analyte list is provided in Table C-4.
- Comment 3: Proposed analyte list will not be changed without OWRD and ODEQ concurrence.





**Oregon**  
Kate Brown, Governor

**Water Resources Department**  
725 Summer St NE, Suite A  
Salem, OR 97301  
(503) 986-0900  
Fax (503) 986-0904

## MEMORANDUM

**PREPARED FOR:** LL -1725 application file

**PREPARED BY:** Jen Woody, Hydrogeologist

**SUBJECT:** Threemile Canyon Farms Inland Area AR Limited License Application is not complete (OWRD and ODEQ comments attached)

**DATE:** 2/26/2018

### Background

Application LL -1725 proposes an Artificial Groundwater Recharge (AR) project at Threemile Canyon Farms's Inland Area wells. It will utilize up to five basalt irrigation wells for AR testing, with one dedicated observation well. No recovery is contemplated at this time, the goal is to mitigate declining groundwater levels.

### OWRD requires the following information to determine the application is complete:

#### **OAR 690-350-0120(3)(f) Hydrogeologic Feasibility Report.**

- Attachment D is interpreted as the report intended to meet 690-350-120(3)(f). It provides a description of the geology, and some hydrogeologic features, but it lacks a conclusion that the project is hydrologically feasible as required by rule. In other words, what about the geology and hydrogeology leads to the conclusion that 10,000 acre-feet can be stored annually? The following additions will help build that case:
- To describe the groundwater conditions prior to AR, provide a comprehensive hydrograph showing the long-term water level data associated with proposed AR wells and the dedicated observation well.
- Please provide the aquifer test (D-5) data plotted on a semi-log scale in addition to the log-log scale.
- Regarding Figure D-4, is it possible to include all six project wells instead of three?

#### **OAR 690-350-0120(3)(a) Oregon Department of Fish and Wildlife input.**

- The proposed source water is from the Columbia River, which does not have a minimum perennial stream flow or instream water right for the protection of aquatic and fish life. ODFW input is needed. OWRD has requested this input, but has not received comment as of the date of this memo.

### **Other OWRD Comments (requiring no action to reach application completeness):**

AR injection wells require registration through ODEQ's Underground Injection Control Program before ASR testing begins. This can be completed before or after an AR LL is issued.

Page E-5 described filtration options, including infiltration basins (under "Natural Filtration"). This type of filtration will likely require additional authorizations from OWRD. Artificial Groundwater Recharge and a Secondary Groundwater Authorization to recover the stored water are applicable (see OAR 690-350-0120 through -0130).



ODEQ (Oregon Department of Environmental Quality) requires the following information before completeness can be determined (Contact is Phil Richerson : [Phil.Richerson@state.or.us](mailto:Phil.Richerson@state.or.us) )

Comment #1 - Attachment E (Water Quality Assessment) includes a discussion of source water samples collected in October 2013, August 2016, and June 2017. The document also acknowledges observed seasonal variability and indicates additional recharge-season samples will be collected to better characterize source water quality. The water quality data would be most useful if sampling occurred during the time of year that recharge would occur (expected to be November 1 through April 15 for this project).

Question 1a: Is the proposed recharge-season sampling discussed in Attachment E part of the sampling proposed in Attachment C, or is it different?

Question 1b: What is the proposed timing, frequency, and analyte list for the recharge-season sampling discussed in Attachment E?

Comment # 2 - Attachment C (Pilot Test Work Plan) includes a discussion of proposed water quality testing during treatment system testing, during baseline monitoring, and during the first three injection cycles.

Regarding frequency: Table C-1 apparently proposes monthly aquifer sampling during Cycles 2 and 3 but none during Cycle 1, and no source water sampling. Table C-3 apparently proposes aquifer water sampling three times during each recharge cycle (i.e., on Day 1, 2, and 3 during Cycle 1; and Day 1, 23, and 45 during Cycles 2 and 3). Table C-3 also proposes "Recharge Sampling" (I assume this is source water) three times during each cycle.

Regarding location: Table C-3 indicates samples will be collected during Cycles 1 through 3 at the injection well and the nearest operating downgradient well. However, the Attachment C text indicates Cycle 2 samples will be collected at the AR well and at the nearest two Inland wells: one upgradient and one downgradient. Attachment C text also indicates the wells proposed to be sampled varies depending on the time of year recharge occurs. So, it is unclear to me exactly when and where source water and receiving water quality sampling is proposed. Also, Attachment C indicates baseline monitoring will begin a minimum of two weeks before the start of AR injection testing. Again, the water quality data would be most useful if sampling occurred during the time of year that recharge would occur.

Question 2: What is the proposed source water and receiving water sampling program (i.e., location, frequency, and analyte list) for the treatment system testing, baseline monitoring, and the recharge cycles?

Comment #3 - Attachment C also states the analyte list may be refined after a source water treatment system is established. Please consult with OWRD and DEQ before making any changes to the water quality analyte list.





# Oregon

Kate Brown, Governor

## Water Resources Department

North Mall Office Building

725 Summer St NE, Suite A

Salem, OR 97301

Phone (503) 986-0900

Fax (503) 986-0904

[www.wrd.state.or.us](http://www.wrd.state.or.us)

January 5, 2018

THREEMILE CANYON FARMS INC.

GREG HARRIS

75906 THREEMILE RD

BOARDMAN, OR 97818

Reference: LL-1725

We received your request on December 27, 2017 for a limited license to use 27.85 CFS up to 10,000.00 AF from COLUMBIA R a tributary of PACIFIC OCEAN for AQUIFER RECHARGE. Enclosed is a copy of your receipt #125557 in the amount of \$ 1150.00.

As required by OAR 690-340-030, a description of this license request will be included in the Department's weekly public notice. A-14 day public comment period will begin at that time. Any substantial public interest issues raised during the comment period must be addressed before your application is processed further.

At this time, a preliminary review of your application has been completed. As a result of that review the Department has concluded that your proposed water use may occur in an area that may affect the habitat of sensitive, threatened or endangered fish species. This determination is based upon information provided by Oregon Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service or the appropriate Indian tribes.

This letter will serve as your notice (required by OAR 690-33-330 (1)) that based on this preliminary determination, your proposed use may affect the habitat of sensitive, threatened or endangered fish species and the application may be conditioned or denied.

We are also required to notify an interagency review team comprised of staff from the Departments of Agriculture, Environmental Quality, Fish and Wildlife, Water Resources and other state natural resource agencies as appropriate.

The interagency review team will be convened, as needed; to review applications that the Department determines may affect sensitive, threatened or endangered fish species. The interagency review team, if possible, will attempt to condition the proposed use, if necessary, to ensure there is no loss of essential habitat as identified by ODFW.

If the interagency review team cannot condition the proposed use to ensure there is no loss of essential habitat as identified by ODFW, the interagency review team may recommend denial of the application unless it concludes that the proposed use would not harm the species.

If you need further assistance, contact Jerry Sauter in the Water Rights Section at the address listed above or phone 503.986.0817.

Enclosure

cc: File

Watermaster #21

BILL DUKE, ODFW

SMITA MEHTA, DEQ





Threemile Canyon Farms, LLC

To: Oregon Water Resources Departm ORE026

Check Number: 010131

Date: 12/21/2017

| Invoice Number   | Date       | Voucher Number    | Description             | Amount     | Discount | Paid Amount |
|------------------|------------|-------------------|-------------------------|------------|----------|-------------|
| AQUIFER RECHARGE | 12/20/2017 | 00000000000035619 | Appli Limited Water Use | \$1,150.00 | \$0.00   | \$1,150.00  |

|         |            |        |            |
|---------|------------|--------|------------|
| TOTALS: | \$1,150.00 | \$0.00 | \$1,150.00 |
|---------|------------|--------|------------|



**STATE OF OREGON  
WATER RESOURCES DEPARTMENT**

RECEIPT # **125557**

725 Summer St. N.E. Ste. A  
SALEM, OR 97301-4172  
(503) 986-0900 / (503) 986-0904 (fax)

INVOICE # \_\_\_\_\_

RECEIVED FROM:

Threemile Canyon  
Farms, LLC

BY:

APPLICATION

LL-1725

PERMIT

TRANSFER

CASH:

CHECK: #

OTHER: (IDENTIFY)

☐

☒ 01031

☐

TOTAL REC'D

\$ 1,150.00

**1083 TREASURY 4170 WRD MISC CASH ACCT**

0407

COPIES

\$

OTHER:

(IDENTIFY)

\$

0243 I/S Lease

0244 Muni Water Mgmt. Plan

0245 Cons. Water

**4270 WRD OPERATING ACCT**

MISCELLANEOUS

0407

COPY & TAPE FEES

\$

0410

RESEARCH FEES

\$

0408

MISC REVENUE: (IDENTIFY)

Limited license

\$ 1150.00

TC162

DEPOSIT LIAB. (IDENTIFY)

\$

0240

EXTENSION OF TIME

\$

WATER RIGHTS:

EXAM FEE

RECORD FEE

0201

SURFACE WATER

\$

0202

\$

0203

GROUND WATER

\$

0204

\$

0205

TRANSFER

\$

WELL CONSTRUCTION

EXAM FEE

LICENSE FEE

0218

WELL DRILL CONSTRUCTOR

\$

0219

\$

LANDOWNER'S PERMIT

0220

\$

OTHER

(IDENTIFY)

**0536 TREASURY 0437 WELL CONST. START FEE**

0211

WELL CONST START FEE

\$

CARD #

0210

MONITORING WELLS

\$

CARD #

OTHER

(IDENTIFY)

**0607 TREASURY 0467 HYDRO ACTIVITY LIC NUMBER**

0233

POWER LICENSE FEE (FWWRD)

\$

0231

HYDRO LICENSE FEE (FWWRD)

\$

HYDRO APPLICATION

\$

**TREASURY OTHER / RDX**

FUND

TITLE

OBJ. CODE

VENDOR #

DESCRIPTION

\$

RECEIPT: **125557**

DATED: 12-27-17

BY: [Signature]



Limited License Completeness Checklist  
Minimum Requirements (OAR 690-340-030) (ORS 537.143)

LL-1725

|                                           |                                   |
|-------------------------------------------|-----------------------------------|
| Received Date: <u>12-27-2017</u>          | Township: <u>4 N</u>              |
| Public Notice Date: <u>1-9-2018</u>       | Range: <u>22 E</u>                |
| Earliest Issue Date: <u>1-24-2018</u>     | Section: <u>36</u>                |
| Source: <u>Collieria River</u>            | POD Loc: <u>1000 SE</u>           |
| Amount: <u>27.85 CFS up to 10,000 gpd</u> |                                   |
| Duration: <u>ISSUE to 12-31-2028</u>      | Watermaster: <u>SUPERVISOR #5</u> |
| County: <u>MORRISON/GILLIAM</u>           | ODFW: _____                       |
| Basin: _____                              | DEQ: _____                        |

- ☒ Applicant/Organization Name, Mailing Address, Telephone Number, and Contact Person.  
*Signature in ink. Original "wet" signature required.*
- ☒ Source listed?
- ☒ If source is groundwater...are well log(s) or sufficient information for the Department to determine aquifer, well depth, well seal, open interval, etc. included? Was the intended aquifer identified? If for multiple wells, each map location shall be clearly tied to a well log.
- ☒ Proposed Use of the water....is each proposed use identified?
- ☒ If source is stored water.... Is there a contract for delivery of stored water. Must have a copy
- ☒ If use is supplemental...is the primary water right listed?
- ☒ Amount of water from each source listed in GPM, CFS or AF?
- ☒ Acreage being proposed, if applicable.
- ☒ Duration of Limited License being requested by applicant.
- ☒ Project schedule... Date when water use will start and date when water use will be completed
- ☒ Is the application signed in ink by the applicant(s) or by the authorized agent with title or authority if an organization or corporation?
- ☒ Water Master Report... Is the local Water Masters report on water availability included?
- ☒ Land Use Form... Is the Land Use Form completed by local planning officials included?  
*Signature must be within the last 12 months. Signature must be an original "wet" signature.*

CONTINUED ON BACK



☒ Does the map meet requirements of OAR 690-340-030? If map is larger than 11 x 17, four copies must be submitted.

☒ Township, Range, Section

☒ Reference corner on map

☒ Scale of the Map, not less than  
2" = 1 mile

☒ Other topographical features such  
as roads, streams, railroads, etc, which  
may be helpful in locating the diversion  
points in the field.

☒ Location of each diversion point,  
well or dam

☒ Each POD coordinate by reference  
to a recognized public land survey  
corner

☐ Fees enclosed?

Base Fee

Water Amount

\$280.00 including the first point of diversion

\$30.00 for each additional point of diversion

1150<sup>00</sup>  
+  
\_\_\_\_\_  
\_\_\_\_\_

total fee

FEE PAID

- 1150<sup>00</sup>

STILL OWED

0

Completeness Check by: JK

Date: 1/2/2018

S:\groups\wr\Customer Service Group\templates\limited-license-checklist 2/5/2015 JKS



## **2021 Annual Report**

Inland Area Aquifer Recharge Project  
OWRD Limited License No. LL-1725  
Boardman, Oregon

*for*

**Oregon Water Resources Department**

*on behalf of*

**Threemile Canyon Farms, LLC**

February 14, 2022



**2021 Annual Report**

Inland Area Aquifer Recharge Project  
OWRD Limited License No. LL-1725  
Boardman, Oregon

*for*

**Oregon Water Resources Department**

*on behalf of*

**Threemile Canyon Farms, LLC**

February 14, 2022

**GEOENGINEERS** 

8019 West Quinault Avenue, Suite 201  
Kennewick, Washington 99336



**2021 Annual Report**  
**Inland Area Aquifer Recharge Project**  
**OWRD Limited License No. LL-1725**  
**Boardman, Oregon**

File No. 23415-001-01

February 14, 2022

Prepared for:

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

Attention: Jen Woody

Prepared on Behalf of:

Threemile Canyon Farms LLC  
75906 Threemile Road  
Boardman, Oregon 97818

Prepared by:

GeoEngineers, Inc.  
8019 West Quinault Avenue, Suite 201  
Kennewick, Washington 99336



*expires: 2/1/2023*

A handwritten signature of Jonathon S. Travis in black ink.

Jonathon S. Travis, RG  
Geologist

A handwritten signature of Kevin A. Lindsey in black ink.

Kevin A. Lindsey, PhD, LHG, PG  
Principal

JST:KAL:mis

Disclaimer: Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

## Table of Contents

|                                                              |          |
|--------------------------------------------------------------|----------|
| <b>1.0 INTRODUCTION</b>                                      | <b>1</b> |
| <b>2.0 2021 ACTIVITY</b>                                     | <b>1</b> |
| <b>3.0 2021 WATER QUALITY SAMPLING SITES</b>                 | <b>2</b> |
| 3.1. 2021 Sampling Sites                                     | 2        |
| <b>4.0 WATER LEVEL DATA</b>                                  | <b>3</b> |
| <b>5.0 2021 WATER QUALITY DATA</b>                           | <b>3</b> |
| 5.1. Untreated Source Water                                  | 3        |
| 5.2. Native Groundwater Quality                              | 4        |
| <b>6.0 SUMMARY OF FIELD PILOT FILTRATION TESTING RESULTS</b> | <b>4</b> |
| <b>7.0 AQUIFER TESTING</b>                                   | <b>5</b> |
| <b>8.0 SUMMARY AND 2021 RECOMMENDATIONS</b>                  | <b>5</b> |
| <b>9.0 LIMITATIONS</b>                                       | <b>6</b> |

### LIST OF TABLES

Table 1. Inland AR Analyte List

Table 2a. Water Quality Samples—April 15, 2021

Table 2b. Water Quality Samples—May 26 and 27, 2021

Table 3. Inland Wells Biannual Static Water Level Measurements

### LIST OF FIGURES

Figure 1. Location Map

Figure 2. Inland Wells Hydrograph 2020–2021

### APPENDICES

#### Appendix A. Water Quality Tables 2018–2020

Table A-1—Water Quality Samples—April 10, 2018

Table A-2—Water Quality Samples—September 20, 2018

Table A-3—Water Quality Samples—October 29, 2018

Table A-4—Water Quality Samples—April 30, 2019

Table A-5—Water Quality Samples—June 6, 2019

Table A-6—Water Quality Samples—September 17, 2019

Table A-7—Water Quality Samples—October 23, 2019

Table A-8—Water Quality Samples—April 6, 2020

Table A-9—Water Quality Samples—May 18, 2020



## 1.0 INTRODUCTION

Threemile Canyon Farms, LLC (TMCF) owns and operates approximately 40,000 acres of irrigated farmland near Boardman, Oregon (Figure 1, Location Map). TMCF irrigation relies primarily on water diverted from the Columbia River; however, the TMCF Inland Area relies heavily on the basalt aquifer system. The Inland Area portion of TMCF lies on the east side of the TMCF, generally 3 to 6 miles west-southwest of Boardman, Oregon (Figure 1). TMCF is exploring the feasibility of using aquifer recharge (AR) to stabilize declining water levels in the basalt aquifer system supplying the five Inland Area irrigation water supply wells. TMCF refers to this project as the Inland AR Project.

The proposed Inland AR Project is described in supporting documents accompanying the Limited License (LL) application to test AR feasibility submitted to the Oregon Water Resources Department (OWRD) on December 27, 2017. OWRD issued LL-1725 to TMCF on April 3, 2018. Project testing and reporting elements described in LL-1725 are based on OWRD and Oregon Department of Environmental Quality (ODEQ) requirements and project-specific data needs described in the application. LL-1725 Order Item 6 requires annual reports describing activities conducted during the preceding calendar year. This document, the third annual report submitted in accordance with LL-1725, is for calendar year 2021.

Work completed in 2021 focused on evaluation of potential source water, native groundwater quality, field pilot treatment testing, and aquifer testing. Water quality samples were collected from on-farm water supply infrastructure and from Inland Area wells. This report describes:

- Work completed in 2021 under LL-1725.
- Water quality sampling sites and associated infrastructure.
- Recently collected water level and water quality data.
- A summary of field pilot treatment testing results. Details of this work will be provided in a report prepared by Carollo Engineers, Inc. (Carollo).
- A summary of aquifer testing work. Detailed information about this testing is provided in a separate report prepared by GeoEngineers, Inc. and Northwest Groundwater Services, LLC.
- Recommendations for possible 2022 work.

This report presents the data collected in 2021 and was prepared for TMCF's submittal to OWRD by GeoEngineers, Inc.

## 2.0 2021 ACTIVITY

Attachment C of the Inland AR LL Application describes the Pilot Test Work Plan (PTWP) for the Inland AR Project. As described in the PTWP the first testing work to be completed for the Inland AR Project focuses on water quality sampling and analysis of water treatment systems. Field pilot treatment testing was performed throughout most of September and October 2021. Findings pertaining to possible treatment options are summarized later in this report and described in more detail in Carollo (2922).



Sample collection timing was again influenced by the timing of the irrigation system startup. In 2021 the irrigation system began operating in late March, resulting in spring sampling events occurring in April and May, after the system had been flushed and was operating at normal capacity. The 2021 water sampling was as follows:

- Untreated water samples were collected in April and May 2021 from the Inland Booster pump.
- Untreated water was collected from the Willow Creek pump booster station in April and May 2021.
- A native groundwater sample was collected from Inland Well 2 in May 2021.

Locations for these sites and other TCMF features, including all Inland production wells and the Inland observation well, are shown in Figure 1, Location Map, and the sampling results are described in more detail later in this annual report. Table 1, Inland AR Analyte List, lists the analytical program expected to be used as the AR project moves forward. Data collected during these sampling events is provided in Tables 2a and 2b, Water Quality Samples.

### 3.0 2021 WATER QUALITY SAMPLING SITES

The 2021 sampling program focused on the Inland Booster pump, Willow Creek pump booster station, and Inland Well 2. Previous sampling under the LL in 2018 through 2020 was done at the Willow Creek pump station, Sixmile Filter, Inland Booster pump, and Inland Well 5. This data is included in Appendix A, Water Quality Tables 2018–2020. Prior to issuance of the LL, data was collected from several other locations including the Dairy Well 5 filter site and Inland Wells 1, 2, and 3. This data was previously reported in the 2018 annual report and in the LL application. The remainder of Section 3.0 focuses on 2021 sampling.

#### 3.1. 2021 Sampling Sites

Inland Well 2, the Inland booster pump, and the Willow Creek pump booster station sampling is described below.

**Inland Well 2** was sampled in May 2021 because it was the only operating Inland Area well at that time, being pumped for the aquifer testing effort. Water samples were collected from this well at a sampling port installed on the discharge pipe at the wellhead. Water samples from this well—coupled with the historical data and previous LL data from Inland Wells 1, 2, 3, and 5—are being used to build a representative picture of native, pre-AR background groundwater conditions.

The **Inland Booster pump** was sampled because it is located on the main water line feeding the Inland Area from the Willow Creek pump station and there is easy access for collecting water samples. Samples collected from this site would be representative of unfiltered/untreated source water that would be delivered to any future treatment site for AR in the Inland Area. The site consists of five booster pumps on the Inland Area main water delivery line that are used to maintain pressure in the Inland Area irrigation system. The middle booster pump pipeline downstream of the middle pump was sampled via an existing sampling port.

TCMF diverts water from the Columbia River for irrigation at the **Willow Creek pump booster station**. The pump station consists of a series of large pumps that are used to maintain pressure in the main farm irrigation system. These pumps deliver water to the main farm and the Inland Area. Sampling at this location



was done to determine what effect the length of pipeline between the source and the Inland area may have on water quality. Samples were taken from an existing port on the eastern most portion of the pump station.

#### **4.0 WATER LEVEL DATA**

Groundwater levels have been measured in the Inland wells since they first went on-line in 2013. Measurements have been collected using digital data recording pressure transducers and twice a year, before and after the irrigation season, they are collected manually. Transducer data for 2021 was complete for all wells except Well 3. Between March and October the transducer in Well 3 malfunctioned and did not record data. The data for 2021 is transferred in the attached data package. Available transducer data for previous years for the inland wells (Wells 1, 2, 3, 4, and 5) was transferred with previous annual reports.

A hydrograph illustrating 2020 through 2021 water levels in the Inland production wells and the Inland Observation Well is shown in Figure 2, Inland Wells Hydrograph 2020–2021. This hydrograph illustrates the typical seasonal fluctuation in groundwater levels seen before, during, and after each irrigation season. The seasonal dynamic drawdown of approximately 80 to 90 feet seen on these hydrographs is typical of the aquifer response to Inland pumping. Table 3, Inland Wells Biannual Static Water Level Measurements—reproduced from biannual water levels reported to OWRD—shows the extent of static water level changes since the beginning of Inland Area irrigation operations.

#### **5.0 2021 WATER QUALITY DATA**

Water samples were collected at the locations noted above per Attachment C (AR Pilot Testing Program) and Attachment F (Inland AR Project QAPP) of the limited license application. Samples, packing lists, and chain-of-custody were submitted to Anatek Labs. The results of laboratory analysis and field parameter measurements collected under LL-1725 for 2021 are listed on Tables 2a and 2b and in Appendix A. These tables are organized by sampling date to show how the results for each location compared to each other in that sampling event. Note, groundwater samples were collected from Well 2 once in May 2021. These results are included in each table for comparing surface water (potential source water) to native groundwater.

The following discussions provide general highlights and observations pertaining to potential source water and native groundwater.

##### **5.1. Untreated Source Water**

Untreated/unfiltered potential source water analytical results to-date show very few exceedances of Oregon water quality standards. The 2021 exceedances noted include:

- Inorganic chemicals: Of these only iron has been detected above its maximum contaminant level (MCL), which is 0.3 mg/L, in the April source water sample. Manganese was detected at just over half its MCL of 0.5 mg/L also in the April sample. Both were well below the MCL in the May sample.
- Turbidity: Turbidity was above the MCL of 1 NTU in both May source water samples.
- Microbial constituents reported as total coliforms, fecal coliforms, and E. coli: These analytes are present in all 2021 source water samples.



Notable non detects include:

- Volatile Organic Compounds (VOCs)
- Synthetic organic compounds (SOCs)

These observations from April 2021 water quality are consistent with historical data previously reported. It is a deviation from the historical data for iron and manganese to be below half of their MCL in May.

## **5.2. Native Groundwater Quality**

One native groundwater quality sample was collected from Inland Well 2 May 2020. Inland wells were not sampled during other sampling events because they were not operating during those events. With respect to aquifer water quality, based on that sample:

- Inorganic chemicals: None of these analytes have been detected above their individual regulatory limit.
- Turbidity: Turbidity not detected.
- Volatile Organic Compounds (VOCs): None of these analytes have been detected to-date.
- Synthetic organic compounds (SOCs): None of these analytes have been detected to-date.
- Unregulated SOC: None of these analytes have been detected to-date.
- Radiologicals: Gross alpha and gross beta were detected in this sample. Of the radiological detections in Inland Well 2 none of them exceed regulatory limits.

These observations from 2021 water quality are consistent with historical data previously reported.

## **6.0 SUMMARY OF FIELD PILOT FILTRATION TESTING RESULTS**

One of the primary goals the project team set for 2021 was to scale up source water treatment testing. Several constituents in the potential surface water source were identified as requiring treatment to reduce values below 50 percent of the MCL. These included:

- Iron, manganese, turbidity, color (potentially) were identified as exceeding desired values in at least some portions of the samples. Treatment for these constituents would include coagulation and filtration.
- Total Coliform and E.coli were identified in source water samples. Application of chlorine has been effective at achieving removal in water used for dairies on site. However, chlorination of the natural organic compounds in the surface water results in disinfection by product (DBP) formation, including total trihalomethane (TTHM) concentrations exceeding 50 percent of the MCL.

Carollo team members led on-site pilot scale treatability studies in September and October 2021 near Well 5. Testing was done by feeding Inland irrigation water into a skid-mounted pilot filtration system with two filters. Each filter could be tested simultaneously with different filter media. A coagulant and sodium hypochlorite was injected pre-filter. For coagulation, two chemicals were tested individually, Ferric Sulfate and Alum. Water then passed through the two filters and was captured in effluent tanks for testing. Findings included the following:



- Alum does not increase iron concentration in the effluent water like Ferric Sulfate does and is the coagulant of choice for this application.
- Coagulation with Alum, chlorination, and filtration were sufficient to meet project water quality goals.

Details of the testing and analysis are described in an independent report currently being prepared by Carollo.

## **7.0 AQUIFER TESTING**

A 72-hour pumping test was performed at Inland Well No. 2 in May 2021. The test was done to characterize aquifer transmissivity, storativity, and evaluate the presence of negative aquifer boundaries. It was performed with the existing Inland infrastructure. Pumped water was distributed through the existing irrigation system. Transmissivity estimates ranged from 11.96 to 35.53 ft<sup>2</sup>/min, with a value of 14.23 ft<sup>2</sup>/min being used in future work. A flow limiting boundary is suggested by the data collected in this test.

The test provides good evaluation of the transmissivity and storativity of the aquifer and confirms a negative boundary influences hydraulic response. These results will support development of the conceptual hydrogeologic model and allow good simulation of hydraulic response to recharge in the project area. The primary uncertainty that remains is with respect to the observed declining water levels that result from annual irrigation withdrawals. This test did not identify boundary conditions that result in a negative change in storage at this scale of the seasonal withdrawals. This is likely because the volume of water extracted from the aquifer during the test was not significant relative to the size of the aquifer and seasonal pumping. A detailed test report accompanies this report under a separate cover.

## **8.0 SUMMARY AND 2021 RECOMMENDATIONS**

Generally, water sampled to-date within the irrigation water system (the potential source water) contains constituents at concentrations less than the groundwater quality regulatory limits. The one exception is iron. Several other surface water constituents have been reported at one time or another to be at higher concentrations than groundwater.

The field pilot treatment study in September and October 2021 was able to reduce constituents that typically have been elevated to concentrations below groundwater quality regulatory limits. It was able to display that coagulation with Alum, chlorination, and filtration were sufficient to meet project water quality goals.

The 2021 aquifer testing was successful in producing transmissivity and storativity values for the Inland aquifer system. The scale of the test was not sufficient to assess the boundary conditions that are causing annual water level declines.

TMCF is planning to continue the Inland AR Project into 2022. In 2022 the project will focus on: (1) costing full-scale field pilot testing of treatment; (2) determining wider boundary conditions using pumped volume and water level decline in Inland Wells; and (3) meeting with OWRD and ODEQ about the future viability of the Inland AR effort, potentially setting the stage for injection testing in 2023.



We propose to meet with OWRD and ODEQ staff as early as practicable in 2022 to discuss our 2023 testing plans data collection objectives.

## **9.0 LIMITATIONS**

We have prepared this report for TCMF for the Inland AR project in Boardman, Oregon, TCMF may distribute copies of this report to its authorized agents and regulatory agencies as may be required for the Project.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices for environmental science practices in this area at the time this report was prepared. The conclusions, recommendations, and opinions presented in this report are based on our professional knowledge, judgment experience, and discrete sample collection. Contaminants may be present in areas of the site not sampled or tested. No warranty, express or implied, applies to the services or this report.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments should be considered a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.







**Table 1**  
Inland AR Analyte List  
Threemilie Canyon Farms  
Boardman, Oregon

| Analyte                                    | OHA Drinking Water Standards     | DEQ Groundwater Standards |
|--------------------------------------------|----------------------------------|---------------------------|
| <b>INORGANIC CHEMICALS (IOCs)</b>          |                                  |                           |
| Alkalinity (as CaCO <sub>3</sub> ) (mg/L)  |                                  |                           |
| Aluminum (total) (mg/L)                    | 0.05-0.2 (SMCL)                  |                           |
| Antimony (total) (mg/L)                    | 0.006 (MCL)                      |                           |
| Arsenic (total) (mg/L)                     | 0.010 (MCL)                      | 0.050 (DEQ MML)           |
| Barium (total) (mg/L)                      | 2 (MCL)                          | 1 (DEQ MML)               |
| Bicarbonate (as CaCO <sub>3</sub> ) (mg/L) |                                  |                           |
| Beryllium (total) (mg/L)                   | 0.004 (MCL)                      |                           |
| Cadmium (total) (mg/L)                     | 0.005 (MCL)                      | 0.01 (DEQ MML)            |
| Calcium (total) (mg/L)                     |                                  |                           |
| Carbonate (as CaCO <sub>3</sub> ) (mg/L)   |                                  |                           |
| Chloramine (mg/L)                          |                                  |                           |
| Chloride (total) (mg/L)                    | 250 (SMCL)                       | 250 (DEQ MML)             |
| Chromium (total) (mg/L)                    | 0.1 (MCL)                        | 0.05 (DEQ MML)            |
| Copper (total) (mg/L)                      | 1.3 (Action Level)<br>(1.0 SMCL) | 1.0 (DEQ MML)             |
| Cyanide (total) (mg/L)                     | 0.2 (MCL)                        |                           |
| Fluoride (total) (mg/L)                    | 4 (MCL), 2.0 (SMCL)              | 4 (DEQ MML)               |
| Hardness (as CaCO <sub>3</sub> ) (mg/L)    | 250 (SMCL)                       |                           |
| Iron (total) (mg/L)                        | 0.3 (SMCL)                       | 0.3 (DEQ MML)             |
| Lead (total) (mg/L)                        | 0.015 (MCL)                      | 0.05 (DEQ MML)            |
| Magnesium (total) (mg/L)                   |                                  |                           |
| Manganese (total) (mg/L)                   | 0.05 (SMCL)                      | 0.05 (DEQ MML)            |
| Mercury (total inorganic) (mg/L)           | 0.002 (MCL)                      | 0.002 (DEQ MML)           |
| Nickel (total) (mg/L)                      | 0.1**                            |                           |
| Nitrate (as N) (mg/L)                      | 10 (MCL)                         | 10 (DEQ MML)              |
| Nitrite (mg/L)                             | 1 (MCL)                          |                           |
| Nitrate+Nitrite (total N) (mg/L)           | 10 (MCL)                         |                           |
| Perchlorate (ug/L)                         |                                  |                           |
| Phosphate (mg/L)                           |                                  |                           |
| Phosphorus (total) (mg/L)                  |                                  |                           |
| Potassium (mg/L)                           |                                  |                           |
| Selenium (total) (mg/L)                    | 0.05 (MCL)                       | 0.01 (DEQ MML)            |
| Silica (mg/L)                              |                                  |                           |
| Silicon (mg/L)                             |                                  |                           |
| Silver (total) (mg/L)                      | 0.1 (SMCL)                       | 0.05 (DEQ MML)            |
| Sodium (mg/L)                              |                                  |                           |
| Sulfate (mg/L)                             | 250 (SMCL)                       | 250 (DEQ MML)             |
| Sulfide (mg/L)                             |                                  |                           |
| Thallium (mg/L)                            | 0.002 (MCL)                      |                           |
| Uranium (mg/L)                             |                                  |                           |
| Zinc (total) (mg/L)                        | 5 (SMCL)                         | 5 (DEQ MML)               |



| Analyte                                                             | OHA Drinking Water Standards                 | DEQ Groundwater Standards |
|---------------------------------------------------------------------|----------------------------------------------|---------------------------|
| <b>MISCELLANEOUS</b>                                                |                                              |                           |
| Color ( <i>color units</i> )                                        | 15 (SMCL)                                    | 15 (DEQ MML)              |
| Corrosivity <sup>†</sup> ( <i>S.U.</i> )                            | NON-CORROSIVE                                |                           |
| Foaming Agents (MBAS); ( <i>mg/L</i> )                              | 0.5 (SMCL)                                   | 0.5 (DEQ MML)             |
| Odor ( <i>T.O.N.</i> )                                              | 3 TON (SMCL)                                 | 3 TON (DEQ MML)           |
| Total Dissolved Solids ( <i>mg/L</i> )                              | 500 (MCL)                                    | 500 (DEQ MML)             |
| Total Organic Carbon ( <i>mg/L</i> )                                |                                              |                           |
| Total Suspended Solids ( <i>mg/L</i> )                              |                                              |                           |
| <b>VOLATILE ORGANIC COMPOUNDS (VOCs)</b>                            |                                              |                           |
| 1,1-Dichloroethylene ( <i>ug/L</i> )                                | 7 (MCL)                                      | 7 (DEQ MML)               |
| 1,1,1-Trichloroethane ( <i>ug/L</i> )                               | 200 (MCL)                                    | 200 (DEQ MML)             |
| 1,2-Dichloroethane ( <i>ug/L</i> )                                  | 5 (MCL)                                      | 5 (DEQ MML)               |
| Benzene ( <i>ug/L</i> )                                             | 5 (MCL)                                      | 5 (DEQ MML)               |
| Carbon tetrachloride ( <i>ug/L</i> )                                | 5 (MCL)                                      | 5 (DEQ MML)               |
| Dacthal ( <i>ug/L</i> )                                             |                                              |                           |
| p-Dichlorobenzene (1,4-) ( <i>ug/L</i> )                            | 75 (MCL)                                     | 75 (DEQ MML)              |
| Trichloroethylene (TCE) ( <i>ug/L</i> )                             | 5 (MCL)                                      | 5 (DEQ MML)               |
| Vinyl chloride ( <i>ug/L</i> )                                      | 2 (MCL)                                      | 2 (DEQ MML)               |
| <b>DISINFECTION BY-PRODUCTS (DBPs) &amp; RESIDUAL DISINFECTANTS</b> |                                              |                           |
| Total Trihalomethanes (TTHM) ( <i>ug/L</i> )                        | 80 (MCL)                                     | 10 (DEQ MML)              |
| <b>MICROBIAL</b>                                                    |                                              |                           |
| Total Coliforms ( <i>cell count per 100 mL</i> )                    | < 5% positive                                | <1/100mL                  |
| Fecal Coliforms ( <i>cell count per 100 mL</i> )                    | Confirmed presence                           | Confirmed presence        |
| E. Coli ( <i>cell count per 100 mL</i> )                            | Confirmed presence                           | Confirmed presence        |
| <b>SYNTHETIC ORGANIC COMPOUNDS (SOCs)</b>                           |                                              |                           |
| 2,4-D ( <i>ug/L</i> )                                               | 7 (MCL)                                      | 10 (DEQ MML)              |
| 2,4,5-TP (Silvex) ( <i>ug/L</i> )                                   | 5 (MCL)                                      | 10 (DEQ MML)              |
| Endrin ( <i>ug/L</i> )                                              | 2 (MCL)                                      | 0.2 (DEQ MML)             |
| Lindane (BHC-gamma) ( <i>mg/L</i> )                                 | 0.0002 (MCL)                                 | 0.004 (DEQ MML)           |
| Methoxychlor ( <i>mg/L</i> )                                        | 0.04 (MCL)                                   | 0.100 (DEQ MML)           |
| Toxaphene ( <i>ug/L</i> )                                           | 3 (MCL)                                      | 0.005 (DEQ MML)           |
| <b>RADIOLOGICALS</b>                                                |                                              |                           |
| Gross Alpha ( <i>pCi/L</i> )                                        | 15 (MCL)                                     | 15 (DEQ MML)              |
| Gross Beta ( <i>pCi/L</i> )                                         | 4 mrem/year (official)<br>50 pCi/L (trigger) | 50 pCi/L (DEQ MML)        |



**Table 2a**  
**Water Quality Samples-April 15, 2021**  
 Threemile Canyon Farms  
 Boardman, Oregon

| Analyte                                    | MRL    | Oregon DEQ Standards | WC PUMP <sup>1</sup>   | INLAND BOOSTER | INLAND WELL 2 |
|--------------------------------------------|--------|----------------------|------------------------|----------------|---------------|
|                                            |        |                      | Sample Date: 4/16/2020 | 4/16/2020      | 5/20/2021     |
|                                            |        |                      | Lab ID: MDB0462-03     | MDB0462-01     | MBE0583-01    |
| Analyte                                    | MRL    | Oregon DEQ Standards | Result                 | Result         | Result        |
| <b>INORGANIC CHEMICALS (IOCs)</b>          |        |                      |                        |                |               |
| <b>FORMULA</b>                             |        |                      |                        |                |               |
| Alkalinity (as CaCO <sub>3</sub> ) (mg/L)  | 5      |                      | 89                     | 84             | 180           |
| Aluminum (total) (mg/L)                    | 0.01   |                      | 0.378                  | 0.302          | ND            |
| Antimony (total) (mg/L)                    | 0.001  |                      | ND                     | ND             | ND            |
| Arsenic (total) (mg/L)                     | 0.001  | 0.050 (DEQ MML)      | 0.00139                | 0.00108        | ND            |
| Barium (total) (mg/L)                      | 0.001  | 1 (DEQ MML)          | 0.0326                 | 0.0315         | 0.0263        |
| Bicarbonate (as CaCO <sub>3</sub> ) (mg/L) | 5      |                      | 89                     | 84             | 176           |
| Beryllium (total) (mg/L)                   | 0.001  |                      | ND                     | ND             | ND            |
| Cadmium (total) (mg/L)                     | 0.001  | 0.01 (DEQ MML)       | ND                     | ND             | ND            |
| Calcium (total) (mg/L)                     | 0.1    |                      | 23.1                   | 23.1           | 7.6           |
| Carbonate (as CaCO <sub>3</sub> ) (mg/L)   | 5      |                      | ND                     | ND             | ND            |
| Chloramine (mg/L)                          |        |                      | ND                     | 0.0831         | ND            |
| Chloride (total) (mg/L)                    | 0.1    | 250 (DEQ MML)        | 6.59                   | 6.39           | 32.1          |
| Chromium (total) (mg/L)                    | 0.001  | 0.05 (DEQ MML)       | ND                     | ND             | ND            |
| Copper (total) (mg/L)                      | 0.0    | 1.0 (DEQ MML)        | 0.00146                | 0.00152        | 0.00144       |
| Cyanide (total) (mg/L)                     | NR     |                      | ND                     | ND             | ND            |
| Fluoride (total) (mg/L)                    | 0.1    | 4 (DEQ MML)          | 0.165                  | 0.159          | 1.63          |
| Hardness (as CaCO <sub>3</sub> ) (mg/L)    | 10     |                      | 88.6                   | 88             | 27.5          |
| Iron (total) (mg/L)                        | 0.01   | 0.3 (DEQ MML)        | 0.465                  | 0.37           | 0.0243        |
| Lead (total) (mg/L)                        | 0.001  | 0.05 (DEQ MML)       | ND                     | ND             | ND            |
| Magnesium (total) (mg/L)                   | 0.1    |                      | 7.52                   | 7.53           | 2.06          |
| Manganese (total) (mg/L)                   | 0.001  | 0.05 (DEQ MML)       | 0.0376                 | 0.0271         | 0.00848       |
| Mercury (total inorganic) (mg/L)           | 0.0001 | 0.002 (DEQ MML)      | ND                     | ND             | ND            |
| Nickel (total) (mg/L)                      | 0.001  |                      | ND                     | ND             | ND            |
| Nitrate (as N) (mg/L)                      | 0.1    | 10 (DEQ MML)         | 0.55                   | 0.537          | ND            |
| Nitrite (mg/L)                             | 0.1    |                      | ND                     | ND             | ND            |
| Nitrate+Nitrite (total N) (mg/L)           | 0.1    |                      | 0.55                   | 0.537          | ND            |
| Perchlorate (ug/L)                         |        |                      | 0.16                   | 0.187          | ND            |
| Phosphate (mg/L)                           | NA     |                      | ND                     | ND             | ND            |
| Phosphorus (total) (mg/L)                  | NA     |                      | 0.0616                 | 0.0396         | 0.0322        |
| Potassium (mg/L)                           | 0.1    |                      | 1.98                   | 1.98           | 13.8          |
| Selenium (total) (mg/L)                    | 0.00   | 0.01 (DEQ MML)       | ND                     | ND             | 0.00112       |
| Silica (mg/L)                              | 0.1    |                      | 14.3                   | 14             | 64.9          |
| Silicon (mg/L)                             | NR     |                      | 6.68                   | 6.56           | 30.3          |
| Silver (total) (mg/L)                      | 0.0    | 0.05 (DEQ MML)       | ND                     | ND             | ND            |
| Sodium (mg/L)                              | 0.1    |                      | 11.8                   | 11.6           | 90.2          |
| Sulfate (mg/L)                             | 0.1    | 250 (DEQ MML)        | 16.4                   | 16.1           | 0.92          |
| Sulfide (mg/L)                             |        |                      | ND                     | ND             | ND            |
| Thallium (mg/L)                            | 0.001  |                      | ND                     | ND             | ND            |
| Uranium (mg/L)                             |        |                      | 0.00158                | 0.0015         | ND            |
| Zinc (total) (mg/L)                        | 0.001  | 5 (DEQ MML)          | 0.00244                | 0.00216        | ND            |
| <b>FIELD PARAMETERS</b>                    |        |                      |                        |                |               |
| pH (pH units)                              | NA     | 6.5-8.5 (DEQ MML)    | 6.64                   | 6.95           | 9.18          |
| Specific Conductance (mS/cm)               | NA     |                      | 0.292                  | 0.281          | 0.601         |
| Turbidity (NTUs)                           | NA     | 1 (DEQ MML)          | 13                     | 15             | 4             |
| Temperature (°F)                           | NA     |                      | 44.27                  | 44.17          | 71.23         |
| Dissolved Oxygen (mg/L)                    | NA     |                      | 11.97                  | 11.64          | 0.15          |
| Oxidation-reduction potential (mV)         | NA     |                      | 140.1                  | 124.2          | 164           |
| <b>MISCELLANEOUS</b>                       |        |                      |                        |                |               |
| Color (color units)                        |        | 15 (DEQ MML)         | 15                     | 10             | ND            |
| Corrosivity <sup>1</sup> (S.U.)            |        |                      | -0.215                 | -0.462         | -0.0966       |
| Foaming Agents (MBAS) (mg/L)               |        | 0.5 (DEQ MML)        | ND                     | ND             | ND            |
| Odor (T.O.N.)                              |        | 3 TON (DEQ MML)      | ND                     | ND             | 4             |
| Total Dissolved Solids (mg/L)              | 10     | 500 (DEQ MML)        | 143                    | 154            | 321           |
| Total Organic Carbon (mg/L)                | 0.5    |                      | 1.94                   | 1.94           | 0.234         |
| Total Suspended Solids (mg/L)              | 1      |                      | 12.3                   | 8.35           | ND            |



| Analyte                                                             |              |                      |                      |                |               |
|---------------------------------------------------------------------|--------------|----------------------|----------------------|----------------|---------------|
|                                                                     |              |                      | WC PUMP <sup>1</sup> | INLAND BOOSTER | INLAND WELL 2 |
|                                                                     | Sample Date: |                      | 4/16/2020            | 4/16/2020      | 5/20/2021     |
|                                                                     | Lab ID:      |                      | MDB0462-03           | MDB0462-01     | MBE0583-01    |
|                                                                     | MRL          | Oregon DEQ Standards | Result               | Result         | Result        |
| <b>VOLATILE ORGANIC COMPOUNDS (VOCs)</b>                            |              |                      |                      |                |               |
| 1,1-Dichloroethylene (ug/L)                                         | 0.5          | 7 (DEQ MML)          | ND                   | ND             | ND            |
| 1,1,1-Trichloroethane (ug/L)                                        | 0.5          | 200 (DEQ MML)        | ND                   | ND             | ND            |
| 1,2-Dichloroethane (ug/L)                                           | 0.5          | 5 (DEQ MML)          | ND                   | ND             | ND            |
| Benzene (ug/L)                                                      | 0.5          | 5 (DEQ MML)          | ND                   | ND             | ND            |
| Carbon tetrachloride (ug/L)                                         | 0.5          | 5 (DEQ MML)          | ND                   | ND             | ND            |
| p-Dichlorobenzene (1,4-) (ug/L)                                     | 0.5          | 75 (DEQ MML)         | ND                   | ND             | ND            |
| Trichloroethylene (TCE) (ug/L)                                      | 0.5          | 5 (DEQ MML)          | ND                   | ND             | ND            |
| Vinyl chloride (ug/L)                                               | 0.5          | 2 (DEQ MML)          | ND                   | ND             | ND            |
| <b>DISINFECTION BY-PRODUCTS (DBPs) &amp; RESIDUAL DISINFECTANTS</b> |              |                      |                      |                |               |
| Total Trihalomethanes (TTHM) (ug/L)                                 | 0.5          | 10 (DEQ MML)         |                      |                |               |
| <b>MICROBIAL</b>                                                    |              |                      |                      |                |               |
| Total Coliforms (cell count per 100 mL)                             |              | <1/100mL             | 143                  | 113            | ND            |
| Fecal Coliforms (cell count per 100 mL)                             |              | Confirmed presence   | 13                   | 9.8            | <1.8          |
| E. Coli (cell count per 100 mL)                                     |              | Confirmed presence   | 7.4                  | 4.5            | ND            |
| <b>SYNTHETIC ORGANIC COMPOUNDS (SOCs)</b>                           |              |                      |                      |                |               |
| 2,4-D (ug/L)                                                        | 0.1          | 10 (DEQ MML)         | ND                   | ND             | ND            |
| 2,4,5-TP (Silvex) (ug/L)                                            |              | 10 (DEQ MML)         | ND                   | ND             | ND            |
| Dacthal (ug/L)                                                      |              |                      |                      |                | ND            |
| Endrin (ug/L)                                                       | 0.02         | 0.2 (DEQ MML)        | ND                   | ND             | ND            |
| Lindane (BHC-gamma) (mg/L)                                          |              | 0.004 (DEQ MML)      | ND                   | ND             | ND            |
| Methoxychlor (mg/L)                                                 |              | 0.100 (DEQ MML)      | ND                   | ND             | ND            |
| Toxaphene (ug/L)                                                    | 2            | 0.005 (DEQ MML)      | ND                   | ND             | ND            |
| <b>RADIOLOGICALS</b>                                                |              |                      |                      |                |               |
| Gross Alpha (pCi/L)                                                 |              | 15 (DEQ MML)         | <3.00+/-0.41         | <3.00+/-0.482  | <3.0+/-0.368  |
| Gross Beta (pCi/L)                                                  |              | 50 pCi/L (DEQ MML)   | <4.00+/-0.462        | <4.00+/-0.42   | 8.94+/-0.82   |

**Notes:**

Result is over DEQ MML

Result is over 1/2 DEQ MML

†: Corrosivity analysis by Langelier Index

1: WC Pump = Willow Creek Pump Station



**Table 2b**  
**Water Quality Samples—May 26,27, 2021**  
 Threemile Canyon Farms  
 Boardman, Oregon

| Analyte                                    |              |                      | WC PUMP <sup>1</sup> | INLAND BOOSTER | INLAND WELL 2 |
|--------------------------------------------|--------------|----------------------|----------------------|----------------|---------------|
|                                            | Sample Date: |                      | 5/26/2021            | 5/27/2021      | 5/20/2021     |
|                                            | Lab ID:      |                      | MAE0524-01           | MAE0524-02     | MBE0583-01    |
|                                            | MRL          | Oregon DEQ Standards | Result               | Result         | Result        |
| <b>INORGANIC CHEMICALS (IOCs)</b>          |              |                      |                      |                |               |
| <b>FORMULA</b>                             |              |                      |                      |                |               |
| Alkalinity (as CaCO <sub>3</sub> ) (mg/L)  | 5            |                      | 56                   | 56             | 180           |
| Aluminum (total) (mg/L)                    | 0.01         |                      | 0.0872               | 0.0982         | ND            |
| Antimony (total) (mg/L)                    | 0.001        |                      | ND                   | ND             | ND            |
| Arsenic (total) (mg/L)                     | 0.001        | 0.050 (DEQ MML)      | ND                   | 0.00114        | ND            |
| Barium (total) (mg/L)                      | 0.001        | 1 (DEQ MML)          | 0.0247               | 0.0251         | 0.0263        |
| Bicarbonate (as CaCO <sub>3</sub> ) (mg/L) | 5            |                      | 56                   | 56             | 176           |
| Beryllium (total) (mg/L)                   | 0.001        |                      | ND                   | ND             | ND            |
| Cadmium (total) (mg/L)                     | 0.001        | 0.01 (DEQ MML)       | ND                   | ND             | ND            |
| Calcium (total) (mg/L)                     | 0.1          |                      | 15.7                 | 15.7           | 7.6           |
| Carbonate (as CaCO <sub>3</sub> ) (mg/L)   | 5            |                      | ND                   | ND             | ND            |
| Chloramine (mg/L)                          |              |                      | ND                   | ND             | ND            |
| Chloride (total) (mg/L)                    | 0.1          | 250 (DEQ MML)        | 1.96                 | 1.92           | 32.1          |
| Chromium (total) (mg/L)                    | 0.001        | 0.05 (DEQ MML)       | ND                   | ND             | ND            |
| Copper (total) (mg/L)                      | 0.0          | 1.0 (DEQ MML)        | 0.00138              | 0.00136        | 0.00144       |
| Cyanide (total) (mg/L)                     | NR           |                      | ND                   | ND             | ND            |
| Fluoride (total) (mg/L)                    | 0.1          | 4 (DEQ MML)          | ND                   | ND             | 1.63          |
| Hardness (as CaCO <sub>3</sub> ) (mg/L)    | 10           |                      | 56.5                 | 56.6           | 27.5          |
| Iron (total) (mg/L)                        | 0.01         | 0.3 (DEQ MML)        | 0.155                | 0.148          | 0.0243        |
| Lead (total) (mg/L)                        | 0.001        | 0.05 (DEQ MML)       | ND                   | ND             | ND            |
| Magnesium (total) (mg/L)                   | 0.1          |                      | 4.19                 | 4.18           | 2.06          |
| Manganese (total) (mg/L)                   | 0.001        | 0.05 (DEQ MML)       | 0.0183               | ND             | 0.00848       |
| Mercury (total inorganic) (mg/L)           | 0.0001       | 0.002 (DEQ MML)      | ND                   | ND             | ND            |
| Nickel (total) (mg/L)                      | 0.001        |                      | ND                   | ND             | ND            |
| Nitrate (as N) (mg/L)                      | 0.1          | 10 (DEQ MML)         | ND                   | ND             | ND            |
| Nitrite (mg/L)                             | 0.1          |                      | ND                   | ND             | ND            |
| Nitrate+Nitrite (total N) (mg/L)           | 0.1          |                      | ND                   | ND             | ND            |
| Perchlorate (ug/L)                         |              |                      | 0.148                | 0.162          | ND            |
| Phosphate (mg/L)                           | NA           |                      | ND                   | ND             | ND            |
| Phosphorus (total) (mg/L)                  | NA           |                      | 0.0296               | 0.0286         | 0.0322        |
| Potassium (mg/L)                           | 0.1          |                      | 1.03                 | 1.02           | 13.8          |
| Selenium (total) (mg/L)                    | 0.00         | 0.01 (DEQ MML)       | ND                   | 0.00142        | 0.00112       |
| Silica (mg/L)                              | 0.1          |                      | 10.4                 | 10.1           | 64.9          |
| Silicon (mg/L)                             | NR           |                      | 4.86                 | 4.73           | 30.3          |
| Silver (total) (mg/L)                      | 0.0          | 0.05 (DEQ MML)       | ND                   | ND             | ND            |
| Sodium (mg/L)                              | 0.1          |                      | 4.16                 | 4.12           | 90.2          |
| Sulfate (mg/L)                             | 0.1          | 250 (DEQ MML)        | 9.57                 | 9.28           | 0.92          |
| Sulfide (mg/L)                             |              |                      | ND                   | ND             | ND            |
| Thallium (mg/L)                            | 0.001        |                      | ND                   | ND             | ND            |
| Uranium (mg/L)                             |              |                      | ND                   | ND             | ND            |
| Zinc (total) (mg/L)                        | 0.001        | 5 (DEQ MML)          | 0.00303              | 0.00267        | ND            |
| <b>FIELD PARAMETERS</b>                    |              |                      |                      |                |               |
| pH (pH units)                              | NA           | 6.5-8.5 (DEQ MML)    | 7.75                 | 7.63           | 9.18          |
| Specific Conductance (mS/cm)               | NA           |                      | 0.151                | 0.154          | 0.601         |
| Turbidity (NTUs)                           | NA           | 1 (DEQ MML)          | 10                   | 8              | 4             |
| Temperature (°F)                           | NA           |                      | 53.33                | 52.99          | 71.23         |
| Dissolved Oxygen (mg/L)                    | NA           |                      | 11.6                 | 11.2           | 0.15          |
| Oxidation-reduction potential (mV)         | NA           |                      | 289.9                | 291.4          | 164           |
| <b>MISCELLANEOUS</b>                       |              |                      |                      |                |               |
| Color (color units)                        |              | 15 (DEQ MML)         | 10                   | 10             | ND            |
| Corrosivity <sup>†</sup> (S.U.)            |              |                      | -0.731               | -0.752         | -0.0966       |
| Foaming Agents (MBAS) (mg/L)               |              | 0.5 (DEQ MML)        | 0.0534               | ND             | ND            |
| Odor (T.O.N.)                              |              | 3 TON (DEQ MML)      | ND                   | ND             | 4             |
| Total Dissolved Solids (mg/L)              | 10           | 500 (DEQ MML)        | 86                   | 89             | 321           |
| Total Organic Carbon (mg/L)                | 0.5          |                      | 2.13                 | 2.19           | 0.234         |
| Total Suspended Solids (mg/L)              | 1            |                      | 9.67                 | 10.6           | ND            |



| Analyte                                                  |      |                      | WC PUMP <sup>1</sup>   | INLAND BOOSTER | INLAND WELL 2 |
|----------------------------------------------------------|------|----------------------|------------------------|----------------|---------------|
|                                                          |      |                      | Sample Date: 5/26/2021 | 5/27/2021      | 5/20/2021     |
|                                                          |      |                      | Lab ID: MAE0524-01     | MAE0524-02     | MBE0583-01    |
|                                                          | MRL  | Oregon DEQ Standards | Result                 | Result         | Result        |
| VOLATILE ORGANIC COMPOUNDS (VOCs)                        |      |                      |                        |                |               |
| 1,1-Dichloroethylene (ug/L)                              | 0.5  | 7 (DEQ MML)          | ND                     | ND             | ND            |
| 1,1,1-Trichloroethane (ug/L)                             | 0.5  | 200 (DEQ MML)        | ND                     | ND             | ND            |
| 1,2-Dichloroethane (ug/L)                                | 0.5  | 5 (DEQ MML)          | ND                     | ND             | ND            |
| Benzene (ug/L)                                           | 0.5  | 5 (DEQ MML)          | ND                     | ND             | ND            |
| Carbon tetrachloride (ug/L)                              | 0.5  | 5 (DEQ MML)          | ND                     | ND             | ND            |
| p-Dichlorobenzene (1,4-) (ug/L)                          | 0.5  | 75 (DEQ MML)         | ND                     | ND             | ND            |
| Trichloroethylene (TCE) (ug/L)                           | 0.5  | 5 (DEQ MML)          | ND                     | ND             | ND            |
| Vinyl chloride (ug/L)                                    | 0.5  | 2 (DEQ MML)          | ND                     | ND             | ND            |
| DISINFECTION BY-PRODUCTS (DBPs) & RESIDUAL DISINFECTANTS |      |                      |                        |                |               |
| Total Trihalomethanes (TTHM) (ug/L)                      | 0.5  | 10 (DEQ MML)         |                        |                |               |
| MICROBIAL                                                |      |                      |                        |                |               |
| Total Coliforms (cell count per 100 mL)                  |      | <1/100mL             | 547.5                  | 270            | ND            |
| Fecal Coliforms (cell count per 100 mL)                  |      | Confirmed presence   | 46                     | 79             | <1.8          |
| E. Coli (cell count per 100 mL)                          |      | Confirmed presence   | 50.4                   | 52.9           | ND            |
| SYNTHETIC ORGANIC COMPOUNDS (SOCs)                       |      |                      |                        |                |               |
| 2,4-D (ug/L)                                             | 0.1  | 10 (DEQ MML)         | ND                     | ND             | ND            |
| 2,4,5-TP (Silvex) (ug/L)                                 |      | 10 (DEQ MML)         | ND                     | ND             | ND            |
| Dacthal (ug/L)                                           |      |                      |                        |                | ND            |
| Endrin (ug/L)                                            | 0.02 | 0.2 (DEQ MML)        | ND                     | ND             | ND            |
| Lindane (BHC-gamma) (mg/L)                               |      | 0.004 (DEQ MML)      | ND                     | ND             | ND            |
| Methoxychlor (mg/L)                                      |      | 0.100 (DEQ MML)      | ND                     | ND             | ND            |
| Toxaphene (ug/L)                                         | 2    | 0.005 (DEQ MML)      | ND                     | ND             | ND            |
| RADIOLOGICALS                                            |      |                      |                        |                |               |
| Gross Alpha (pCi/L)                                      |      | 15 (DEQ MML)         | <3.00+/-0.279          | <3.00+/-0.336  | <3.0+/-0.368  |
| Gross Beta (pCi/L)                                       |      | 50 pCi/L (DEQ MML)   | <4.00+/-0.371          | <4.00+/-0.413  | 8.94+/-0.82   |

**Notes:**

Result is over DEQ MML

Result is over 1/2 DEQ MML

†: Corrosivity analysis by Langelier Index

1: WC Pump = Willow Creek Pump Station



**Table 3**  
**Inland Wells Biannual Static Water Level Measurements**  
 Threemile Canyon Farms  
 Boardman, Oregon

| Well ID       | State ID   | Easting | Northing | 10/28/2013 | 3/5/2014 | 10/1/2014 | 3/10/2015 | 10/30/2015 | 3/8/2016 | 10/28/2016 | 2/24/2017 | 10/18/2017 | 3/15/2018 | 10/26/2018 | 3/18/2019 | 10/30/2019 | 3/6/2020 | 10/29/2020 | 3/13/2021 | 10/27/2021 |
|---------------|------------|---------|----------|------------|----------|-----------|-----------|------------|----------|------------|-----------|------------|-----------|------------|-----------|------------|----------|------------|-----------|------------|
| Inland Well 1 | MORR 52037 | 284436  | 5071982  | 221.21     | 213.65   | 243.36    | 230.08    | 250.40     | 247.00   | 277.08     | 267.72    | no mmt     | no mmt    | no mmt     | No mmt    | He mmt     | 307.86   | no mmt     | 306.47    | 324.11     |
| Inland Well 2 | MORR 52045 | 285281  | 5071570  | 228.55     | 220.22   | 250.71    | 237.58    | 266.73     | 254.31   | 284.38     | no mmt    | 308.55     | 288.74    | 308.45     | 297.37    | 313.76     | 287.96   | 304.81     | 295.31    | 312.24     |
| Inland Well 3 | MORR 52132 | 285010  | 5060534  | 218.00     | 209.69   | 240.37    | 227.12    | 256.36     | 243.99   | 274.06     | 264.68    | 298.03     | 276.20    | 298.11     | 286.49    | 303.04     | 292.93   | 309.76     | 300.79    | 317.51     |
| Inland Well 4 | MORR 52131 | 284033  | 5068816  | 217.96     | 209.66   | 240.18    | 227.04    | 256.09     | 243.79   | 273.85     | 264.60    | 297.75     | 276.26    | 297.55     | 286.50    | 303.13     | 293.13   | 310.37     | 300.93    | 317.55     |
| Inland Well 5 | MORR 52130 | 283582  | 5070778  | 250.84     | 222.10   | 252.63    | 241.47    | 268.67     | 256.24   | 286.28     | 276.92    | 310.45     | 288.61    | 308.37     | 298.93    | 315.61     | 305.59   | 322.93     | 312.37    | 330.00     |
| Inland OBS    |            | 283261  | 5072349  |            |          |           |           | 234.42     | 222.38   | 252.50     | 241.98    | 288.31     | 254.71    | 276.06     | 264.09    | 281.88     | 271.79   | 290.50     | no mmt    | 297.60     |



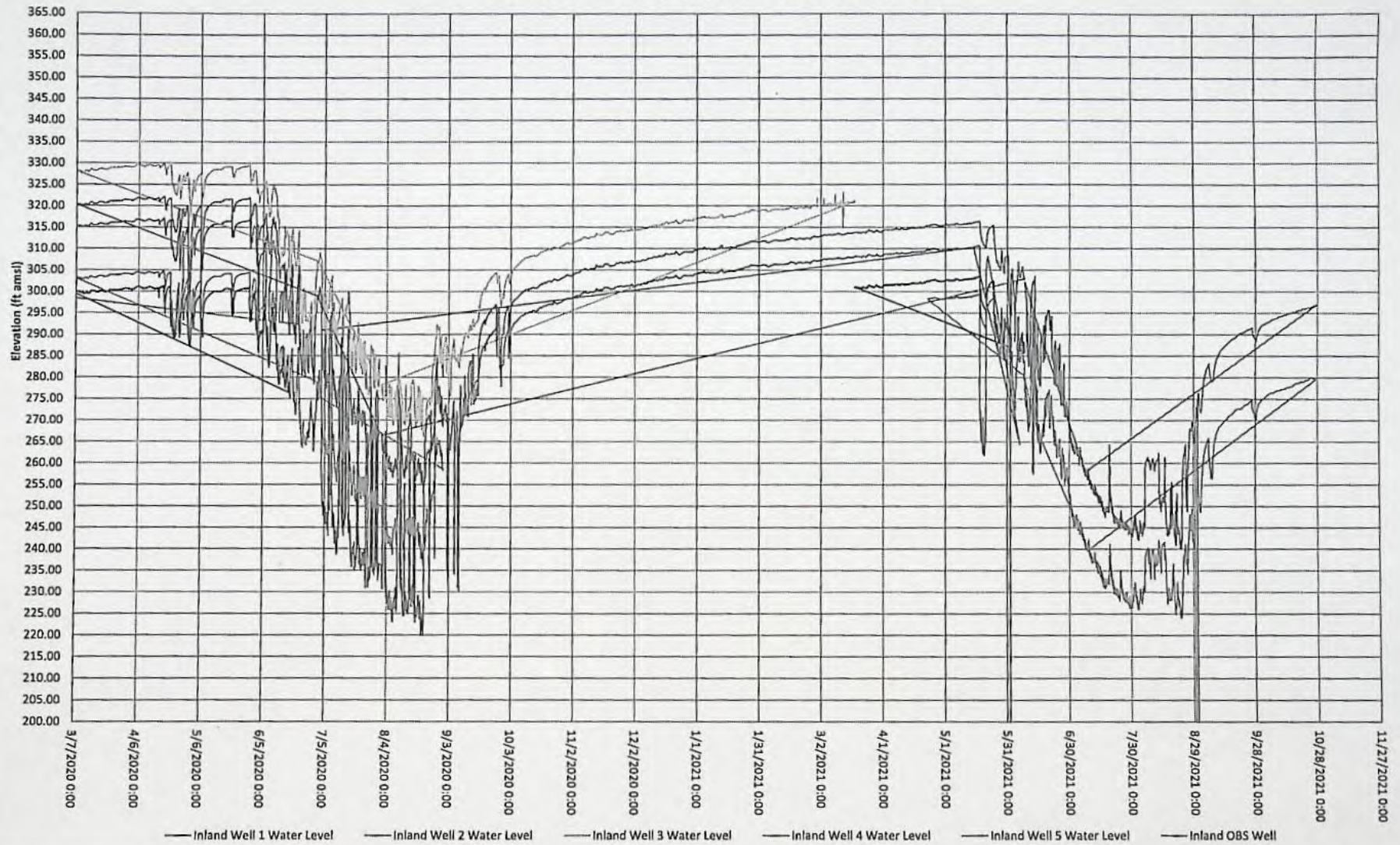








Inland Wells 1, 2, 3, 4, 5 and OBS Hydrograph









**APPENDIX A**  
**Water Quality Tables 2018–2020**



**Table A-1**  
**Water Quality Samples--April 10, 2018**  
 Threemile Canyon Farms  
 Boardman, Oregon

| Analyte                                    |        |                      | WC PUMP <sup>1</sup> | INLAND BOOSTER | SIXMILE FILTER IN |         | SIXMILE FILTER OUT |         | INLAND WELL 5 |         |   |
|--------------------------------------------|--------|----------------------|----------------------|----------------|-------------------|---------|--------------------|---------|---------------|---------|---|
|                                            |        | Sample Date:         | 10/24/2019           | 4/10/2018      | 4/10/2018         |         | 4/10/2018          |         | 6/19/2019     |         |   |
|                                            |        | Lab ID:              | 191027021-001        | 170621069-001  | 180411052-004     |         | 180411052-005      |         | 190501031-001 |         |   |
|                                            | MRL    | Oregon DEQ Standards | Result               | Result         | Q                 | Result  | Q                  | Result  | Q             | Result  | Q |
| INORGANIC CHEMICALS (IOCs)                 |        |                      |                      |                |                   |         |                    |         |               |         |   |
| FORMULA                                    |        |                      |                      |                |                   |         |                    |         |               |         |   |
| Alkalinity (as CaCO <sub>3</sub> ) (mg/L)  | 5      |                      | 76                   | 120            |                   | 130     |                    | 128     |               | 178     |   |
| Aluminum (total) (mg/L)                    | 0.01   |                      | 0.238                | 1.28           |                   | 0.6     |                    | 0.555   |               | ND      |   |
| Antimony (total) (mg/L)                    | 0.001  |                      | ND                   | ND             |                   | ND      |                    | ND      |               | ND      |   |
| Arsenic (total) (mg/L)                     | 0.001  | 0.050 (DEQ MML)      | 0.00175              | 0.00136        |                   | 0.00119 |                    | 0.00126 |               | ND      |   |
| Barium (total) (mg/L)                      | 0.001  | 1 (DEQ MML)          | 0.0347               | 0.0419         |                   | 0.0414  |                    | 0.0406  |               | 0.0269  |   |
| Bicarbonate (as CaCO <sub>3</sub> ) (mg/L) | 5      |                      | 76                   | 120            |                   | 130     |                    | 128     |               | 178     |   |
| Beryllium (total) (mg/L)                   | 0.001  |                      | ND                   | ND             |                   | ND      |                    | ND      |               | ND      |   |
| Cadmium (total) (mg/L)                     | 0.001  | 0.01 (DEQ MML)       | ND                   | ND             |                   | ND      |                    | ND      |               | ND      |   |
| Calcium (total) (mg/L)                     | 0.1    |                      | 22.6                 | 27.6           |                   | 29.2    |                    | 29.5    |               | 8.13    |   |
| Carbonate (as CaCO <sub>3</sub> ) (mg/L)   | 5      |                      | ND                   | ND             |                   | ND      |                    | ND      |               | ND      |   |
| Chloramine (mg/L)                          |        |                      | ND                   | ND             |                   | ND      |                    | ND      |               | ND      |   |
| Chloride (total) (mg/L)                    | 0.1    | 250 (DEQ MML)        | 5.25                 | 8.02           |                   | 8.88    |                    | 13      |               | 37.1    |   |
| Chromium (total) (mg/L)                    | 0.001  | 0.05 (DEQ MML)       | 0.0139               | ND             |                   | ND      |                    | ND      |               | 0.00116 |   |
| Copper (total) (mg/L)                      | 0.0    | 1.0 (DEQ MML)        | 0.00222              | 0.00318        |                   | 0.00265 |                    | 0.00335 |               | 0.00332 |   |
| Cyanide (total) (mg/L)                     | NR     |                      |                      | ND             |                   | ND      |                    | ND      |               |         |   |
| Fluoride (total) (mg/L)                    | 0.1    | 4 (DEQ MML)          | WC PUMP1             | 0.191          |                   | 0.196   |                    | 0.189   |               | 1.71    |   |
| Hardness (as CaCO <sub>3</sub> ) (mg/L)    | 10     |                      | 86.6                 | 111            |                   | 117     |                    | 119     |               | 31.1    |   |
| Iron (total) (mg/L)                        | 0.01   | 0.3 (DEQ MML)        | 0.325                | 1.56           |                   | 0.738   |                    | 0.681   |               | 0.0107  |   |
| Lead (total) (mg/L)                        | 0.001  | 0.05 (DEQ MML)       | ND                   | ND             |                   | ND      |                    | ND      |               | ND      |   |
| Magnesium (total) (mg/L)                   | 0.1    |                      | 7.3                  | 10.3           |                   | 10.7    |                    | 10.9    |               | 0.61    |   |
| Manganese (total) (mg/L)                   | 0.001  | 0.05 (DEQ MML)       | 0.0184               | 0.079          |                   | 0.0362  |                    | 0.0348  |               | 0.00801 |   |
| Mercury (total inorganic) (mg/L)           | 0.0001 | 0.002 (DEQ MML)      | ND                   | ND             |                   | ND      |                    | ND      |               | ND      |   |
| Nickel (total) (mg/L)                      | 0.001  |                      | 0.00197              | 0.00159        |                   | 0.00118 |                    | 0.00159 |               | ND      |   |
| Nitrate (as N) (mg/L)                      | 0.1    | 10 (DEQ MML)         | 1.13                 | 0.806          |                   | 1.07    |                    | 0.951   |               | ND      |   |
| Nitrite (mg/L)                             | 0.1    |                      | ND                   | ND             |                   | ND      |                    | ND      |               | ND      |   |
| Nitrate+Nitrite (total N) (mg/L)           | 0.1    |                      | 1.13                 | 0.806          |                   | 1.07    |                    | 0.951   |               | ND      |   |
| Perchlorate (ug/L)                         |        |                      | 0.194                | 0.239          |                   | 0.241   |                    | 0.291   |               | ND      |   |
| Phosphate (mg/L)                           | NA     |                      | ND                   | ND             |                   | ND      |                    | ND      |               | ND      |   |
| Phosphorus (total) (mg/L)                  | NA     |                      | 0.0293               | 0.102          |                   | ND      |                    | 0.0786  |               | 0.0319  |   |
| Potassium (mg/L)                           | 0.1    |                      | 1.73                 | 3.56           |                   | 3.51    |                    | 3.67    |               | 14.9    |   |
| Selenium (total) (mg/L)                    | 0.00   | 0.01 (DEQ MML)       | 0.00125              | ND             |                   | ND      |                    | ND      |               | ND      |   |
| Silica (mg/L)                              | 0.1    |                      | 9.54                 | 32.1           |                   | 28.2    |                    | 28.5    |               | 60.8    |   |
| Silicon (mg/L)                             | NR     |                      | 4.46                 | 15             |                   | 13.2    |                    | 13.3    |               | 28.4    |   |
| Silver (total) (mg/L)                      | 0.0    | 0.05 (DEQ MML)       | ND                   | ND             |                   | ND      |                    | ND      |               | ND      |   |
| Sodium (mg/L)                              | 0.1    |                      | 10.4                 | 18             |                   | 19.2    |                    | 23.1    |               | 90.9    |   |
| Sulfate (mg/L)                             | 0.1    | 250 (DEQ MML)        | 19.4                 | 14.6           |                   | 16.1    |                    | 16.1    |               | 2.52    |   |
| Sulfide (mg/L)                             |        |                      | ND                   | ND             |                   | ND      |                    | ND      |               | ND      |   |
| Thallium (mg/L)                            | 0.001  |                      | ND                   | ND             |                   | ND      |                    | ND      |               | ND      |   |
| Uranium (mg/L)                             |        |                      | 0.00182              | 1.8            |                   | 2.13    |                    | 2.08    |               | ND      |   |
| Zinc (total) (mg/L)                        | 0.001  | 5 (DEQ MML)          | 0.00351              | 0.00426        |                   | 0.00237 |                    | 0.0038  |               | 0.00398 |   |
| FIELD PARAMETERS                           |        |                      |                      |                |                   |         |                    |         |               |         |   |
| pH (pH units)                              | NA     | 6.5-8.5 (DEQ MML)    | 8.04                 | 8.24           |                   | 7.92    |                    | 8.06    |               | 8.05    |   |
| Specific Conductance (mS/cm)               | NA     |                      | 232                  | 306            |                   | 326     |                    | 335     |               | 531     |   |



| Analyte                                                  |      |                      | WC PUMP <sup>1</sup> | INLAND BOOSTER | SIXMILE FILTER IN | SIXMILE FILTER OUT | INLAND WELL 5 |              |               |
|----------------------------------------------------------|------|----------------------|----------------------|----------------|-------------------|--------------------|---------------|--------------|---------------|
|                                                          |      | Sample Date:         | 10/24/2019           | 4/10/2018      | 4/10/2018         | 4/10/2018          | 6/19/2019     |              |               |
|                                                          |      | Lab ID:              | 191027021-001        | 170621069-001  | 180411052-004     | 180411052-005      | 190501031-001 |              |               |
|                                                          | MRL  | Oregon DEQ Standards | Result               | Result         | Q                 | Result             | Q             | Result       | Q             |
| Turbidity (NTUs)                                         | NA   | 1 (DEQ MML)          | 4.59                 | 46             |                   | 25                 |               | 19           | 8             |
| Temperature (°F)                                         | NA   |                      | 51.75                | 51.22          |                   | 49.38              |               | 49.47        | 71.92         |
| Dissolved Oxygen (mg/L)                                  | NA   |                      | 10.16                | 86.6           |                   | 91.60%             |               | 86.60%       | 0.05          |
| Oxidation-reduction potential (mV)                       | NA   |                      | 160.3                | 467.2          |                   | 52.8               |               | 495.6        | 31.8          |
| MISCELLANEOUS                                            |      |                      |                      |                |                   |                    |               |              |               |
| Color (color units)                                      |      | 15 (DEQ MML)         | 5                    | 10             |                   | 20                 |               | 5            | 5             |
| Corrosivity <sup>1</sup> (S.U.)                          |      |                      | -0.739               | 0.218          |                   | 0.346              |               | 0.213        | 0.065         |
| Foaming Agents (MBAS); (mg/L)                            |      | 0.5 (DEQ MML)        | ND                   | ND             |                   | ND                 |               | ND           | ND            |
| Odor (T.O.N.)                                            |      | 3 TON (DEQ MML)      | ND                   | ND             |                   | ND                 |               | ND           | 4             |
| Total Dissolved Solids (mg/L)                            | 10   | 500 (DEQ MML)        | 142                  | 182            |                   | 192                |               | 208          | 295           |
| Total Organic Carbon (mg/L)                              | 0.5  |                      | 1.6                  | 3.64           |                   | 3.53               |               | 3.66         | 0.369         |
| Total Suspended Solids (mg/L)                            | 1    |                      | 3.94                 | 39.6           |                   | 13.7               |               | 13.2         | ND            |
| VOLATILE ORGANIC COMPOUNDS (VOCs)                        |      |                      |                      |                |                   |                    |               |              |               |
| 1,1-Dichloroethylene (ug/L)                              | 0.5  | 7 (DEQ MML)          |                      | ND             |                   | ND                 |               | ND           | ND            |
| 1,1,1-Trichloroethane (ug/L)                             | 0.5  | 200 (DEQ MML)        |                      | ND             |                   | ND                 |               | ND           | ND            |
| 1,2-Dichloroethane (ug/L)                                | 0.5  | 5 (DEQ MML)          |                      | ND             |                   | ND                 |               | ND           | ND            |
| Benzene (ug/L)                                           | 0.5  | 5 (DEQ MML)          |                      | ND             |                   | ND                 |               | ND           | ND            |
| Carbon tetrachloride (ug/L)                              | 0.5  | 5 (DEQ MML)          |                      | ND             |                   | ND                 |               | ND           | ND            |
| p-Dichlorobenzene (1,4-) (ug/L)                          | 0.5  | 75 (DEQ MML)         |                      | ND             |                   | ND                 |               | ND           | ND            |
| Trichloroethylene (TCE) (ug/L)                           | 0.5  | 5 (DEQ MML)          |                      | ND             |                   | ND                 |               | ND           | ND            |
| Vinyl chloride (ug/L)                                    | 0.5  | 2 (DEQ MML)          |                      | ND             |                   | ND                 |               | ND           | ND            |
| DISINFECTION BY-PRODUCTS (DBPs) & RESIDUAL DISINFECTANTS |      |                      |                      |                |                   |                    |               |              |               |
| Total Trihalomethanes (TTHM) (ug/L)                      | 0.5  | 10 (DEQ MML)         |                      | ND             |                   | ND                 |               | 8.71         | ND            |
| MICROBIAL                                                |      |                      |                      |                |                   |                    |               |              |               |
| Total Coliforms (cell count per 100 mL)                  |      | <1/100mL             | 435                  | 1732.9         |                   | 866.4              |               | 0            |               |
| Fecal Coliforms (cell count per 100 mL)                  |      | Confirmed presence   | 18.9                 |                |                   |                    |               |              |               |
| E. Coli (cell count per 100 mL)                          |      | Confirmed presence   | 23.8                 | 61.3           |                   | 24                 |               | 0            |               |
| SYNTHETIC ORGANIC COMPOUNDS (SOCs)                       |      |                      |                      |                |                   |                    |               |              |               |
| 2,4-D (ug/L)                                             | 0.1  | 10 (DEQ MML)         |                      | ND             |                   | ND                 |               | ND           | ND            |
| 2,4,5-TP (Silvex) (ug/L)                                 |      | 10 (DEQ MML)         |                      | ND             |                   | ND                 |               | ND           | ND            |
| Dacthal (ug/L)                                           |      |                      |                      | 0.05           |                   | ND                 |               | ND           |               |
| Endrin (ug/L)                                            | 0.02 | 0.2 (DEQ MML)        |                      | ND             |                   | ND                 |               | ND           | ND            |
| Lindane (BHC-gamma) (mg/L)                               |      | 0.004 (DEQ MML)      |                      | ND             |                   | ND                 |               | ND           | ND            |
| Methoxychlor (mg/L)                                      |      | 0.100 (DEQ MML)      |                      | ND             |                   | ND                 |               | ND           | ND            |
| Toxaphene (ug/L)                                         | 2    | 0.005 (DEQ MML)      |                      | ND             |                   | ND                 |               | ND           | ND            |
| RADIOLOGICALS                                            |      |                      |                      |                |                   |                    |               |              |               |
| Gross Alpha (pCi/L)                                      |      | 15 (DEQ MML)         | <3+/-0.978           | 3.73+/-1.43    |                   | 3.88+/-1.26        |               | 3.69+/-1.55  | <1.20+/-0.963 |
| Gross Beta (pCi/L)                                       |      | 50 pCi/L (DEQ MML)   | <4+/-0.780           | 3.68+/-0.702   |                   | 4.15+/-0.695       |               | 3.79+/-0.735 | 9.73+/-1.47   |

**Notes:**

Result is over DEQ MML

Result is over 1/2 DEQ MML

†: Corrosivity analysis by Langelier Index

1: WC Pump = Willow Creek Pump Station



**Table A-2**  
**Water Quality Samples-September 20, 2018**  
 Threemile Canyon Farms  
 Boardman, Oregon

| Analyte                                    | MRL    | Oregon DEQ Standards | WC PUMP <sup>1</sup> |   | SIXMILE FILTER IN |   | SIXMILE FILTER OUT |   | INLAND WELL 5 |   |
|--------------------------------------------|--------|----------------------|----------------------|---|-------------------|---|--------------------|---|---------------|---|
|                                            |        |                      | Sample Date:         |   | 9/20/2018         |   | 9/20/2018          |   | 6/19/2019     |   |
|                                            |        |                      | Lab ID:              |   | 180921031-001     |   | 180921031-006      |   | 190501031-001 |   |
|                                            |        |                      | Result               | Q | Result            | Q | Result             | Q | Result        | Q |
| <b>INORGANIC CHEMICALS (IOCs)</b>          |        |                      |                      |   |                   |   |                    |   |               |   |
| <b>FORMULA</b>                             |        |                      |                      |   |                   |   |                    |   |               |   |
| Alkalinity (as CaCO <sub>3</sub> ) (mg/L)  | 5      |                      | 76                   |   | 58.6              |   | 56                 |   | 178           |   |
| Aluminum (total) (mg/L)                    | 0.01   |                      | 0.238                |   | 0.14              |   | 0.105              |   | ND            |   |
| Antimony (total) (mg/L)                    | 0.001  |                      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Arsenic (total) (mg/L)                     | 0.001  | 0.050 (DEQ MML)      | 0.00175              |   | ND                |   | ND                 |   | ND            |   |
| Barium (total) (mg/L)                      | 0.001  | 1 (DEQ MML)          | 0.0347               |   | 0.0293            |   | 0.0291             |   | 0.0269        |   |
| Bicarbonate (as CaCO <sub>3</sub> ) (mg/L) | 5      |                      | 76                   |   | 58.6              |   | 56                 |   | 178           |   |
| Beryllium (total) (mg/L)                   | 0.001  |                      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Cadmium (total) (mg/L)                     | 0.001  | 0.01 (DEQ MML)       | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Calcium (total) (mg/L)                     | 0.1    |                      | 22.6                 |   | 17.7              |   | 17.6               |   | 8.13          |   |
| Carbonate (as CaCO <sub>3</sub> ) (mg/L)   | 5      |                      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Chloramine (mg/L)                          |        |                      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Chloride (total) (mg/L)                    | 0.1    | 250 (DEQ MML)        | 5.25                 |   | 2.46              |   | 3.43               |   | 37.1          |   |
| Chromium (total) (mg/L)                    | 0.001  | 0.05 (DEQ MML)       | 0.0139               |   | ND                |   | ND                 |   | 0.00116       |   |
| Copper (total) (mg/L)                      | 0.0    | 1.0 (DEQ MML)        | 0.00222              |   | 0.00185           |   | 0.00275            |   | 0.00332       |   |
| Cyanide (total) (mg/L)                     | NR     |                      |                      |   | ND                |   | ND                 |   | ND            |   |
| Fluoride (total) (mg/L)                    | 0.1    | 4 (DEQ MML)          | 0.134                |   | 0.113             |   | 0.112              |   | 1.71          |   |
| Hardness (as CaCO <sub>3</sub> ) (mg/L)    | 10     |                      | 86.6                 |   | 66.3              |   | 64.3               |   | 31.1          |   |
| Iron (total) (mg/L)                        | 0.01   | 0.3 (DEQ MML)        | 0.325                |   | 0.113             |   | 0.105              |   | 0.0107        |   |
| Lead (total) (mg/L)                        | 0.001  | 0.05 (DEQ MML)       | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Magnesium (total) (mg/L)                   | 0.1    |                      | 7.3                  |   | 5.06              |   | 4.87               |   | 0.61          |   |
| Manganese (total) (mg/L)                   | 0.001  | 0.05 (DEQ MML)       | 0.0184               |   | 0.0104            |   | 0.00772            |   | 0.00801       |   |
| Mercury (total inorganic) (mg/L)           | 0.0001 | 0.002 (DEQ MML)      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Nickel (total) (mg/L)                      | 0.001  |                      | 0.00197              |   | ND                |   | ND                 |   | ND            |   |
| Nitrate (as N) (mg/L)                      | 0.1    | 10 (DEQ MML)         | 1.13                 |   | ND                |   | ND                 |   | ND            |   |
| Nitrite (mg/L)                             | 0.1    |                      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Nitrate+Nitrite (total N) (mg/L)           | 0.1    |                      | 1.13                 |   | ND                |   | ND                 |   | ND            |   |
| Perchlorate (ug/L)                         |        |                      | 0.194                |   | 0.075             |   | 0.117              |   | ND            |   |
| Phosphate (mg/L)                           | NA     |                      | ND                   |   |                   |   |                    |   | ND            |   |
| Phosphorus (total) (mg/L)                  | NA     |                      | 0.0293               |   | 0.0374            |   | 0.0177             |   | 0.0319        |   |
| Potassium (mg/L)                           | 0.1    |                      | 1.73                 |   | 1.15              |   | 1.14               |   | 14.9          |   |
| Selenium (total) (mg/L)                    | 0.00   | 0.01 (DEQ MML)       | 0.00125              |   | ND                |   | ND                 |   | ND            |   |
| Silica (mg/L)                              | 0.1    |                      | 9.54                 |   | 6.98              |   | 6.59               |   | 60.8          |   |
| Silicon (mg/L)                             | NR     |                      | 4.46                 |   | 3.26              |   | 3.08               |   | 28.4          |   |
| Silver (total) (mg/L)                      | 0.0    | 0.05 (DEQ MML)       | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Sodium (mg/L)                              | 0.1    |                      | 10.4                 |   | 4.63              |   | 5.33               |   | 90.9          |   |
| Sulfate (mg/L)                             | 0.1    | 250 (DEQ MML)        | 19.4                 |   | 11.9              |   | 12                 |   | 2.52          |   |
| Sulfide (mg/L)                             |        |                      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Thallium (mg/L)                            | 0.001  |                      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Uranium (mg/L)                             |        |                      | 0.00182              |   | ND                |   | ND                 |   | ND            |   |
| Zinc (total) (mg/L)                        | 0.001  | 5 (DEQ MML)          | 0.00351              |   | 0.00195           |   | 0.00691            |   | 0.00398       |   |
| <b>FIELD PARAMETERS</b>                    |        |                      |                      |   |                   |   |                    |   |               |   |
| pH (pH units)                              | NA     | 6.5-8.5 (DEQ MML)    | 8.04                 |   | 7.28              |   | 7.38               |   | 8.05          |   |
| Specific Conductance (mS/cm)               | NA     |                      | 232                  |   | 151               |   | 154                |   | 531           |   |



| Analyte                                                             | WC PUMP <sup>1</sup>    |                      | SIXMILE FILTER IN |   | SIXMILE FILTER OUT |   | INLAND WELL 5 |               |
|---------------------------------------------------------------------|-------------------------|----------------------|-------------------|---|--------------------|---|---------------|---------------|
|                                                                     | Sample Date: 10/24/2019 |                      | 9/20/2018         |   | 9/20/2018          |   | 6/19/2019     |               |
|                                                                     | Lab ID: 191027021-001   |                      | 180921031-001     |   | 180921031-006      |   | 190501031-001 |               |
|                                                                     | MRL                     | Oregon DEQ Standards | Result            | Q | Result             | Q | Result        | Q             |
| Turbidity (NTUs)                                                    | NA                      | 1 (DEQ MML)          | 4.59              |   | 3.83               |   | 4.39          | 8             |
| Temperature (°F)                                                    | NA                      |                      | 51.75             |   | 61.49              |   | 61.31         | 71.92         |
| Dissolved Oxygen (mg/L)                                             | NA                      |                      | 10.16             |   | 8.69               |   | 8.61          | 0.05          |
| Oxidation-reduction potential (mV)                                  | NA                      |                      | 160.3             |   | 50.8               |   | 447.8         | 31.8          |
| <b>MISCELLANEOUS</b>                                                |                         |                      |                   |   |                    |   |               |               |
| Color (color units)                                                 |                         | 15 (DEQ MML)         | 5                 |   | ND                 |   | ND            | 5             |
| Corrosivity <sup>†</sup> (S.U.)                                     |                         |                      | -0.739            |   | -0.606             |   | -0.669        | 0.065         |
| Foaming Agents (MBAS) (mg/L)                                        |                         | 0.5 (DEQ MML)        | ND                |   | ND                 |   | ND            | ND            |
| Odor (T.O.N.)                                                       |                         | 3 TON (DEQ MML)      | ND                |   | ND                 |   | ND            | 4             |
| Total Dissolved Solids (mg/L)                                       | 10                      | 500 (DEQ MML)        | 142               |   | 79                 |   | 83            | 295           |
| Total Organic Carbon (mg/L)                                         | 0.5                     |                      | 1.6               |   | 1.41               |   | 1.46          | 0.369         |
| Total Suspended Solids (mg/L)                                       | 1                       |                      | 3.94              |   | 2.87               |   | 4.37          | ND            |
| <b>VOLATILE ORGANIC COMPOUNDS (VOCs)</b>                            |                         |                      |                   |   |                    |   |               |               |
| 1,1-Dichloroethylene (ug/L)                                         | 0.5                     | 7 (DEQ MML)          |                   |   | ND                 |   | ND            | ND            |
| 1,1,1-Trichloroethane (ug/L)                                        | 0.5                     | 200 (DEQ MML)        |                   |   | ND                 |   | ND            | ND            |
| 1,2-Dichloroethane (ug/L)                                           | 0.5                     | 5 (DEQ MML)          |                   |   |                    |   |               | ND            |
| Benzene (ug/L)                                                      | 0.5                     | 5 (DEQ MML)          |                   |   | ND                 |   | ND            | ND            |
| Carbon tetrachloride (ug/L)                                         | 0.5                     | 5 (DEQ MML)          |                   |   | ND                 |   | ND            | ND            |
| p-Dichlorobenzene (1,4-) (ug/L)                                     | 0.5                     | 75 (DEQ MML)         |                   |   | ND                 |   | ND            | ND            |
| Trichloroethylene (TCE) (ug/L)                                      | 0.5                     | 5 (DEQ MML)          |                   |   | ND                 |   | ND            | ND            |
| Vinyl chloride (ug/L)                                               | 0.5                     | 2 (DEQ MML)          |                   |   | ND                 |   | ND            | ND            |
| <b>DISINFECTION BY-PRODUCTS (DBPs) &amp; RESIDUAL DISINFECTANTS</b> |                         |                      |                   |   |                    |   |               |               |
| Total Trihalomethanes (TTHM) (ug/L)                                 | 0.5                     | 10 (DEQ MML)         |                   |   |                    |   | 2.03          | ND            |
| <b>MICROBIAL</b>                                                    |                         |                      |                   |   |                    |   |               |               |
| Total Coliforms (cell count per 100 mL)                             |                         | <1/100mL             | 435               |   | 517                |   | 0             |               |
| Fecal Coliforms (cell count per 100 mL)                             |                         | Confirmed presence   | 18.9              |   |                    |   |               |               |
| E. Coli (cell count per 100 mL)                                     |                         | Confirmed presence   | 23.8              |   | 16                 |   | 0             |               |
| <b>SYNTHETIC ORGANIC COMPOUNDS (SOCs)</b>                           |                         |                      |                   |   |                    |   |               |               |
| 2,4-D (ug/L)                                                        | 0.1                     | 10 (DEQ MML)         |                   |   | ND                 |   | ND            | ND            |
| 2,4,5-TP (Silvex) (ug/L)                                            |                         | 10 (DEQ MML)         |                   |   | ND                 |   | ND            | ND            |
| Dacthal (ug/L)                                                      |                         |                      |                   |   | ND                 |   | ND            |               |
| Endrin (ug/L)                                                       | 0.02                    | 0.2 (DEQ MML)        |                   |   | ND                 |   | ND            | ND            |
| Lindane (BHC-gamma) (mg/L)                                          |                         | 0.004 (DEQ MML)      |                   |   | ND                 |   | ND            | ND            |
| Methoxychlor (mg/L)                                                 |                         | 0.100 (DEQ MML)      |                   |   | ND                 |   | ND            | ND            |
| Toxaphene (ug/L)                                                    | 2                       | 0.005 (DEQ MML)      |                   |   | ND                 |   | ND            | ND            |
| <b>RADIOLOGICALS</b>                                                |                         |                      |                   |   |                    |   |               |               |
| Gross Alpha (pCi/L)                                                 |                         | 15 (DEQ MML)         | <3+/-0.978        |   | 1.73+/-0.655       |   | 2.89+/-1.14   | <1.20+/-0.963 |
| Gross Beta (pCi/L)                                                  |                         | 50 pCi/L (DEQ MML)   | <4+/-0.780        |   | 2.02+/-0.512       |   | 2.24+/-0.931  | 9.73+/-1.47   |

**Notes:**

Result is over DEQ MML

Result is over 1/2 DEQ MML

† Corrosivity analysis by Langelier Index

1: WC Pump = Willow Creek Pump Station



**Table A-3**  
**Water Quality Samples—October 29, 2018**  
 Threemile Canyon Farms  
 Boardman, Oregon

| Analyte                                    | MRL    | Oregon DEQ Standards | WC PUMP <sup>1</sup>    |   | SIXMILE FILTER IN |   | SIXMILE FILTER OUT |   | INLAND WELL 5 |   |
|--------------------------------------------|--------|----------------------|-------------------------|---|-------------------|---|--------------------|---|---------------|---|
|                                            |        |                      | Sample Date: 10/24/2019 |   | 10/29/2018        |   | 10/29/2018         |   | 6/19/2019     |   |
|                                            |        |                      | Lab ID: 191027021-001   |   | 181030050-001     |   | 181030050-002      |   | 190501031-001 |   |
|                                            |        |                      | Result                  | Q | Result            | Q | Result             | Q | Result        | Q |
| <b>INORGANIC CHEMICALS (IOCs)</b>          |        |                      |                         |   |                   |   |                    |   |               |   |
| <b>FORMULA</b>                             |        |                      |                         |   |                   |   |                    |   |               |   |
| Alkalinity (as CaCO <sub>3</sub> ) (mg/L)  | 5      |                      | 76                      |   | 72                |   | 74                 |   | 178           |   |
| Aluminum (total) (mg/L)                    | 0.01   |                      | 0.238                   |   | 0.0305            |   | 0.0241             |   | ND            |   |
| Antimony (total) (mg/L)                    | 0.001  |                      | ND                      |   | ND                |   | ND                 |   | ND            |   |
| Arsenic (total) (mg/L)                     | 0.001  | 0.050 (DEQ MML)      | 0.00175                 |   | ND                |   | ND                 |   | ND            |   |
| Barium (total) (mg/L)                      | 0.001  | 1 (DEQ MML)          | 0.0347                  |   | 0.0325            |   | 0.0309             |   | 0.0269        |   |
| Bicarbonate (as CaCO <sub>3</sub> ) (mg/L) | 5      |                      | 76                      |   | 72                |   | 74                 |   | 178           |   |
| Beryllium (total) (mg/L)                   | 0.001  |                      | ND                      |   | ND                |   | ND                 |   | ND            |   |
| Cadmium (total) (mg/L)                     | 0.001  | 0.01 (DEQ MML)       | ND                      |   | ND                |   | ND                 |   | ND            |   |
| Calcium (total) (mg/L)                     | 0.1    |                      | 22.6                    |   | 21.3              |   | 21.1               |   | 8.13          |   |
| Carbonate (as CaCO <sub>3</sub> ) (mg/L)   | 5      |                      | ND                      |   | ND                |   | ND                 |   | ND            |   |
| Chloramine (mg/L)                          |        |                      | ND                      |   | ND                |   | ND                 |   | ND            |   |
| Chloride (total) (mg/L)                    | 0.1    | 250 (DEQ MML)        | 5.25                    |   | 5.78              |   | 6.82               |   | 37.1          |   |
| Chromium (total) (mg/L)                    | 0.001  | 0.05 (DEQ MML)       | 0.0139                  |   | 0.00105           |   | 0.00133            |   | 0.00116       |   |
| Copper (total) (mg/L)                      | 0.0    | 1.0 (DEQ MML)        | 0.00222                 |   | 0.0029            |   | 0.00209            |   | 0.00332       |   |
| Cyanide (total) (mg/L)                     | NR     |                      |                         |   | ND                |   | ND                 |   | ND            |   |
| Fluoride (total) (mg/L)                    | 0.1    | 4 (DEQ MML)          | 0.134                   |   | 0.139             |   | 0.139              |   | 1.71          |   |
| Hardness (as CaCO <sub>3</sub> ) (mg/L)    | 10     |                      | 86.6                    |   | 82.4              |   | 82                 |   | 31.1          |   |
| Iron (total) (mg/L)                        | 0.01   | 0.3 (DEQ MML)        | 0.325                   |   | 0.0885            |   | 0.0737             |   | 0.0107        |   |
| Lead (total) (mg/L)                        | 0.001  | 0.05 (DEQ MML)       | ND                      |   | ND                |   | ND                 |   | ND            |   |
| Magnesium (total) (mg/L)                   | 0.1    |                      | 7.3                     |   | 7.08              |   | 7.09               |   | 0.61          |   |
| Manganese (total) (mg/L)                   | 0.001  | 0.05 (DEQ MML)       | 0.0184                  |   | 0.00383           |   | 0.00317            |   | 0.00801       |   |
| Mercury (total inorganic) (mg/L)           | 0.0001 | 0.002 (DEQ MML)      | ND                      |   | ND                |   | ND                 |   | ND            |   |
| Nickel (total) (mg/L)                      | 0.001  |                      | 0.00197                 |   | ND                |   | ND                 |   | ND            |   |
| Nitrate (as N) (mg/L)                      | 0.1    | 10 (DEQ MML)         | 1.13                    |   | 0.852             |   | 0.808              |   | ND            |   |
| Nitrite (mg/L)                             | 0.1    |                      | ND                      |   | ND                |   | ND                 |   | ND            |   |
| Nitrate+Nitrite (total N) (mg/L)           | 0.1    |                      | 1.13                    |   | 0.852             |   | 0.808              |   | ND            |   |
| Perchlorate (ug/L)                         |        |                      | 0.194                   |   | 0.209             |   | 0.267              |   | ND            |   |
| Phosphate (mg/L)                           | NA     |                      | ND                      |   | ND                |   | ND                 |   | ND            |   |
| Phosphorus (total) (mg/L)                  | NA     |                      | 0.0293                  |   | ND                |   | ND                 |   | 0.0319        |   |
| Potassium (mg/L)                           | 0.1    |                      | 1.73                    |   | 1.48              |   | 1.49               |   | 14.9          |   |
| Selenium (total) (mg/L)                    | 0.00   | 0.01 (DEQ MML)       | 0.00125                 |   | ND                |   | ND                 |   | ND            |   |
| Silica (mg/L)                              | 0.1    |                      | 9.54                    |   | 7.98              |   | 8                  |   | 60.8          |   |
| Silicon (mg/L)                             | NR     |                      | 4.46                    |   | 3.73              |   | 3.74               |   | 28.4          |   |
| Silver (total) (mg/L)                      | 0.0    | 0.05 (DEQ MML)       | ND                      |   | ND                |   | ND                 |   | ND            |   |
| Sodium (mg/L)                              | 0.1    |                      | 10.4                    |   | 8.68              |   | 9.79               |   | 90.9          |   |
| Sulfate (mg/L)                             | 0.1    | 250 (DEQ MML)        | 19.4                    |   | 17.9              |   | 17.7               |   | 2.52          |   |
| Sulfide (mg/L)                             |        |                      | ND                      |   | ND                |   | ND                 |   | ND            |   |
| Thallium (mg/L)                            | 0.001  |                      | ND                      |   | ND                |   | ND                 |   | ND            |   |
| Uranium (mg/L)                             |        |                      | 0.00182                 |   | 0.00148           |   | 0.00141            |   | ND            |   |
| Zinc (total) (mg/L)                        | 0.001  | 5 (DEQ MML)          | 0.00351                 |   | 0.00196           |   | 0.00429            |   | 0.00398       |   |
| <b>FIELD PARAMETERS</b>                    |        |                      |                         |   |                   |   |                    |   |               |   |
| pH (pH units)                              | NA     | 6.5-8.5 (DEQ MML)    | 8.04                    |   | 7.06              |   | 7.44               |   | 8.05          |   |
| Specific Conductance (mS/cm)               | NA     |                      | 232                     |   | 252               |   | 258                |   | 531           |   |



| Analyte                                                             | MRL  | Oregon DEQ Standards | WC PUMP <sup>1</sup> |   | SIXMILE FILTER IN |   | SIXMILE FILTER OUT |   | INLAND WELL 5 |   |
|---------------------------------------------------------------------|------|----------------------|----------------------|---|-------------------|---|--------------------|---|---------------|---|
|                                                                     |      |                      | Sample Date:         |   | 10/24/2019        |   | 10/29/2018         |   | 10/29/2018    |   |
|                                                                     |      |                      | Lab ID:              |   | 191027021-001     |   | 181030050-001      |   | 181030050-002 |   |
|                                                                     |      |                      | Result               | Q | Result            | Q | Result             | Q | Result        | Q |
| Turbidity (NTUs)                                                    | NA   | 1 (DEQ MML)          | 4.59                 |   |                   |   |                    |   | 8             |   |
| Temperature (°F)                                                    | NA   |                      | 51.75                |   | 54.3              |   | 54.12              |   | 71.92         |   |
| Dissolved Oxygen (mg/L)                                             | NA   |                      | 10.16                |   | 9.25              |   | 9.32               |   | 0.05          |   |
| Oxidation-reduction potential (mV)                                  | NA   |                      | 160.3                |   | 81.7              |   | 624.3              |   | 31.8          |   |
| <b>MISCELLANEOUS</b>                                                |      |                      |                      |   |                   |   |                    |   |               |   |
| Color (color units)                                                 |      | 15 (DEQ MML)         | 5                    |   | ND                |   | ND                 |   | 5             |   |
| Corrosivity <sup>†</sup> (S.U.)                                     |      |                      | -0.739               |   | -0.684            |   | -0.621             |   | 0.065         |   |
| Foaming Agents (MBAS): (mg/L)                                       |      | 0.5 (DEQ MML)        | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Odor (T.O.N.)                                                       |      | 3 TON (DEQ MML)      | ND                   |   | ND                |   | ND                 |   | 4             |   |
| Total Dissolved Solids (mg/L)                                       | 10   | 500 (DEQ MML)        | 142                  |   | 120               |   | 134                |   | 285           |   |
| Total Organic Carbon (mg/L)                                         | 0.5  |                      | 1.6                  |   | 1.66              |   | 1.68               |   | 0.369         |   |
| Total Suspended Solids (mg/L)                                       | 1    |                      | 3.94                 |   | 1.24              |   | ND                 |   | ND            |   |
| <b>VOLATILE ORGANIC COMPOUNDS (VOCs)</b>                            |      |                      |                      |   |                   |   |                    |   |               |   |
| 1,1-Dichloroethylene (ug/L)                                         | 0.5  | 7 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND            |   |
| 1,1,1-Trichloroethane (ug/L)                                        | 0.5  | 200 (DEQ MML)        |                      |   | ND                |   | ND                 |   | ND            |   |
| 1,2-Dichloroethane (ug/L)                                           | 0.5  | 5 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND            |   |
| Benzene (ug/L)                                                      | 0.5  | 5 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND            |   |
| Carbon tetrachloride (ug/L)                                         | 0.5  | 5 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND            |   |
| p-Dichlorobenzene (1,4-) (ug/L)                                     | 0.5  | 75 (DEQ MML)         |                      |   | ND                |   | ND                 |   | ND            |   |
| Trichloroethylene (TCE) (ug/L)                                      | 0.5  | 5 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND            |   |
| Vinyl chloride (ug/L)                                               | 0.5  | 2 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND            |   |
| <b>DISINFECTION BY-PRODUCTS (DBPs) &amp; RESIDUAL DISINFECTANTS</b> |      |                      |                      |   |                   |   |                    |   |               |   |
| Total Trihalomethanes (TTHM) (ug/L)                                 | 0.5  | 10 (DEQ MML)         |                      |   | ND                |   | 1.25               |   | ND            |   |
| <b>MICROBIAL</b>                                                    |      |                      |                      |   |                   |   |                    |   |               |   |
| Total Coliforms (cell count per 100 mL)                             |      | <1/100mL             | 435                  |   | 93                |   | 62                 |   |               |   |
| Fecal Coliforms (cell count per 100 mL)                             |      | Confirmed presence   | 18.9                 |   |                   |   |                    |   |               |   |
| E. Coli (cell count per 100 mL)                                     |      | Confirmed presence   | 23.8                 |   | 5                 |   | 0                  |   |               |   |
| <b>SYNTHETIC ORGANIC COMPOUNDS (SOCs)</b>                           |      |                      |                      |   |                   |   |                    |   |               |   |
| 2,4-D (ug/L)                                                        | 0.1  | 10 (DEQ MML)         |                      |   | ND                |   | ND                 |   | ND            |   |
| 2,4,5-TP (Silvex) (ug/L)                                            |      | 10 (DEQ MML)         |                      |   | ND                |   | ND                 |   | ND            |   |
| Dacthal (ug/L)                                                      |      |                      |                      |   | ND                |   | ND                 |   |               |   |
| Endrin (ug/L)                                                       | 0.02 | 0.2 (DEQ MML)        |                      |   | ND                |   | ND                 |   | ND            |   |
| Lindane (BHC-gamma) (mg/L)                                          |      | 0.004 (DEQ MML)      |                      |   | ND                |   | ND                 |   | ND            |   |
| Methoxychlor (mg/L)                                                 |      | 0.100 (DEQ MML)      |                      |   | ND                |   | ND                 |   | ND            |   |
| Toxaphene (ug/L)                                                    | 2    | 0.005 (DEQ MML)      |                      |   | ND                |   | ND                 |   | ND            |   |
| <b>RADIOLOGICALS</b>                                                |      |                      |                      |   |                   |   |                    |   |               |   |
| Gross Alpha (pCi/L)                                                 |      | 15 (DEQ MML)         | <3+/-0.978           |   | 1.78+/-0.774      |   | 1.26+/-0.615       |   | <1.20+/-0.963 |   |
| Gross Beta (pCi/L)                                                  |      | 50 pCi/L (DEQ MML)   | <4+/-0.780           |   | 2.33+/-0.556      |   | 1.33+/-0.465       |   | 9.73+/-1.47   |   |

**Notes:**

Result is over DEQ MML

Result is over 1/2 DEQ MML

†: Corrosivity analysis by Langelier Index

1: WC Pump = Willow Creek Pump Station



**Table A-4**  
**Water Quality Samples—April 30, 2019**  
 Threemile Canyon Farms  
 Boardman, Oregon

| Analyte                                    | MRL    | Oregon DEQ Standards | WC PUMP <sup>1</sup> |   | SIXMILE FILTER IN |   | SIXMILE FILTER OUT |   | INLAND WELL 5 |   |
|--------------------------------------------|--------|----------------------|----------------------|---|-------------------|---|--------------------|---|---------------|---|
|                                            |        |                      | Sample Date:         |   | 4/30/2019         |   | 4/30/2019          |   | 6/19/2019     |   |
|                                            |        |                      | Lab ID:              |   | 190501031-001     |   | 190501031-002      |   | 190501031-001 |   |
|                                            |        |                      | Result               | Q | Result            | Q | Result             | Q | Result        | Q |
| <b>INORGANIC CHEMICALS (IOCs)</b>          |        |                      |                      |   |                   |   |                    |   |               |   |
| <b>FORMULA</b>                             |        |                      |                      |   |                   |   |                    |   |               |   |
| Alkalinity (as CaCO <sub>3</sub> ) (mg/L)  | 5      |                      | 76                   |   | 100               |   | 100                |   | 178           |   |
| Aluminum (total) (mg/L)                    | 0.01   |                      | 0.238                |   | 3.17              |   | 3.04               |   | ND            |   |
| Antimony (total) (mg/L)                    | 0.001  |                      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Arsenic (total) (mg/L)                     | 0.001  | 0.050 (DEQ MML)      | 0.00175              |   | 0.00193           |   | 0.00182            |   | ND            |   |
| Barium (total) (mg/L)                      | 0.001  | 1 (DEQ MML)          | 0.0347               |   | 0.0541            |   | 0.0504             |   | 0.0269        |   |
| Bicarbonate (as CaCO <sub>3</sub> ) (mg/L) | 5      |                      | 76                   |   | 100               |   | 100                |   | 178           |   |
| Beryllium (total) (mg/L)                   | 0.001  |                      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Cadmium (total) (mg/L)                     | 0.001  | 0.01 (DEQ MML)       | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Calcium (total) (mg/L)                     | 0.1    |                      | 22.6                 |   | 22.3              |   | 22.3               |   | 8.13          |   |
| Carbonate (as CaCO <sub>3</sub> ) (mg/L)   | 5      |                      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Chloramine (mg/L)                          |        |                      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Chloride (total) (mg/L)                    | 0.1    | 250 (DEQ MML)        | 5.25                 |   | 6                 |   | 9.22               |   | 37.1          |   |
| Chromium (total) (mg/L)                    | 0.001  | 0.05 (DEQ MML)       | 0.0139               |   | 0.00337           |   | 0.00298            |   | 0.00116       |   |
| Copper (total) (mg/L)                      | 0.0    | 1.0 (DEQ MML)        | 0.00222              |   | 0.00698           |   | 0.0072             |   | 0.00332       |   |
| Cyanide (total) (mg/L)                     | NR     |                      |                      |   | ND                |   | ND                 |   | ND            |   |
| Fluoride (total) (mg/L)                    | 0.1    | 4 (DEQ MML)          | 0.134                |   | 0.176             |   | 0.18               |   | 1.71          |   |
| Hardness (as CaCO <sub>3</sub> ) (mg/L)    | 10     |                      | 86.6                 |   | 89.3              |   | 89                 |   | 31.1          |   |
| Iron (total) (mg/L)                        | 0.01   | 0.3 (DEQ MML)        | 0.325                |   | 3.86              |   | 3.64               |   | 0.0107        |   |
| Lead (total) (mg/L)                        | 0.001  | 0.05 (DEQ MML)       | ND                   |   | 0.00141           |   | 0.00108            |   | ND            |   |
| Magnesium (total) (mg/L)                   | 0.1    |                      | 7.3                  |   | 8.14              |   | 8.06               |   | 0.61          |   |
| Manganese (total) (mg/L)                   | 0.001  | 0.05 (DEQ MML)       | 0.0184               |   | 0.0692            |   | 0.0586             |   | 0.00801       |   |
| Mercury (total inorganic) (mg/L)           | 0.0001 | 0.002 (DEQ MML)      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Nickel (total) (mg/L)                      | 0.001  |                      | 0.00197              |   | 0.00277           |   | 0.00269            |   | ND            |   |
| Nitrate (as N) (mg/L)                      | 0.1    | 10 (DEQ MML)         | 1.13                 |   | 1.1               |   | 1.23               |   | ND            |   |
| Nitrite (mg/L)                             | 0.1    |                      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Nitrate+Nitrite (total N) (mg/L)           | 0.1    |                      | 1.13                 |   | 1.1               |   | 1.23               |   | ND            |   |
| Perchlorate (ug/L)                         |        |                      | 0.194                |   | 0.201             |   | 0.245              |   | ND            |   |
| Phosphate (mg/L)                           | NA     |                      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Phosphorus (total) (mg/L)                  | NA     |                      | 0.0293               |   | 0.211             |   | 0.188              |   | 0.0319        |   |
| Potassium (mg/L)                           | 0.1    |                      | 1.73                 |   | 3.69              |   | 3.61               |   | 14.9          |   |
| Selenium (total) (mg/L)                    | 0.00   | 0.01 (DEQ MML)       | 0.00125              |   | ND                |   | ND                 |   | ND            |   |
| Silica (mg/L)                              | 0.1    |                      | 9.54                 |   | 50.1              |   | 49.4               |   | 60.8          |   |
| Silicon (mg/L)                             | NR     |                      | 4.46                 |   | 23.4              |   | 23.1               |   | 28.4          |   |
| Silver (total) (mg/L)                      | 0.0    | 0.05 (DEQ MML)       | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Sodium (mg/L)                              | 0.1    |                      | 10.4                 |   | 14.8              |   | 17.5               |   | 90.9          |   |
| Sulfate (mg/L)                             | 0.1    | 250 (DEQ MML)        | 19.4                 |   | 9.05              |   | 9.72               |   | 2.52          |   |
| Sulfide (mg/L)                             |        |                      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Thallium (mg/L)                            | 0.001  |                      | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Uranium (mg/L)                             |        |                      | 0.00182              |   | 0.0012            |   | 0.00122            |   | ND            |   |
| Zinc (total) (mg/L)                        | 0.001  | 5 (DEQ MML)          | 0.00351              |   | 0.0118            |   | 0.0136             |   | 0.00398       |   |
| <b>FIELD PARAMETERS</b>                    |        |                      |                      |   |                   |   |                    |   |               |   |
| pH (pH units)                              | NA     | 6.5-8.5 (DEQ MML)    | 8.04                 |   | 7.21              |   | 7.66               |   | 8.05          |   |
| Specific Conductance (mS/cm)               | NA     |                      | 232                  |   | 267               |   | 288                |   | 531           |   |



| Analyte                                                             | MRL  | Oregon DEQ Standards | WC PUMP <sup>1</sup> |   | SIXMILE FILTER IN |   | SIXMILE FILTER OUT |   | INLAND WELL 5 |   |
|---------------------------------------------------------------------|------|----------------------|----------------------|---|-------------------|---|--------------------|---|---------------|---|
|                                                                     |      |                      | Sample Date:         |   | 4/30/2019         |   | 4/30/2019          |   | 6/19/2019     |   |
|                                                                     |      |                      | Lab ID:              |   | 191027021-001     |   | 190501031-001      |   | 190501031-002 |   |
|                                                                     |      |                      | Result               | Q | Result            | Q | Result             | Q | Result        | Q |
| Turbidity (NTUs)                                                    | NA   | 1 (DEQ MML)          | 4.59                 |   | very high         |   | very high          |   | 8             |   |
| Temperature (°F)                                                    | NA   |                      | 51.75                |   | 51.38             |   | 50.46              |   | 71.92         |   |
| Dissolved Oxygen (mg/L)                                             | NA   |                      | 10.16                |   | 9.93              |   | 9.79               |   | 0.05          |   |
| Oxidation-reduction potential (mV)                                  | NA   |                      | 160.3                |   | 71.5              |   | 680.2              |   | 31.8          |   |
| <b>MISCELLANEOUS</b>                                                |      |                      |                      |   |                   |   |                    |   |               |   |
| Color (color units)                                                 |      | 15 (DEQ MML)         | 5                    |   | 40                |   | 30                 |   | 5             |   |
| Corrosivity <sup>†</sup> (S.U.)                                     |      |                      | -0.739               |   | -0.57             |   | -0.533             |   | 0.065         |   |
| Foaming Agents (MBAS): (mg/L)                                       |      | 0.5 (DEQ MML)        | ND                   |   | ND                |   | ND                 |   | ND            |   |
| Odor (T.O.N.)                                                       |      | 3 TON (DEQ MML)      | ND                   |   | ND                |   | ND                 |   | 4             |   |
| Total Dissolved Solids (mg/L)                                       | 10   | 500 (DEQ MML)        | 142                  |   | 198               |   | 214                |   | 295           |   |
| Total Organic Carbon (mg/L)                                         | 0.5  |                      | 1.6                  |   | 5.97              |   | 6.32               |   | 0.369         |   |
| Total Suspended Solids (mg/L)                                       | 1    |                      | 3.94                 |   | 42.2              |   | 41.2               |   | ND            |   |
| <b>VOLATILE ORGANIC COMPOUNDS (VOCs)</b>                            |      |                      |                      |   |                   |   |                    |   |               |   |
| 1,1-Dichloroethylene (ug/L)                                         | 0.5  | 7 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND            |   |
| 1,1,1-Trichloroethane (ug/L)                                        | 0.5  | 200 (DEQ MML)        |                      |   | ND                |   | ND                 |   | ND            |   |
| 1,2-Dichloroethane (ug/L)                                           | 0.5  | 5 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND            |   |
| Benzene (ug/L)                                                      | 0.5  | 5 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND            |   |
| Carbon tetrachloride (ug/L)                                         | 0.5  | 5 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND            |   |
| p-Dichlorobenzene (1,4-) (ug/L)                                     | 0.5  | 75 (DEQ MML)         |                      |   | ND                |   | ND                 |   | ND            |   |
| Trichloroethylene (TCE) (ug/L)                                      | 0.5  | 5 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND            |   |
| Vinyl chloride (ug/L)                                               | 0.5  | 2 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND            |   |
| <b>DISINFECTION BY-PRODUCTS (DBPs) &amp; RESIDUAL DISINFECTANTS</b> |      |                      |                      |   |                   |   |                    |   |               |   |
| Total Trihalomethanes (TTHM) (ug/L)                                 | 0.5  | 10 (DEQ MML)         |                      |   | ND                |   | 15.1               |   | ND            |   |
| <b>MICROBIAL</b>                                                    |      |                      |                      |   |                   |   |                    |   |               |   |
| Total Coliforms (cell count per 100 mL)                             |      | <1/100mL             | 435                  |   | 770               |   | ND                 |   |               |   |
| Fecal Coliforms (cell count per 100 mL)                             |      | Confirmed presence   | 18.9                 |   |                   |   |                    |   |               |   |
| E. Coli (cell count per 100 mL)                                     |      | Confirmed presence   | 23.8                 |   | 23                |   | ND                 |   |               |   |
| <b>SYNTHETIC ORGANIC COMPOUNDS (SOCs)</b>                           |      |                      |                      |   |                   |   |                    |   |               |   |
| 2,4-D (ug/L)                                                        | 0.1  | 10 (DEQ MML)         |                      |   | ND                |   | ND                 |   | ND            |   |
| 2,4,5-TP (Silvex) (ug/L)                                            |      | 10 (DEQ MML)         |                      |   | ND                |   | ND                 |   | ND            |   |
| Dacthal (ug/L)                                                      |      |                      |                      |   | ND                |   | ND                 |   |               |   |
| Endrin (ug/L)                                                       | 0.02 | 0.2 (DEQ MML)        |                      |   | ND                |   | ND                 |   | ND            |   |
| Lindane (BHC-gamma) (mg/L)                                          |      | 0.004 (DEQ MML)      |                      |   | ND                |   | ND                 |   | ND            |   |
| Methoxychlor (mg/L)                                                 |      | 0.100 (DEQ MML)      |                      |   | ND                |   | ND                 |   | ND            |   |
| Toxaphene (ug/L)                                                    | 2    | 0.005 (DEQ MML)      |                      |   | ND                |   | ND                 |   | ND            |   |
| <b>RADIOLOGICALS</b>                                                |      |                      |                      |   |                   |   |                    |   |               |   |
| Gross Alpha (pCi/L)                                                 |      | 15 (DEQ MML)         | <3+/-0.978           |   | 3.14+/-1.38       |   | 2.77+/-1.31        |   | <1.20+/-0.963 |   |
| Gross Beta (pCi/L)                                                  |      | 50 pCi/L (DEQ MML)   | <4+/-0.780           |   | 5.24+/-0.829      |   | 4.12+/-0.828       |   | 9.73+/-1.47   |   |

**Notes:**

Result is over DEQ MML

Result is over 1/2 DEQ MML

†: Corrosivity analysis by Langletier Index

1: WC Pump = Willow Creek Pump Station



**Table A-5**  
**Water Quality Sample-June 6, 2019**  
 Threemile Canyon Farms  
 Boardman, Oregon

| Analyte                                    | MRL    | Oregon DEQ Standards | WC PUMP <sup>1</sup> |   | SIXMILE FILTER IN |   | SIXMILE FILTER OUT |   | INLAND BOOSTER |   | INLAND WELL 5 |   |
|--------------------------------------------|--------|----------------------|----------------------|---|-------------------|---|--------------------|---|----------------|---|---------------|---|
|                                            |        |                      | Sample Date:         |   | 6/6/2019          |   | 6/6/2019           |   | 6/6/2019       |   | 6/19/2019     |   |
|                                            |        |                      | Lab ID:              |   | 191027021-001     |   | 190607059-001      |   | 190607059-002  |   | 190607059-003 |   |
|                                            |        |                      | Result               | Q | Result            | Q | Result             | Q | Result         | Q | Result        | Q |
| <b>INORGANIC CHEMICALS (IOCs)</b>          |        |                      |                      |   |                   |   |                    |   |                |   |               |   |
| <b>FORMULA</b>                             |        |                      |                      |   |                   |   |                    |   |                |   |               |   |
| Alkalinity (as CaCO <sub>3</sub> ) (mg/L)  | 5      |                      | 76                   |   | 68                |   | 72                 |   | 74             |   | 178           |   |
| Aluminum (total) (mg/L)                    | 0.01   |                      | 0.238                |   | 0.342             |   | 0.19               |   | 0.626          |   | ND            |   |
| Antimony (total) (mg/L)                    | 0.001  |                      | ND                   |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Arsenic (total) (mg/L)                     | 0.001  | 0.050 (DEQ MML)      | 0.00175              |   | 0.00174           |   | ND                 |   | 0.00146        |   | ND            |   |
| Barium (total) (mg/L)                      | 0.001  | 1 (DEQ MML)          | 0.0347               |   | 0.0297            |   | 0.0287             |   | 0.0343         |   | 0.0269        |   |
| Bicarbonate (as CaCO <sub>3</sub> ) (mg/L) | 5      |                      | 76                   |   | 68                |   | 72                 |   | 74             |   | 178           |   |
| Beryllium (total) (mg/L)                   | 0.001  |                      | ND                   |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Cadmium (total) (mg/L)                     | 0.001  | 0.01 (DEQ MML)       | ND                   |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Calcium (total) (mg/L)                     | 0.1    |                      | 22.6                 |   | 17.9              |   | 18.4               |   | 18.2           |   | 8.13          |   |
| Carbonate (as CaCO <sub>3</sub> ) (mg/L)   | 5      |                      | ND                   |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Chloramine (mg/L)                          |        |                      | ND                   |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Chloride (total) (mg/L)                    | 0.1    | 250 (DEQ MML)        | 5.25                 |   | 4.28              |   | 7.55               |   | 4.94           |   | 37.1          |   |
| Chromium (total) (mg/L)                    | 0.001  | 0.05 (DEQ MML)       | 0.0139               |   | 0.00103           |   | 0.00694            |   | 0.0012         |   | 0.00116       |   |
| Copper (total) (mg/L)                      | 0.0    | 1.0 (DEQ MML)        | 0.00222              |   | 0.00228           |   | 0.00431            |   | 0.0114         |   | 0.00332       |   |
| Cyanide (total) (mg/L)                     | NR     |                      |                      |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Fluoride (total) (mg/L)                    | 0.1    | 4 (DEQ MML)          | 0.134                |   | 0.131             |   | 0.137              |   | 0.135          |   | 1.71          |   |
| Hardness (as CaCO <sub>3</sub> ) (mg/L)    | 10     |                      | 86.6                 |   | 66.8              |   | 68.6               |   | 69.5           |   | 31.1          |   |
| Iron (total) (mg/L)                        | 0.01   | 0.3 (DEQ MML)        | 0.325                |   | 0.467             |   | 0.298              |   | 0.804          |   | 0.0107        |   |
| Lead (total) (mg/L)                        | 0.001  | 0.05 (DEQ MML)       | ND                   |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Magnesium (total) (mg/L)                   | 0.1    |                      | 7.3                  |   | 5.46              |   | 5.49               |   | 5.83           |   | 0.61          |   |
| Manganese (total) (mg/L)                   | 0.001  | 0.05 (DEQ MML)       | 0.0184               |   | 0.0177            |   | 0.0104             |   | 0.0292         |   | 0.00801       |   |
| Mercury (total inorganic) (mg/L)           | 0.0001 | 0.002 (DEQ MML)      | ND                   |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Nickel (total) (mg/L)                      | 0.001  |                      | 0.00197              |   | ND                |   | 0.00472            |   | 0.00158        |   | ND            |   |
| Nitrate (as N) (mg/L)                      | 0.1    | 10 (DEQ MML)         | 1.13                 |   | 0.315             |   | 0.35               |   | 0.41           |   | ND            |   |
| Nitrite (mg/L)                             | 0.1    |                      | ND                   |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Nitrate+Nitrite (total N) (mg/L)           | 0.1    |                      | 1.13                 |   | 0.315             |   | 0.35               |   | 0.41           |   | ND            |   |
| Perchlorate (ug/L)                         |        |                      | 0.194                |   | 0.122             |   | 0.252              |   | 0.143          |   | ND            |   |
| Phosphate (mg/L)                           | NA     |                      | ND                   |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Phosphorus (total) (mg/L)                  | NA     |                      | 0.0293               |   | 0.0469            |   | 0.16               |   | 0.053          |   | 0.0319        |   |
| Potassium (mg/L)                           | 0.1    |                      | 1.73                 |   | 1.61              |   | 1.63               |   | 1.73           |   | 14.9          |   |
| Selenium (total) (mg/L)                    | 0.00   | 0.01 (DEQ MML)       | 0.00125              |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Silica (mg/L)                              | 0.1    |                      | 9.54                 |   | 13.5              |   | 13.3               |   | 15.9           |   | 60.8          |   |
| Silicon (mg/L)                             | NR     |                      | 4.46                 |   | 2.63              |   | 6.31               |   | 7.45           |   | 28.4          |   |
| Silver (total) (mg/L)                      | 0.0    | 0.05 (DEQ MML)       | ND                   |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Sodium (mg/L)                              | 0.1    |                      | 10.4                 |   | 8.33              |   | 11.9               |   | 9.14           |   | 90.9          |   |
| Sulfate (mg/L)                             | 0.1    | 250 (DEQ MML)        | 19.4                 |   | 10.7              |   | 11.1               |   | 11.7           |   | 2.52          |   |
| Sulfide (mg/L)                             |        |                      | ND                   |   | 0.435             |   | 0.291              |   | 0.422          |   | ND            |   |
| Thallium (mg/L)                            | 0.001  |                      | ND                   |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Uranium (mg/L)                             |        |                      | 0.00182              |   | 0.00112           |   | ND                 |   | 0.00116        |   | ND            |   |
| Zinc (total) (mg/L)                        | 0.001  | 5 (DEQ MML)          | 0.00351              |   | 0.00339           |   | 0.0254             |   | 0.00577        |   | 0.00398       |   |
| <b>FIELD PARAMETERS</b>                    |        |                      |                      |   |                   |   |                    |   |                |   |               |   |
| pH (pH units)                              | NA     | 6.5-8.5 (DEQ MML)    | 8.04                 |   | 7.61              |   | 7.97               |   | 7.81           |   | 8.05          |   |
| Specific Conductance (mS/cm)               | NA     |                      | 232                  |   | 195               |   | 216                |   | 216            |   | 531           |   |



| Analyte                                                             |              |                      | WC PUMP <sup>1</sup> |   | SIXMILE FILTER IN |   | SIXMILE FILTER OUT |   | INLAND BOOSTER |   | INLAND WELL 5 |   |
|---------------------------------------------------------------------|--------------|----------------------|----------------------|---|-------------------|---|--------------------|---|----------------|---|---------------|---|
|                                                                     | Sample Date: |                      | 10/24/2019           |   | 6/6/2019          |   | 6/6/2019           |   | 6/6/2019       |   | 6/19/2019     |   |
|                                                                     | Lab ID:      |                      | 191027021-001        |   | 190607059-001     |   | 190607059-002      |   | 190607059-003  |   | 190501031-001 |   |
|                                                                     | MRL          | Oregon DEQ Standards | Result               | Q | Result            | Q | Result             | Q | Result         | Q | Result        | Q |
| Turbidity (NTUs)                                                    | NA           | 1 (DEQ MML)          | 4.59                 |   | 0                 |   | 4                  |   | 37             |   | 8             |   |
| Temperature (°F)                                                    | NA           |                      | 51.75                |   | 58.51             |   | 58.58              |   | 76.51          |   | 71.92         |   |
| Dissolved Oxygen (mg/L)                                             | NA           |                      | 10.16                |   | 10.25             |   | 9.92               |   | 9.55           |   | 0.05          |   |
| Oxidation-reduction potential (mV)                                  | NA           |                      | 160.3                |   | 63.5              |   | 397.2              |   | 302.3          |   | 31.8          |   |
| <b>MISCELLANEOUS</b>                                                |              |                      |                      |   |                   |   |                    |   |                |   |               |   |
| Color (color units)                                                 |              | 15 (DEQ MML)         | 5                    |   | 15                |   | 10                 |   | 20             |   | 5             |   |
| Corrosivity <sup>†</sup> (S.U.)                                     |              |                      | -0.739               |   | -0.725            |   | -0.661             |   | -0.664         |   | 0.065         |   |
| Foaming Agents (MBAS) (mg/L)                                        |              | 0.5 (DEQ MML)        | ND                   |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Odor (T.O.N.)                                                       |              | 3 TON (DEQ MML)      | ND                   |   | ND                |   | ND                 |   | ND             |   | 4             |   |
| Total Dissolved Solids (mg/L)                                       | 10           | 500 (DEQ MML)        | 142                  |   | 82                |   | 110                |   | 111            |   | 295           |   |
| Total Organic Carbon (mg/L)                                         | 0.5          |                      | 1.6                  |   | 2.7               |   | 2.69               |   | 2.66           |   | 0.369         |   |
| Total Suspended Solids (mg/L)                                       | 1            |                      | 3.94                 |   | 13.4              |   | 3.58               |   | 23.2           |   | ND            |   |
| <b>VOLATILE ORGANIC COMPOUNDS (VOCs)</b>                            |              |                      |                      |   |                   |   |                    |   |                |   |               |   |
| 1,1-Dichloroethylene (ug/L)                                         | 0.5          | 7 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| 1,1,1-Trichloroethane (ug/L)                                        | 0.5          | 200 (DEQ MML)        |                      |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| 1,2-Dichloroethane (ug/L)                                           | 0.5          | 5 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Benzene (ug/L)                                                      | 0.5          | 5 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Carbon tetrachloride (ug/L)                                         | 0.5          | 5 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| p-Dichlorobenzene (1,4-) (ug/L)                                     | 0.5          | 75 (DEQ MML)         |                      |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Trichloroethylene (TCE) (ug/L)                                      | 0.5          | 5 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Vinyl chloride (ug/L)                                               | 0.5          | 2 (DEQ MML)          |                      |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| <b>DISINFECTION BY-PRODUCTS (DBPs) &amp; RESIDUAL DISINFECTANTS</b> |              |                      |                      |   |                   |   |                    |   |                |   |               |   |
| Total Trihalomethanes (TTHM) (ug/L)                                 | 0.5          | 10 (DEQ MML)         |                      |   | ND                |   | 0.0156             |   | ND             |   | ND            |   |
| <b>MICROBIAL</b>                                                    |              |                      |                      |   |                   |   |                    |   |                |   |               |   |
| Total Coliforms (cell count per 100 mL)                             |              | <1/100mL             | 435                  |   | 921               |   | ND                 |   | 1990           |   |               |   |
| Fecal Coliforms (cell count per 100 mL)                             |              | Confirmed presence   | 18.9                 |   | 20.3              |   | ND                 |   | 35.4           |   |               |   |
| E. Coli (cell count per 100 mL)                                     |              | Confirmed presence   | 23.8                 |   | 15                |   | ND                 |   | 13             |   |               |   |
| <b>SYNTHETIC ORGANIC COMPOUNDS (SOCs)</b>                           |              |                      |                      |   |                   |   |                    |   |                |   |               |   |
| 2,4-D (ug/L)                                                        | 0.1          | 10 (DEQ MML)         |                      |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| 2,4,5-TP (Silvex) (ug/L)                                            |              | 10 (DEQ MML)         |                      |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Dacthal (ug/L)                                                      |              |                      |                      |   | ND                |   | ND                 |   | ND             |   |               |   |
| Endrin (ug/L)                                                       | 0.02         | 0.2 (DEQ MML)        |                      |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Lindane (BHC-gamma) (mg/L)                                          |              | 0.004 (DEQ MML)      |                      |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Methoxychlor (mg/L)                                                 |              | 0.100 (DEQ MML)      |                      |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| Toxaphene (ug/L)                                                    | 2            | 0.005 (DEQ MML)      |                      |   | ND                |   | ND                 |   | ND             |   | ND            |   |
| <b>RADIOLOGICALS</b>                                                |              |                      |                      |   |                   |   |                    |   |                |   |               |   |
| Gross Alpha (pCi/L)                                                 |              | 15 (DEQ MML)         | <3+/-0.978           |   | 1.85+/-0.763      |   | 2.10+/-1.03        |   | 1.37+/-0.822   |   | <1.20+/-0.963 |   |
| Gross Beta (pCi/L)                                                  |              | 50 pCi/L (DEQ MML)   | <4+/-0.780           |   | 2.68+/-0.567      |   | 2.28+/-0.540       |   | 2.24+/-0.538   |   | 9.73+/-1.47   |   |

**Notes:**

Result is over DEQ MML

Result is over 1/2 DEQ MML

†: Corrosivity analysis by Langelier Index

1: WC Pump = Willow Creek Pump Station



**Table A-6**  
**Water Quality Sample-September 17, 2019**  
 Threemile Canyon Farms  
 Boardman, Oregon

| Analyte                                    | MRL    | Oregon DEQ Standards | WC PUMP <sup>1</sup>    |   | INLAND BOOSTER |   | SIXMILE FILTER IN |   | SIXMILE FILTER OUT |   | INLAND WELL 5 |   |
|--------------------------------------------|--------|----------------------|-------------------------|---|----------------|---|-------------------|---|--------------------|---|---------------|---|
|                                            |        |                      | Sample Date: 10/24/2019 |   | 9/17/2019      |   | 9/17/2019         |   | 9/17/2019          |   | 6/19/2019     |   |
|                                            |        |                      | Lab ID: 191027021-001   |   | 190918045-011  |   | 190918045-001     |   | 190918045-006      |   | 190501031-001 |   |
|                                            |        |                      | Result                  | Q | Result         | Q | Result            | Q | Result             | Q | Result        | Q |
| <b>INORGANIC CHEMICALS (IOCs)</b>          |        |                      |                         |   |                |   |                   |   |                    |   |               |   |
| <b>FORMULA</b>                             |        |                      |                         |   |                |   |                   |   |                    |   |               |   |
| Alkalinity (as CaCO <sub>3</sub> ) (mg/L)  | 5      |                      | 76                      |   | 62             |   | 62                |   | 62                 |   | 178           |   |
| Aluminum (total) (mg/L)                    | 0.01   |                      | 0.238                   |   | 0.0665         |   | 0.109             |   | 0.0923             |   | ND            |   |
| Antimony (total) (mg/L)                    | 0.001  |                      | ND                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Arsenic (total) (mg/L)                     | 0.001  | 0.050 (DEQ MML)      | 0.00175                 |   | ND             |   | 0.0012            |   | ND                 |   | ND            |   |
| Barium (total) (mg/L)                      | 0.001  | 1 (DEQ MML)          | 0.0347                  |   | 0.0287         |   | 0.0308            |   | 0.0302             |   | 0.0269        |   |
| Bicarbonate (as CaCO <sub>3</sub> ) (mg/L) | 5      |                      | 76                      |   | 62             |   | 62                |   | 62                 |   | 178           |   |
| Beryllium (total) (mg/L)                   | 0.001  |                      | ND                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Cadmium (total) (mg/L)                     | 0.001  | 0.01 (DEQ MML)       | ND                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Calcium (total) (mg/L)                     | 0.1    |                      | 22.6                    |   | 16.9           |   | 17                |   | 17.6               |   | 8.13          |   |
| Carbonate (as CaCO <sub>3</sub> ) (mg/L)   | 5      |                      | ND                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Chloramine (mg/L)                          |        |                      | ND                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Chloride (total) (mg/L)                    | 0.1    | 250 (DEQ MML)        | 5.25                    |   | 2.22           |   | 2.2               |   | 6.98               |   | 37.1          |   |
| Chromium (total) (mg/L)                    | 0.001  | 0.05 (DEQ MML)       | 0.0139                  |   | 0.00253        |   | 0.00297           |   | 0.00307            |   | 0.00116       |   |
| Copper (total) (mg/L)                      | 0.0    | 1.0 (DEQ MML)        | 0.00222                 |   | 0.00125        |   | 0.00182           |   | 0.00293            |   | 0.00332       |   |
| Cyanide (total) (mg/L)                     | NR     |                      |                         |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Fluoride (total) (mg/L)                    | 0.1    | 4 (DEQ MML)          | 0.134                   |   | ND             |   | ND                |   | ND                 |   | 1.71          |   |
| Hardness (as CaCO <sub>3</sub> ) (mg/L)    | 10     |                      | 86.6                    |   | 61.4           |   | 61.9              |   | 64.2               |   | 31.1          |   |
| Iron (total) (mg/L)                        | 0.01   | 0.3 (DEQ MML)        | 0.325                   |   | 0.0699         |   | 0.146             |   | 0.108              |   | 0.0107        |   |
| Lead (total) (mg/L)                        | 0.001  | 0.05 (DEQ MML)       | ND                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Magnesium (total) (mg/L)                   | 0.1    |                      | 7.3                     |   | 4.65           |   | 4.71              |   | 4.91               |   | 0.61          |   |
| Manganese (total) (mg/L)                   | 0.001  | 0.05 (DEQ MML)       | 0.0184                  |   | 0.0089         |   | 0.0245            |   | 0.0108             |   | 0.00801       |   |
| Mercury (total inorganic) (mg/L)           | 0.0001 | 0.002 (DEQ MML)      | ND                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Nickel (total) (mg/L)                      | 0.001  |                      | 0.00197                 |   | 0.00129        |   | ND                |   | ND                 |   | ND            |   |
| Nitrate (as N) (mg/L)                      | 0.1    | 10 (DEQ MML)         | 1.13                    |   | ND             |   | ND                |   | 0.15               |   | ND            |   |
| Nitrite (mg/L)                             | 0.1    |                      | ND                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Nitrate+Nitrite (total N) (mg/L)           | 0.1    |                      | 1.13                    |   | ND             |   | ND                |   | 0.15               |   | ND            |   |
| Perchlorate (ug/L)                         |        |                      | 0.194                   |   | 0.0838         |   | 0.0861            |   | 0.424              |   | ND            |   |
| Phosphate (mg/L)                           | NA     |                      | ND                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Phosphorus (total) (mg/L)                  | NA     |                      | 0.0293                  |   | 0.0308         |   | 0.036             |   | 0.0629             |   | 0.0319        |   |
| Potassium (mg/L)                           | 0.1    |                      | 1.73                    |   | 1.04           |   | 1.05              |   | 1.11               |   | 14.9          |   |
| Selenium (total) (mg/L)                    | 0.00   | 0.01 (DEQ MML)       | 0.00125                 |   | ND             |   | 0.00124           |   | 0.00119            |   | ND            |   |
| Silica (mg/L)                              | 0.1    |                      | 9.54                    |   | 6.96           |   | 6.87              |   | 7.34               |   | 60.8          |   |
| Silicon (mg/L)                             | NR     |                      | 4.46                    |   | 3.25           |   | 3.21              |   | 3.43               |   | 28.4          |   |
| Silver (total) (mg/L)                      | 0.0    | 0.05 (DEQ MML)       | ND                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Sodium (mg/L)                              | 0.1    |                      | 10.4                    |   | 4.2            |   | 4.23              |   | 8.33               |   | 90.9          |   |
| Sulfate (mg/L)                             | 0.1    | 250 (DEQ MML)        | 19.4                    |   | 12             |   | 11.9              |   | 12                 |   | 2.52          |   |
| Sulfide (mg/L)                             |        |                      | ND                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Thallium (mg/L)                            | 0.001  |                      | ND                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Uranium (mg/L)                             |        |                      | 0.00182                 |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Zinc (total) (mg/L)                        | 0.001  | 5 (DEQ MML)          | 0.00351                 |   | 0.00129        |   | 0.00234           |   | 0.00344            |   | 0.00398       |   |
| <b>FIELD PARAMETERS</b>                    |        |                      |                         |   |                |   |                   |   |                    |   |               |   |
| pH (pH units)                              | NA     | 6.5-8.5 (DEQ MML)    | 8.04                    |   | 7.83           |   | 7.79              |   | 8.06               |   | 8.05          |   |
| Specific Conductance (mS/cm)               | NA     |                      | 232                     |   | 154            |   | 153               |   | 171                |   | 531           |   |



| Analyte                                                             | MRL  | Oregon DEQ Standards | WC PUMP <sup>1</sup>    |   | INLAND BOOSTER |   | SIXMILE FILTER IN |   | SIXMILE FILTER OUT |   | INLAND WELL 5 |   |
|---------------------------------------------------------------------|------|----------------------|-------------------------|---|----------------|---|-------------------|---|--------------------|---|---------------|---|
|                                                                     |      |                      | Sample Date: 10/24/2019 |   | 9/17/2019      |   | 9/17/2019         |   | 9/17/2019          |   | 6/19/2019     |   |
|                                                                     |      |                      | Lab ID: 191027021-001   |   | 190918045-011  |   | 190918045-001     |   | 190918045-006      |   | 190501031-001 |   |
|                                                                     |      |                      | Result                  | Q | Result         | Q | Result            | Q | Result             | Q | Result        | Q |
| Turbidity (NTUs)                                                    | NA   | 1 (DEQ MML)          | 4.59                    |   | 3              |   | 26                |   | 8                  |   | 8             |   |
| Temperature (°F)                                                    | NA   |                      | 51.75                   |   | 67.61          |   | 67.72             |   | 67.74              |   | 71.92         |   |
| Dissolved Oxygen (mg/L)                                             | NA   |                      | 10.16                   |   | 7.14           |   | 7.1               |   | 7.01               |   | 0.05          |   |
| Oxidation-reduction potential (mV)                                  | NA   |                      | 160.3                   |   | 195.3          |   | 96.4              |   | 433.2              |   | 31.8          |   |
| <b>MISCELLANEOUS</b>                                                |      |                      |                         |   |                |   |                   |   |                    |   |               |   |
| Color (color units)                                                 |      | 15 (DEQ MML)         | 5                       |   | 15             |   | 30                |   | 20                 |   | 5             |   |
| Corrosivity <sup>†</sup> (S.U.)                                     |      |                      | -0.739                  |   | -0.93          |   | -0.973            |   | -0.893             |   | 0.065         |   |
| Foaming Agents (MBAS); (mg/L)                                       |      | 0.5 (DEQ MML)        | ND                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Odor (T.O.N.)                                                       |      | 3 TON (DEQ MML)      | ND                      |   | ND             |   | ND                |   | ND                 |   | 4             |   |
| Total Dissolved Solids (mg/L)                                       | 10   | 500 (DEQ MML)        | 142                     |   | 82             |   | 93                |   | 104                |   | 295           |   |
| Total Organic Carbon (mg/L)                                         | 0.5  |                      | 1.6                     |   | 1.36           |   | 1.27              |   | 2.01               |   | 0.369         |   |
| Total Suspended Solids (mg/L)                                       | 1    |                      | 3.94                    |   | 4.32           |   | 6.94              |   | 1.19               |   | ND            |   |
| <b>VOLATILE ORGANIC COMPOUNDS (VOCs)</b>                            |      |                      |                         |   |                |   |                   |   |                    |   |               |   |
| 1,1-Dichloroethylene (ug/L)                                         | 0.5  | 7 (DEQ MML)          |                         |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| 1,1,1-Trichloroethane (ug/L)                                        | 0.5  | 200 (DEQ MML)        |                         |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| 1,2-Dichloroethane (ug/L)                                           | 0.5  | 5 (DEQ MML)          |                         |   | ND             |   |                   |   |                    |   | ND            |   |
| Benzene (ug/L)                                                      | 0.5  | 5 (DEQ MML)          |                         |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Carbon tetrachloride (ug/L)                                         | 0.5  | 5 (DEQ MML)          |                         |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| p-Dichlorobenzene (1,4-) (ug/L)                                     | 0.5  | 75 (DEQ MML)         |                         |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Trichloroethylene (TCE) (ug/L)                                      | 0.5  | 5 (DEQ MML)          |                         |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Vinyl chloride (ug/L)                                               | 0.5  | 2 (DEQ MML)          |                         |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| <b>DISINFECTION BY-PRODUCTS (DBPs) &amp; RESIDUAL DISINFECTANTS</b> |      |                      |                         |   |                |   |                   |   |                    |   |               |   |
| Total Trihalomethanes (TTHM) (ug/L)                                 | 0.5  | 10 (DEQ MML)         |                         |   | ND             |   | ND                |   | 29.6               |   | ND            |   |
| <b>MICROBIAL</b>                                                    |      |                      |                         |   |                |   |                   |   |                    |   |               |   |
| Total Coliforms (cell count per 100 mL)                             |      | <1/100mL             | 435                     |   | 358            |   | 1200              |   | 2                  |   |               |   |
| Fecal Coliforms (cell count per 100 mL)                             |      | Confirmed presence   | 18.9                    |   | 5.2            |   | 6.3               |   | ND                 |   |               |   |
| E. Coli (cell count per 100 mL)                                     |      | Confirmed presence   | 23.8                    |   | 3.1            |   | 1                 |   | ND                 |   |               |   |
| <b>SYNTHETIC ORGANIC COMPOUNDS (SOCs)</b>                           |      |                      |                         |   |                |   |                   |   |                    |   |               |   |
| 2,4-D (ug/L)                                                        | 0.1  | 10 (DEQ MML)         |                         |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| 2,4,5-TP (Silvex) (ug/L)                                            |      | 10 (DEQ MML)         |                         |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Dacthal (ug/L)                                                      |      |                      |                         |   | ND             |   | ND                |   | ND                 |   |               |   |
| Endrin (ug/L)                                                       | 0.02 | 0.2 (DEQ MML)        |                         |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Lindane (BHC-gamma) (mg/L)                                          |      | 0.004 (DEQ MML)      |                         |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Methoxychlor (mg/L)                                                 |      | 0.100 (DEQ MML)      |                         |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Toxaphene (ug/L)                                                    | 2    | 0.005 (DEQ MML)      |                         |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| <b>RADIOLOGICALS</b>                                                |      |                      |                         |   |                |   |                   |   |                    |   |               |   |
| Gross Alpha (pCi/L)                                                 |      | 15 (DEQ MML)         | <3+/-0.978              |   | <3+/-0.646     |   | <3+/-0.692        |   | <3+/-0.743         |   | <1.20+/-0.963 |   |
| Gross Beta (pCi/L)                                                  |      | 50 pCi/L (DEQ MML)   | <4+/-0.780              |   | <4+/-1.06      |   | <4+/-0.832        |   | <4+/-0.977         |   | 9.73+/-1.47   |   |

**Notes:**

Result is over DEQ MML

Result is over 1/2 DEQ MML

†: Corrosivity analysis by Langelier Index

1: WC Pump = Willow Creek Pump Station



**Table A-7**  
**Water Quality Samples-October 23, 2019**  
**Threemile Canyon Farms**  
**Boardman, Oregon**

| Analyte                                    |        |                      | WC PUMP <sup>1</sup> |   | INLAND BOOSTER |   | SIXMILE FILTER IN |   | SIXMILE FILTER OUT |   | INLAND WELL 5 |   |
|--------------------------------------------|--------|----------------------|----------------------|---|----------------|---|-------------------|---|--------------------|---|---------------|---|
|                                            |        | Sample Date:         | 10/24/2019           |   | 10/23/2019     |   | 10/23/2019        |   | 10/23/2019         |   | 6/19/2019     |   |
|                                            |        | Lab ID:              | 191027021-001        |   | 191025051-012  |   | 191025051-001     |   | 191025051-006      |   | 190501031-001 |   |
|                                            | MRL    | Oregon DEQ Standards | Result               | Q | Result         | Q | Result            | Q | Result             | Q | Result        | Q |
| INORGANIC CHEMICALS (IOCs)                 |        |                      |                      |   |                |   |                   |   |                    |   |               |   |
| FORMULA                                    |        |                      |                      |   |                |   |                   |   |                    |   |               |   |
| Alkalinity (as CaCO <sub>3</sub> ) (mg/L)  | 5      |                      | 76                   |   | 80             |   | 80                |   | 80                 |   | 178           |   |
| Aluminum (total) (mg/L)                    | 0.01   |                      | 0.238                |   | 0.19           |   | 0.0665            |   | 0.0743             |   | ND            |   |
| Antimony (total) (mg/L)                    | 0.001  |                      | ND                   |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Arsenic (total) (mg/L)                     | 0.001  | 0.050 (DEQ MML)      | 0.00175              |   | 0.0248         |   | ND                |   | 0.00158            |   | ND            |   |
| Barium (total) (mg/L)                      | 0.001  | 1 (DEQ MML)          | 0.0347               |   | 0.0335         |   | 0.0327            |   | 0.0338             |   | 0.0269        |   |
| Bicarbonate (as CaCO <sub>3</sub> ) (mg/L) | 5      |                      | 76                   |   | 80             |   | 80                |   | 80                 |   | 178           |   |
| Beryllium (total) (mg/L)                   | 0.001  |                      | ND                   |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Cadmium (total) (mg/L)                     | 0.001  | 0.01 (DEQ MML)       | ND                   |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Calcium (total) (mg/L)                     | 0.1    |                      | 22.6                 |   | 23             |   | 22.3              |   | 22.2               |   | 8.13          |   |
| Carbonate (as CaCO <sub>3</sub> ) (mg/L)   | 5      |                      | ND                   |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Chloramine (mg/L)                          |        |                      | ND                   |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Chloride (total) (mg/L)                    | 0.1    | 250 (DEQ MML)        | 5.25                 |   | 6.24           |   | 5.85              |   | 7.51               |   | 37.1          |   |
| Chromium (total) (mg/L)                    | 0.001  | 0.05 (DEQ MML)       | 0.0139               |   | 0.0145         |   | ND                |   | ND                 |   | 0.00116       |   |
| Copper (total) (mg/L)                      | 0.0    | 1.0 (DEQ MML)        | 0.00222              |   | 0.00368        |   | 0.0133            |   | 0.00151            |   | 0.00332       |   |
| Cyanide (total) (mg/L)                     | NR     |                      |                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Fluoride (total) (mg/L)                    | 0.1    | 4 (DEQ MML)          | 0.134                |   | 0.1034         |   | ND                |   | 0.134              |   | 1.71          |   |
| Hardness (as CaCO <sub>3</sub> ) (mg/L)    | 10     |                      | 86.6                 |   | 88.2           |   | 86.3              |   | 85.7               |   | 31.1          |   |
| Iron (total) (mg/L)                        | 0.01   | 0.3 (DEQ MML)        | 0.325                |   | 0.249          |   | 0.0916            |   | 0.0995             |   | 0.0107        |   |
| Lead (total) (mg/L)                        | 0.001  | 0.05 (DEQ MML)       | ND                   |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Magnesium (total) (mg/L)                   | 0.1    |                      | 7.3                  |   | 7.46           |   | 7.41              |   | 7.32               |   | 0.61          |   |
| Manganese (total) (mg/L)                   | 0.001  | 0.05 (DEQ MML)       | 0.0184               |   | 0.0121         |   | 0.00512           |   | 0.00455            |   | 0.00801       |   |
| Mercury (total inorganic) (mg/L)           | 0.0001 | 0.002 (DEQ MML)      | ND                   |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Nickel (total) (mg/L)                      | 0.001  |                      | 0.00197              |   | ND             |   | 0.0015            |   | ND                 |   | ND            |   |
| Nitrate (as N) (mg/L)                      | 0.1    | 10 (DEQ MML)         | 1.13                 |   | 1.45           |   | 1.34              |   | 1.38               |   | ND            |   |
| Nitrite (mg/L)                             | 0.1    |                      | ND                   |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Nitrate+Nitrite (total N) (mg/L)           | 0.1    |                      | 1.13                 |   | 1.45           |   | 1.34              |   | 1.38               |   | ND            |   |
| Perchlorate (ug/L)                         |        |                      | 0.194                |   | 0.242          |   | 0.232             |   | 0.324              |   | ND            |   |
| Phosphate (mg/L)                           | NA     |                      | ND                   |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Phosphorus (total) (mg/L)                  | NA     |                      | 0.0293               |   | 0.0513         |   | 0.0472            |   | 0.0356             |   | 0.0319        |   |
| Potassium (mg/L)                           | 0.1    |                      | 1.73                 |   | 1.74           |   | 1.62              |   | 1.61               |   | 14.9          |   |
| Selenium (total) (mg/L)                    | 0.00   | 0.01 (DEQ MML)       | 0.00125              |   | 0.00125        |   | ND                |   | ND                 |   | ND            |   |
| Silica (mg/L)                              | 0.1    |                      | 9.54                 |   | 8.84           |   | 7.77              |   | 7.81               |   | 60.8          |   |
| Silicon (mg/L)                             | NR     |                      | 4.46                 |   | 4.13           |   | 3.63              |   | 3.65               |   | 28.4          |   |
| Silver (total) (mg/L)                      | 0.0    | 0.05 (DEQ MML)       | ND                   |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Sodium (mg/L)                              | 0.1    |                      | 10.4                 |   | 11.4           |   | 10.2              |   | 11.6               |   | 90.9          |   |
| Sulfate (mg/L)                             | 0.1    | 250 (DEQ MML)        | 19.4                 |   | 21.2           |   | 20.4              |   | 21                 |   | 2.52          |   |
| Sulfide (mg/L)                             |        |                      | ND                   |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Thallium (mg/L)                            | 0.001  |                      | ND                   |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Uranium (mg/L)                             |        |                      | 0.00182              |   | ND             |   | 0.00192           |   | 0.00197            |   | ND            |   |
| Zinc (total) (mg/L)                        | 0.001  | 5 (DEQ MML)          | 0.00351              |   |                |   | 0.00451           |   | 0.00323            |   | 0.00398       |   |
| FIELD PARAMETERS                           |        |                      |                      |   |                |   |                   |   |                    |   |               |   |
| pH (pH units)                              | NA     | 6.5-8.5 (DEQ MML)    | 8.04                 |   | 8.04           |   | 7.93              |   | 7.94               |   | 8.05          |   |
| Specific Conductance (mS/cm)               | NA     |                      | 232                  |   | 232            |   | 226               |   | 235                |   | 531           |   |



| Analyte                                                             | MRL  | Oregon DEQ Standards | WC PUMP <sup>1</sup> |   | INLAND BOOSTER |   | SIXMILE FILTER IN |   | SIXMILE FILTER OUT |   | INLAND WELL 5 |   |
|---------------------------------------------------------------------|------|----------------------|----------------------|---|----------------|---|-------------------|---|--------------------|---|---------------|---|
|                                                                     |      |                      | Sample Date:         |   | 10/23/2019     |   | 10/23/2019        |   | 10/23/2019         |   | 6/19/2019     |   |
|                                                                     |      |                      | Lab ID:              |   | 191027021-001  |   | 191025051-012     |   | 191025051-001      |   | 191025051-006 |   |
|                                                                     |      |                      | Result               | Q | Result         | Q | Result            | Q | Result             | Q | Result        | Q |
| Turbidity (NTUs)                                                    | NA   | 1 (DEQ MML)          | 4.59                 |   | 4.59           |   | 1.73              |   | 2.08               |   | 8             |   |
| Temperature (°F)                                                    | NA   |                      | 51.75                |   | 51.75          |   | 49.65             |   | 49.69              |   | 71.92         |   |
| Dissolved Oxygen (mg/L)                                             | NA   |                      | 10.16                |   | 10.16          |   | 10.26             |   | 10.16              |   | 0.05          |   |
| Oxidation-reduction potential (mV)                                  | NA   |                      | 160.3                |   | 160.3          |   | 45.1              |   | 571.1              |   | 31.8          |   |
| <b>MISCELLANEOUS</b>                                                |      |                      |                      |   |                |   |                   |   |                    |   |               |   |
| Color (color units)                                                 |      | 15 (DEQ MML)         | 5                    |   | 5              |   | 5                 |   | 5                  |   | 5             |   |
| Corrosivity <sup>†</sup> (S.U.)                                     |      |                      | -0.739               |   | -0.739         |   | -0.84             |   | -0.804             |   | 0.065         |   |
| Foaming Agents (MBAS) (mg/L)                                        |      | 0.5 (DEQ MML)        | ND                   |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Odor (T.O.N.)                                                       |      | 3 TON (DEQ MML)      | ND                   |   | ND             |   | ND                |   | ND                 |   | 4             |   |
| Total Dissolved Solids (mg/L)                                       | 10   | 500 (DEQ MML)        | 142                  |   | 142            |   | 133               |   | 141                |   | 295           |   |
| Total Organic Carbon (mg/L)                                         | 0.5  |                      | 1.6                  |   | 1.6            |   | 1.59              |   | 1.66               |   | 0.369         |   |
| Total Suspended Solids (mg/L)                                       | 1    |                      | 3.94                 |   | 3.94           |   | 2.33              |   | 1.87               |   | ND            |   |
| <b>VOLATILE ORGANIC COMPOUNDS (VOCs)</b>                            |      |                      |                      |   |                |   |                   |   |                    |   |               |   |
| 1,1-Dichloroethylene (ug/L)                                         | 0.5  | 7 (DEQ MML)          |                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| 1,1,1-Trichloroethane (ug/L)                                        | 0.5  | 200 (DEQ MML)        |                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| 1,2-Dichloroethane (ug/L)                                           | 0.5  | 5 (DEQ MML)          |                      |   | ND             |   |                   |   |                    |   | ND            |   |
| Benzene (ug/L)                                                      | 0.5  | 5 (DEQ MML)          |                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Carbon tetrachloride (ug/L)                                         | 0.5  | 5 (DEQ MML)          |                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| p-Dichlorobenzene (1,4-) (ug/L)                                     | 0.5  | 75 (DEQ MML)         |                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Trichloroethylene (TCE) (ug/L)                                      | 0.5  | 5 (DEQ MML)          |                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Vinyl chloride (ug/L)                                               | 0.5  | 2 (DEQ MML)          |                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| <b>DISINFECTION BY-PRODUCTS (DBPs) &amp; RESIDUAL DISINFECTANTS</b> |      |                      |                      |   |                |   |                   |   |                    |   |               |   |
| Total Trihalomethanes (TTHM) (ug/L)                                 | 0.5  | 10 (DEQ MML)         |                      |   | ND             |   | ND                |   | 4.24               |   | ND            |   |
| <b>MICROBIAL</b>                                                    |      |                      |                      |   |                |   |                   |   |                    |   |               |   |
| Total Coliforms (cell count per 100 mL)                             |      | <1/100mL             | 435                  |   | 435            |   | 248               |   | ND                 |   |               |   |
| Fecal Coliforms (cell count per 100 mL)                             |      | Confirmed presence   | 18.9                 |   | 18.9           |   | 9.6               |   | ND                 |   |               |   |
| E. Coli (cell count per 100 mL)                                     |      | Confirmed presence   | 23.8                 |   | 23.8           |   | 9.8               |   | ND                 |   |               |   |
| <b>SYNTHETIC ORGANIC COMPOUNDS (SOCs)</b>                           |      |                      |                      |   |                |   |                   |   |                    |   |               |   |
| 2,4-D (ug/L)                                                        | 0.1  | 10 (DEQ MML)         |                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| 2,4,5-TP (Silvex) (ug/L)                                            |      | 10 (DEQ MML)         |                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Dacthal (ug/L)                                                      |      |                      |                      |   | 0.025          |   | 0.023             |   | 0.028              |   |               |   |
| Endrin (ug/L)                                                       | 0.02 | 0.2 (DEQ MML)        |                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Lindane (BHC-gamma) (mg/L)                                          |      | 0.004 (DEQ MML)      |                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Methoxychlor (mg/L)                                                 |      | 0.100 (DEQ MML)      |                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| Toxaphene (ug/L)                                                    | 2    | 0.005 (DEQ MML)      |                      |   | ND             |   | ND                |   | ND                 |   | ND            |   |
| <b>RADIOLOGICALS</b>                                                |      |                      |                      |   |                |   |                   |   |                    |   |               |   |
| Gross Alpha (pCi/L)                                                 |      | 15 (DEQ MML)         | <3+/-0.978           |   | <3+/-0.978     |   | <3+/-0.823        |   | <3+/-1.13          |   | <1.20+/-0.963 |   |
| Gross Beta (pCi/L)                                                  |      | 50 pCi/L (DEQ MML)   | <4+/-0.780           |   | <4+/-0.780     |   | <4+/-0.786        |   | <4+/-0.804         |   | 9.73+/-1.47   |   |

**Notes:**

Result is over DEQ MML

Result is over 1/2 DEQ MML

†: Corrosivity analysis by Langelier Index

1: WC Pump = Willow Creek Pump Station



**Table A-8**  
**Water Quality Samples-April 6, 2020**  
 Threemile Canyon Farms  
 Boardman, Oregon

| Analyte                                    |              |                      | WC PUMP <sup>1</sup> | INLAND BOOSTER |   | INLAND WELL 1 |   |
|--------------------------------------------|--------------|----------------------|----------------------|----------------|---|---------------|---|
|                                            | Sample Date: |                      | 4/6/2020             | 4/6/2020       |   | 6/4/2020      |   |
|                                            | Lab ID:      |                      | MAD0121-01           | MAD0121-02     |   | MAF0273-01    |   |
|                                            | MRL          | Oregon DEQ Standards | Result               | Result         | Q | Result        | Q |
| <b>INORGANIC CHEMICALS (IOCs)</b>          |              |                      |                      |                |   |               |   |
| <b>FORMULA</b>                             |              |                      |                      |                |   |               |   |
| Alkalinity (as CaCO <sub>3</sub> ) (mg/L)  | 5            |                      | 100                  | 96             |   |               |   |
| Aluminum (total) (mg/L)                    | 0.01         |                      | 0.391                | 0.283          |   | 0.0137        |   |
| Antimony (total) (mg/L)                    | 0.001        |                      | ND                   | ND             |   | ND            |   |
| Arsenic (total) (mg/L)                     | 0.001        | 0.050 (DEQ MML)      | 0.00284              | ND             |   | ND            |   |
| Barium (total) (mg/L)                      | 0.001        | 1 (DEQ MML)          | 0.037                | 0.0341         |   | 0.0233        |   |
| Bicarbonate (as CaCO <sub>3</sub> ) (mg/L) | 5            |                      | 100                  | 96             |   |               |   |
| Beryllium (total) (mg/L)                   | 0.001        |                      | ND                   | ND             |   | ND            |   |
| Cadmium (total) (mg/L)                     | 0.001        | 0.01 (DEQ MML)       | ND                   | ND             |   | ND            |   |
| Calcium (total) (mg/L)                     | 0.1          |                      | 26.6                 | 26.3           |   |               |   |
| Carbonate (as CaCO <sub>3</sub> ) (mg/L)   | 5            |                      | ND                   | ND             |   |               |   |
| Chloramine (mg/L)                          |              |                      | ND                   | ND             |   | ND            |   |
| Chloride (total) (mg/L)                    | 0.1          | 250 (DEQ MML)        | 8.28                 | 7.6            |   | 33            |   |
| Chromium (total) (mg/L)                    | 0.001        | 0.05 (DEQ MML)       | ND                   | ND             |   | ND            |   |
| Copper (total) (mg/L)                      | 0.0          | 1.0 (DEQ MML)        | 0.00193              | 0.00174        |   | ND            |   |
| Cyanide (total) (mg/L)                     | NR           |                      | ND                   | ND             |   | ND            |   |
| Fluoride (total) (mg/L)                    | 0.1          | 4 (DEQ MML)          | 0.231                | 0.213          |   | 1.46          |   |
| Hardness (as CaCO <sub>3</sub> ) (mg/L)    | 10           |                      | 103                  | 101            |   | 27            |   |
| Iron (total) (mg/L)                        | 0.01         | 0.3 (DEQ MML)        | 0.458                | 0.319          |   | 0.026         |   |
| Lead (total) (mg/L)                        | 0.001        | 0.05 (DEQ MML)       | ND                   | ND             |   |               |   |
| Magnesium (total) (mg/L)                   | 0.1          |                      | 8.94                 | 8.76           |   | 2.16          |   |
| Manganese (total) (mg/L)                   | 0.001        | 0.05 (DEQ MML)       | ND                   | 0.026          |   | 0.00771       |   |
| Mercury (total inorganic) (mg/L)           | 0.0001       | 0.002 (DEQ MML)      | ND                   | ND             |   | ND            |   |
| Nickel (total) (mg/L)                      | 0.001        |                      | ND                   | 0.00103        |   | ND            |   |
| Nitrate (as N) (mg/L)                      | 0.1          | 10 (DEQ MML)         | 0.901                | 0.857          |   | ND            |   |
| Nitrite (mg/L)                             | 0.1          |                      | ND                   | ND             |   | ND            |   |
| Nitrate+Nitrite (total N) (mg/L)           | 0.1          |                      | 0.901                | 0.857          |   | ND            |   |
| Perchlorate (ug/L)                         |              |                      | 0.202                | 0.199          |   | ND            |   |
| Phosphate (mg/L)                           | NA           |                      |                      |                |   | ND            |   |
| Phosphorus (total) (mg/L)                  | NA           |                      | 0.0247               | 0.034          |   | 0.0304        |   |
| Potassium (mg/L)                           | 0.1          |                      | 2.13                 | 2.03           |   | 13.6          |   |
| Selenium (total) (mg/L)                    | 0.00         | 0.01 (DEQ MML)       | ND                   | ND             |   | ND            |   |
| Silica (mg/L)                              | 0.1          |                      | 14.4                 | 13.8           |   | 59.1          |   |
| Silicon (mg/L)                             | NR           |                      | 6.56                 | 6.27           |   | 27.6          |   |
| Silver (total) (mg/L)                      | 0.0          | 0.05 (DEQ MML)       | ND                   | ND             |   | ND            |   |
| Sodium (mg/L)                              | 0.1          |                      | 13.4                 | 12.9           |   | 82.6          |   |
| Sulfate (mg/L)                             | 0.1          | 250 (DEQ MML)        | ND                   | 20.2           |   | 1.13          |   |
| Sulfide (mg/L)                             |              |                      | ND                   | ND             |   | ND            |   |
| Thallium (mg/L)                            | 0.001        |                      | ND                   | ND             |   | ND            |   |
| Uranium (mg/L)                             |              |                      | 0.00182              | 0.00184        |   | ND            |   |
| Zinc (total) (mg/L)                        | 0.001        | 5 (DEQ MML)          | 0.00398              | 0.00278        |   | 0.00161       |   |
| <b>FIELD PARAMETERS</b>                    |              |                      |                      |                |   |               |   |
| pH (pH units)                              | NA           | 6.5-8.5 (DEQ MML)    | 8.24                 | 8.54           |   | 8.59          |   |
| Specific Conductance (mS/cm)               | NA           |                      | 0.28                 | 14.89          |   | 0.407         |   |
| Turbidity (NTUs)                           | NA           | 1 (DEQ MML)          |                      |                |   | 0             |   |
| Temperature (°C)                           | NA           |                      | 42.16                | 42.56          |   | 69.71         |   |
| Dissolved Oxygen (mg/L)                    | NA           |                      | 15.1                 | 14.89          |   | 3.4           |   |
| Oxidation-reduction potential (mV)         | NA           |                      | 59.1                 | 47.9           |   | 119.8         |   |
| <b>MISCELLANEOUS</b>                       |              |                      |                      |                |   |               |   |
| Color (color units)                        |              | 15 (DEQ MML)         | 15                   | 15             |   | ND            |   |
| Corrosivity <sup>1</sup> (S.U.)            |              |                      |                      |                |   |               |   |
| Foaming Agents (MBAS) (mg/L)               |              | 0.5 (DEQ MML)        |                      | ND             |   |               |   |
| Odor (T.O.N.)                              |              | 3 TON (DEQ MML)      | 2                    | 2              |   | ND            |   |
| Total Dissolved Solids (mg/L)              | 10           | 500 (DEQ MML)        | 152                  | 147            |   |               |   |
| Total Organic Carbon (mg/L)                | 0.5          |                      |                      | 1.86           |   | 0.224         |   |
| Total Suspended Solids (mg/L)              | 1            |                      | 12.8                 | 11             |   | ND            |   |
| <b>VOLATILE ORGANIC COMPOUNDS (VOCs)</b>   |              |                      |                      |                |   |               |   |
| 1,1-Dichloroethylene (ug/L)                | 0.5          | 7 (DEQ MML)          | ND                   | ND             |   | ND            |   |
| 1,1,1-Trichloroethane (ug/L)               | 0.5          | 200 (DEQ MML)        | ND                   | ND             |   | ND            |   |
| 1,2-Dichloroethane (ug/L)                  | 0.5          | 5 (DEQ MML)          | ND                   | ND             |   | ND            |   |
| Benzene (ug/L)                             | 0.5          | 5 (DEQ MML)          | ND                   | ND             |   | ND            |   |



| Analyte                                                             |              |                      | WC PUMP <sup>1</sup> | INLAND BOOSTER |   | INLAND WELL 1 |   |
|---------------------------------------------------------------------|--------------|----------------------|----------------------|----------------|---|---------------|---|
|                                                                     |              |                      | 4/6/2020             | 4/6/2020       |   | 6/4/2020      |   |
|                                                                     | Sample Date: |                      |                      |                |   |               |   |
|                                                                     | Lab ID:      |                      | MAD0121-01           | MAD0121-02     |   | MAF0273-01    |   |
|                                                                     | MRL          | Oregon DEQ Standards | Result               | Result         | Q | Result        | Q |
| Carbon tetrachloride (ug/L)                                         | 0.5          | 5 (DEQ MML)          | ND                   | ND             |   | ND            |   |
| p-Dichlorobenzene (1,4-) (ug/L)                                     | 0.5          | 75 (DEQ MML)         | ND                   | ND             |   | ND            |   |
| Trichloroethylene (TCE) (ug/L)                                      | 0.5          | 5 (DEQ MML)          | ND                   | ND             |   | ND            |   |
| Vinyl chloride (ug/L)                                               | 0.5          | 2 (DEQ MML)          | ND                   | ND             |   | ND            |   |
| <b>DISINFECTION BY-PRODUCTS (DBPs) &amp; RESIDUAL DISINFECTANTS</b> |              |                      |                      |                |   |               |   |
| Total Trihalomethanes (TTHM) (ug/L)                                 | 0.5          | 10 (DEQ MML)         |                      |                |   |               |   |
| <b>MICROBIAL</b>                                                    |              |                      |                      |                |   |               |   |
| Total Coliforms (cell count per 100 mL)                             |              | <1/100mL             | 687                  | 548            |   | ND            |   |
| Fecal Coliforms (cell count per 100 mL)                             |              | Confirmed presence   | 3.1                  | 7.4            |   |               |   |
| E. Coli (cell count per 100 mL)                                     |              | Confirmed presence   | 8.6                  | 6.3            |   | ND            |   |
| <b>SYNTHETIC ORGANIC COMPOUNDS (SOCs)</b>                           |              |                      |                      |                |   |               |   |
| 2,4-D (ug/L)                                                        | 0.1          | 10 (DEQ MML)         | ND                   | ND             |   | ND            |   |
| 2,4,5-TP (Silvex) (ug/L)                                            |              | 10 (DEQ MML)         | ND                   | ND             |   | ND            |   |
| Dacthal (ug/L)                                                      |              |                      |                      |                |   | ND            |   |
| Endrin (ug/L)                                                       | 0.02         | 0.2 (DEQ MML)        | ND                   | ND             |   | ND            |   |
| Lindane (BHC-gamma) (mg/L)                                          |              | 0.004 (DEQ MML)      | ND                   | ND             |   | ND            |   |
| Methoxychlor (mg/L)                                                 |              | 0.100 (DEQ MML)      | ND                   | ND             |   | ND            |   |
| Toxaphene (ug/L)                                                    | 2            | 0.005 (DEQ MML)      | ND                   | ND             |   | ND            |   |
| <b>RADIOLOGICALS</b>                                                |              |                      |                      |                |   |               |   |
| Gross Alpha (pCi/L)                                                 |              | 15 (DEQ MML)         | ND                   | ND             |   | <3.00+/-0.7   |   |
| Gross Beta (pCi/L)                                                  |              | 50 pCi/L (DEQ MML)   | ND                   | ND             |   | 7.49+/-0.903  |   |

**Notes:**

Result is over DEQ MML

Result is over 1/2 DEQ MML

†: Corrosivity analysis by Langelier Index

1: WC Pump = Willow Creek Pump Station



**Table A-9**  
**Water Quality Samples—May 18, 2020**  
 Threemile Canyon Farms  
 Boardman, Oregon

| Analyte                                    |              |                      | WC PUMP <sup>1</sup> | INLAND BOOSTER |   | INLAND WELL 1 |   |
|--------------------------------------------|--------------|----------------------|----------------------|----------------|---|---------------|---|
|                                            | Sample Date: |                      | 5/18/2020            | 5/18/2020      |   | 6/4/2020      |   |
|                                            | Lab ID:      |                      | MAE0524-01           | MAE0524-02     |   | MAF0273-01    |   |
|                                            | MRL          | Oregon DEQ Standards | Result               | Result         | Q | Result        | Q |
| <b>INORGANIC CHEMICALS (IOCs)</b>          |              |                      |                      |                |   |               |   |
| <b>FORMULA</b>                             |              |                      |                      |                |   |               |   |
| Alkalinity (as CaCO <sub>3</sub> ) (mg/L)  | 5            |                      | 88                   | 88             |   |               |   |
| Aluminum (total) (mg/L)                    | 0.01         |                      | 0.769                | 0.523          |   | 0.0137        |   |
| Antimony (total) (mg/L)                    | 0.001        |                      | ND                   | ND             |   | ND            |   |
| Arsenic (total) (mg/L)                     | 0.001        | 0.050 (DEQ MML)      | 0.00384              | ND             |   | ND            |   |
| Barium (total) (mg/L)                      | 0.001        | 1 (DEQ MML)          | 0.0387               | 0.0358         |   | 0.0233        |   |
| Bicarbonate (as CaCO <sub>3</sub> ) (mg/L) | 5            |                      | 88                   | 88             |   |               |   |
| Beryllium (total) (mg/L)                   | 0.001        |                      | ND                   | ND             |   | ND            |   |
| Cadmium (total) (mg/L)                     | 0.001        | 0.01 (DEQ MML)       | ND                   | ND             |   | ND            |   |
| Calcium (total) (mg/L)                     | 0.1          |                      | 21.8                 | 22.1           |   |               |   |
| Carbonate (as CaCO <sub>3</sub> ) (mg/L)   | 5            |                      | ND                   | ND             |   |               |   |
| Chloramine (mg/L)                          |              |                      | 0.0831               | 0.0831         |   | ND            |   |
| Chloride (total) (mg/L)                    | 0.1          | 250 (DEQ MML)        | 6.32                 | 6.38           |   | 33            |   |
| Chromium (total) (mg/L)                    | 0.001        | 0.05 (DEQ MML)       | 0.00469              | 0.00401        |   | ND            |   |
| Copper (total) (mg/L)                      | 0.0          | 1.0 (DEQ MML)        | 0.00227              | 0.00211        |   | ND            |   |
| Cyanide (total) (mg/L)                     | NR           |                      | ND                   | ND             |   | ND            |   |
| Fluoride (total) (mg/L)                    | 0.1          | 4 (DEQ MML)          | 0.115                | 0.119          |   | 1.46          |   |
| Hardness (as CaCO <sub>3</sub> ) (mg/L)    | 10           |                      | 84.5                 | 85.5           |   | 27            |   |
| Iron (total) (mg/L)                        | 0.01         | 0.3 (DEQ MML)        | 1                    | 0.676          |   | 0.026         |   |
| Lead (total) (mg/L)                        | 0.001        | 0.05 (DEQ MML)       | ND                   | ND             |   |               |   |
| Magnesium (total) (mg/L)                   | 0.1          |                      | 7.27                 | 7.36           |   | 2.16          |   |
| Manganese (total) (mg/L)                   | 0.001        | 0.05 (DEQ MML)       | 0.0501               | 0.028          |   | 0.00771       |   |
| Mercury (total inorganic) (mg/L)           | 0.0001       | 0.002 (DEQ MML)      | ND                   | ND             |   | ND            |   |
| Nickel (total) (mg/L)                      | 0.001        |                      | 0.00132              | ND             |   | ND            |   |
| Nitrate (as N) (mg/L)                      | 0.1          | 10 (DEQ MML)         | 0.629                | 0.672          |   | ND            |   |
| Nitrite (mg/L)                             | 0.1          |                      | ND                   | ND             |   | ND            |   |
| Nitrate+Nitrite (total N) (mg/L)           | 0.1          |                      | 0.629                | 0.672          |   | ND            |   |
| Perchlorate (ug/L)                         |              |                      | 0.217                | 0.212          |   | ND            |   |
| Phosphate (mg/L)                           | NA           |                      |                      |                |   | ND            |   |
| Phosphorus (total) (mg/L)                  | NA           |                      | 0.0528               | 0.0574         |   | 0.0304        |   |
| Potassium (mg/L)                           | 0.1          |                      | 1.76                 | 1.76           |   | 13.6          |   |
| Selenium (total) (mg/L)                    | 0.00         | 0.01 (DEQ MML)       | ND                   | ND             |   | ND            |   |
| Silica (mg/L)                              | 0.1          |                      | 14.9                 | 13.5           |   | 59.1          |   |
| Silicon (mg/L)                             | NR           |                      | 6.94                 | 6.32           |   | 27.6          |   |
| Silver (total) (mg/L)                      | 0.0          | 0.05 (DEQ MML)       | ND                   | ND             |   | ND            |   |
| Sodium (mg/L)                              | 0.1          |                      | 10.6                 | 10.8           |   | 82.6          |   |
| Sulfate (mg/L)                             | 0.1          | 250 (DEQ MML)        | 15.5                 | 15.4           |   | 1.13          |   |
| Sulfide (mg/L)                             |              |                      | ND                   | ND             |   | ND            |   |
| Thallium (mg/L)                            | 0.001        |                      | ND                   | ND             |   | ND            |   |
| Uranium (mg/L)                             |              |                      | 0.00147              | 0.00146        |   | ND            |   |
| Zinc (total) (mg/L)                        | 0.001        | 5 (DEQ MML)          | 0.00565              | 0.00413        |   | 0.00161       |   |
| <b>FIELD PARAMETERS</b>                    |              |                      |                      |                |   |               |   |
| pH (pH units)                              | NA           | 6.5-8.5 (DEQ MML)    | 8.04                 | 8.53           |   | 8.59          |   |
| Specific Conductance (mS/cm)               | NA           |                      | 0.216                | 0.221          |   | 0.407         |   |
| Turbidity (NTUs)                           | NA           | 1 (DEQ MML)          | 20                   | 10             |   | 0             |   |
| Temperature (°C)                           | NA           |                      | 51.72                | 52.76          |   | 69.71         |   |
| Dissolved Oxygen (mg/L)                    | NA           |                      | 11.58                | 11.24          |   | 3.4           |   |
| Oxidation-reduction potential (mV)         | NA           |                      | 71.7                 | 56.1           |   | 119.8         |   |
| <b>MISCELLANEOUS</b>                       |              |                      |                      |                |   |               |   |
| Color (color units)                        |              | 15 (DEQ MML)         | 20                   | 20             |   | ND            |   |
| Corrosivity <sup>†</sup> (S.U.)            |              |                      |                      |                |   |               |   |
| Foaming Agents (MBAS) (mg/L)               |              | 0.5 (DEQ MML)        | ND                   | 0.478          |   |               |   |
| Odor (T.O.N.)                              |              | 3 TON (DEQ MML)      | 2                    | 2              |   | ND            |   |
| Total Dissolved Solids (mg/L)              | 10           | 500 (DEQ MML)        | 154                  | 164            |   |               |   |
| Total Organic Carbon (mg/L)                | 0.5          |                      | 2.2                  | 2.18           |   | 0.224         |   |
| Total Suspended Solids (mg/L)              | 1            |                      | 19.1                 | 10.9           |   | ND            |   |
| <b>VOLATILE ORGANIC COMPOUNDS (VOCs)</b>   |              |                      |                      |                |   |               |   |
| 1,1-Dichloroethylene (ug/L)                | 0.5          | 7 (DEQ MML)          | ND                   | ND             |   | ND            |   |
| 1,1,1-Trichloroethane (ug/L)               | 0.5          | 200 (DEQ MML)        | ND                   | ND             |   | ND            |   |
| 1,2-Dichloroethane (ug/L)                  | 0.5          | 5 (DEQ MML)          | ND                   | ND             |   | ND            |   |
| Benzene (ug/L)                             | 0.5          | 5 (DEQ MML)          | ND                   | ND             |   | ND            |   |



| Analyte                                                             |              |                    | WC PUMP <sup>1</sup> | INLAND BOOSTER |   | INLAND WELL 1 |   |
|---------------------------------------------------------------------|--------------|--------------------|----------------------|----------------|---|---------------|---|
|                                                                     |              |                    | 5/18/2020            | 5/18/2020      |   | 6/4/2020      |   |
|                                                                     | Sample Date: |                    | MAE0524-01           | MAE0524-02     |   | MAF0273-01    |   |
|                                                                     | Lab ID:      |                    | Result               | Result         | Q | Result        | Q |
| Carbon tetrachloride (ug/L)                                         | 0.5          | 5 (DEQ MML)        | ND                   | ND             |   | ND            |   |
| p-Dichlorobenzene (1,4-) (ug/L)                                     | 0.5          | 75 (DEQ MML)       | ND                   | ND             |   | ND            |   |
| Trichloroethylene (TCE) (ug/L)                                      | 0.5          | 5 (DEQ MML)        | ND                   | ND             |   | ND            |   |
| Vinyl chloride (ug/L)                                               | 0.5          | 2 (DEQ MML)        | ND                   | ND             |   | ND            |   |
| <b>DISINFECTION BY-PRODUCTS (DBPs) &amp; RESIDUAL DISINFECTANTS</b> |              |                    |                      |                |   |               |   |
| Total Trihalomethanes (TTHM) (ug/L)                                 | 0.5          | 10 (DEQ MML)       |                      |                |   |               |   |
| <b>MICROBIAL</b>                                                    |              |                    |                      |                |   |               |   |
| Total Coliforms (cell count per 100 mL)                             |              | <1/100mL           | 461                  | 186            |   | ND            |   |
| Fecal Coliforms (cell count per 100 mL)                             |              | Confirmed presence | 71.2                 | 71.7           |   |               |   |
| E. Coli (cell count per 100 mL)                                     |              | Confirmed presence | 95.9                 | 58.3           |   | ND            |   |
| <b>SYNTHETIC ORGANIC COMPOUNDS (SOCs)</b>                           |              |                    |                      |                |   |               |   |
| 2,4-D (ug/L)                                                        | 0.1          | 10 (DEQ MML)       | ND                   | ND             |   | ND            |   |
| 2,4,5-TP (Silvex) (ug/L)                                            |              | 10 (DEQ MML)       | ND                   | ND             |   | ND            |   |
| Dacthal (ug/L)                                                      |              |                    |                      |                |   |               |   |
| Endrin (ug/L)                                                       | 0.02         | 0.2 (DEQ MML)      | ND                   | ND             |   | ND            |   |
| Lindane (BHC-gamma) (mg/L)                                          |              | 0.004 (DEQ MML)    | ND                   | ND             |   | ND            |   |
| Methoxychlor (mg/L)                                                 |              | 0.100 (DEQ MML)    | ND                   | ND             |   | ND            |   |
| Toxaphene (ug/L)                                                    | 2            | 0.005 (DEQ MML)    | ND                   | ND             |   | ND            |   |
| <b>RADIOLOGICALS</b>                                                |              |                    |                      |                |   |               |   |
| Gross Alpha (pCi/L)                                                 |              | 15 (DEQ MML)       | <3.00+/-0.561        | <3.00+/-0.482  |   | <3.00+/-0.7   |   |
| Gross Beta (pCi/L)                                                  |              | 50 pCi/L (DEQ MML) | <4.00+/-0.4          | <4.00+/-0.42   |   | 7.49+/-0.903  |   |

**Notes:**

Result is over DEQ MML

Result is over 1/2 DEQ MML

†: Corrosivity analysis by Langelier Index

1: WC Pump = Willow Creek Pump Station







**Inland Aquifer Recharge Project—Inland Well  
No. 2 Aquifer Pumping Test and Analysis**

Threemile Canyon Farms  
Boardman, Oregon

*for*  
**Threemile Canyon Farms, LLC**

February 8, 2022



**Inland Aquifer Recharge Project—Inland Well  
No. 2 Aquifer Pumping Test and Analysis**

Threemile Canyon Farms  
Boardman, Oregon

*for*

**Threemile Canyon Farms, LLC**

February 8, 2022

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**Inland Aquifer Recharge Project—Inland Well  
No. 2 Aquifer Pumping Test and Analysis**

**Threemile Canyon Farms  
Boardman Oregon**

**File No. 23415-001-01**

**February 8, 2022**

Prepared for:

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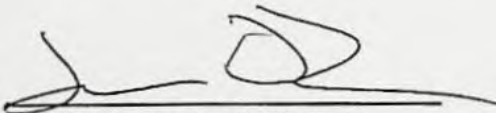
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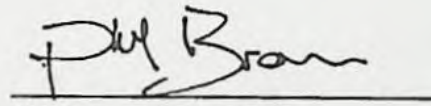
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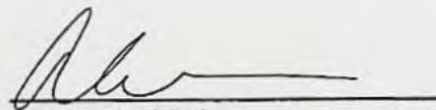
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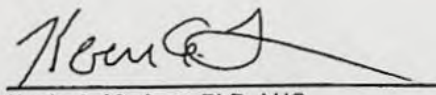


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## Table of Contents

|                                             |          |
|---------------------------------------------|----------|
| <b>1.0 INTRODUCTION .....</b>               | <b>1</b> |
| <b>2.0 PROJECT BACKGROUND .....</b>         | <b>1</b> |
| 2.1. Location .....                         | 1        |
| 2.2. Area Hydrogeologic Setting .....       | 1        |
| 2.3. The Inland Wells .....                 | 3        |
| <b>3.0 AQUIFER TEST .....</b>               | <b>4</b> |
| 3.1. Introduction .....                     | 4        |
| 3.2. Pre-Test Background Water Levels ..... | 5        |
| 3.3. Pumping Period .....                   | 5        |
| 3.3.1. Cooper-Jacob Analysis .....          | 6        |
| 3.3.2. AQTESOLV Analysis .....              | 6        |
| 3.4. Recovery Period .....                  | 7        |
| <b>4.0 RESULTS AND CONCLUSIONS .....</b>    | <b>7</b> |
| <b>5.0 LIMITATIONS .....</b>                | <b>8</b> |
| <b>6.0 REFERENCES .....</b>                 | <b>9</b> |

### LIST OF IN-TEXT TABLES

|                                                             |
|-------------------------------------------------------------|
| Table 1. Inland Well Summary                                |
| Table 2. Antecedent Trends by Well                          |
| Table 3. Summary of Average Pumping Rates used for AQTESOLV |
| Table 4. Results Summary                                    |

### LIST OF FIGURES

|                                                        |
|--------------------------------------------------------|
| Figure 1. Project Area                                 |
| Figure 2. Threemile Canyon Farm Layout                 |
| Figure 3. Local Structural Geology                     |
| Figure 4. Groundwater Well Locations                   |
| Figure 5. Well Cross Sections                          |
| Figure 6. Test Record Hydrographs                      |
| Figure 7. Inland Well No. 2 Drawdown and Pumping Rates |
| Figure 8. Cooper-Jacob Straight Line Analysis          |
| Figure 9. Recovery Analysis                            |

### APPENDICES

|                              |
|------------------------------|
| Appendix A. Well Logs        |
| Appendix B. AQTESOLV Results |



## **1.0 INTRODUCTION**

Under Oregon Water Resources Department (OWRD) Limited License LL-1725, Threemile Canyon Farms, LLC (TMCF) has been investigating the feasibility of using aquifer recharge (AR) to reverse groundwater level declines in irrigation water supply wells associated with TMCF's Inland Farm. This project is referred to as the Inland AR Project and LL-1725 was issued on April 3, 2018. The intent of the Inland AR Project is to use Columbia River water as source water; transmit it from TMCF's Willow Creek Pump Station to the Inland Farm; treat it near the Inland irrigation wells to meet antidegradation standards; and inject it into one or more Inland Farm wells to stabilize and/or reverse water level declines seen in the Inland Farm wells. To-date work on the Inland AR Project has focused on characterizing potential source water geochemistry; target aquifer groundwater geochemistry; bench scale and field treatment tests to evaluate source water treatment needs to meet antidegradation standards; and aquifer pumping tests. Pre-Injection testing work is described in Attachment C to the LL-1725 application. The results of the aquifer testing described in this report and treatment tests to be reported by Carollo Engineers, Inc. (Carollo) will be used by TMCF to decide on the next phases of work it may wish to complete with OWRD concurrence under LL-1725.

The purpose of this report is to present OWRD with aquifer characterization interpretations derived from aquifer pumping tests completed in early summer 2021. The test consisted of one, 72-hour constant-rate pumping test at Inland Well No. 2 (IW2) and five observation wells, Inland Well No. 1 (IW1), Inland Well No. 3 (IW3), Inland Well No. 4 (IW4), Inland Well No. 5 (IW5), and the Inland Observation Well (Obs. Well). The test was timed to avoid conflict with farm irrigation operations and minimize interference from other on-farm wells.

The work and analysis described herein was done by GeoEngineers, Inc (GeoEngineers) and Northwest Groundwater Services, LLC (NWGS). NWGS subcontracted to GeoEngineers under Mutual Services Agreement Authorization Amendment No. 2 dated March 16, 2021. GeoEngineers worked under Revised Amendment No. 3 dated March 16, 2021, to our Master Contract with TMCF dated August 13, 2018.

## **2.0 PROJECT BACKGROUND**

### **2.1. Location**

TMCF owns and operates approximately 40,000 acres of irrigated farmland near Boardman, Oregon (Figure 1, Inland Well Summary). TMCF irrigation relies primarily on water diverted from the Columbia River. However, the TMCF Inland Area also relies on groundwater pumped from the basalt aquifer system. The Inland Area portion of TMCF lies on the east side of the TMCF, generally 3 to 6 miles west-southwest of Boardman, Oregon (Figures 1 and 2). The Willow Creek Pump Station, the potential source of water in the event injection work is undertaken in the future is in the NW ¼, SE ¼, Section 36, Township 4 North, Range 22 East, WM. The Inland Farm project area is located primarily within the 9 northeastern Sections (1, 2, 3, 10, 11, 12, 13, 14, and 15) of Township 3 North, Range 24 East, WM.

### **2.2. Area Hydrogeologic Setting**

The hydrogeologic setting of the Inland AR Project area is described in some detail in Attachment D to the LL-1725 application. A summary is provided in this section.



TMCF lies within the Umatilla Basin (Basin), a structural basin bounded by the Columbia Hills on the north and the Blue Mountains on the south (Figure 1). The oldest exposed bedrock unit in the TMCF area, and the primary aquifer hosting unit, is the Columbia River Basalt Group (CRBG). The CRBG consists of a thick sequence of more than 300 continental tholeiitic flood-basalt lava flows (Tolan et al. 1989). Regional studies and mapping of the CRBG have demonstrated that there are consistent and systematic variations in lithology, geochemical compositions, and paleomagnetic polarity among flows and groups of flows. These differences have allowed for the establishment of stratigraphic units within the CRBG that can be reliably identified and mapped on a regional basis (Swanson et al. 1979, 1981; Beeson et al. 1985; Reidel et al., 2013). In the TMCF area these units include, in descending order, the Saddle Mountains Basalt, Wanapum Basalt and the Grande Ronde Basalt. In the project area these strata dip to the north towards the Columbia River.

The unit of interest to the Inland AR effort is the Wanapum Basalt and two primary subunits, the Priest Rapids Member and the Frenchman Springs Member. Both units are interpreted to be open to Dairy wells at TMCF while the Inland wells, with one exception (discussed below in section 2.1.3), are only open to the Frenchman Springs Member. Multiple water-bearing zones in three subdivisions of the Frenchman Springs Member, the Sentinel Gap, Sand Hollow, and Ginkgo, are generally found in the TMCF area.

CRBG basalt flows typically display a three-part subdivision of lithologic features, referred to as the flow top, flow interior, and flow bottom. The physical character of these features, summarized in the following bullets, control the occurrence and movement of groundwater in the CRBG.

- Flow tops commonly consist of glassy to very fine-grained basalt that is riddled with numerous spherical and elongate voids, or vesicles. Simple vesicular flow tops consist of glassy to fine-grained basalt that displays a rapid increase in the density of vesicles near the top of the flow (USDOE 1988). Vesicles may be isolated or interconnected, resulting respectively in lower and higher permeability and porosity (USDOE 1988). Flow top breccia consists of angular, scoriaceous to vesicular fragments of basaltic rubble that lie above a zone of non-fragmented, vesicular basalt. Flow top breccias can be very thick, laterally extensive and in some cases comprise half the entire thickness of the flow (USDOE 1988). Laterally expansive flow top breccia can have a high degree of interconnected pore space resulting in formation of widespread, permeable, water-bearing aquifers at the tops of individual basalt flows (USDOE 1988).
- CRBG flow interiors typically consist of dense, non-vesicular, glassy to crystalline basalt that contains numerous contraction joints (cooling joints) that formed when the lava shrank as it solidified. CRBG cooling joints often form regular patterns or styles, with the two most common being termed entablature-colonnade and columnar-blocky jointing. Studies on the nature and characteristics of cooling joints (USDOE 1988; Lindbergh 1989) have found that joints are typically 77 to >99 percent filled with secondary minerals (clay, silica, zeolite) and open spaces (voids) that do occur are not well connected. Groundwater movement through undisturbed, dense flow interiors is expected to be inconsequential (Wozniak 1995).
- Flow bottom physical characteristics are largely dependent on the paleoenvironmental conditions the molten lava encountered as it flowed across the Earth's surface. If the lava flow encountered relatively dry ground conditions, the flow bottom typically consists of a narrow (less than 3 feet thick) zone of sparsely vesicular, glassy to very fine-grained basalt. This type of flow bottom structure is very common within the CRBG. However, if advancing flows encountered lakes, rivers, and areas of water-saturated,



unconsolidated sediments more complex flow bottom structures formed (Mackin 1961; Grolier and Bingham 1971; Swanson et al. 1979; USDOE 1988; Beeson et al. 1989). Flow bottom structures can be either highly localized or widespread. The combination of a flow top of one flow and the flow bottom of the overlying flow is commonly referred to as the interflow zone (LL Application, Figure D-2). Individual interflow zones are laterally extensive, extending as far as the flows that they separate.

The TCMF area is cross-cut by several faults and folds including the northwest-trending Dalreed Butte structure and the Sixmile Creek fault (Figure 3, Local Structural Geology). A third northwest trending fault also is mapped near Boardman (Swanson et al. 1981) east of the Inland AR project area shown in Figure 3. Faulting in the CRBG tends to produce a roughly planar zone composed of coarsely shattered basalt that grades into very fine rock flour. Fault zone shatter breccias often display significant degrees of alteration (clays) and/or secondary mineralization (silica, zeolite, calcite, and pyrite). When they display such alteration they may hinder groundwater movement (Newcomb 1961, 1969; Johnson et al. 1993; Myers and Price 1979; Anderson 1987). However, in the absence of such alteration they may provide pathways for groundwater movement.

Groundwater in the Wanapum aquifer system in the TCMF area is interpreted to be confined and flowing towards the Columbia River and the axis of the Dalles-Umatilla syncline (Oberlander and Miller, 1981; Wozniak, 1995). Groundwater flows laterally through the system in widespread, dense flow interior-capped, interflow zones. These interflow zones extend from outcrop areas along the fringe of the Blue Mountains into the center of the Umatilla Basin. Discharge from the Wanapum aquifer system is generally thought to be to shallower aquifers and the Columbia River. However, this discharge is probably limited and vertical groundwater movement from the deep basalt aquifer system to discharge areas may be limited to erosional windows, flow pinchouts, open faults, and unsealed wells. Recharge to the Wanapum system is inferred to be limited to slow, deep percolation through locally disrupted dense flow interiors where they occur in up dip areas south of TCMF. In the western Umatilla Basin modern recharge sources are rare because of scarce precipitation, as such, most Wanapum groundwater is inferred to be relatively old, potentially Pleistocene in age. The limited modern recharge, or slowness of recharge is reflected in water level declines seen at TCMF and the reason for exploring an AR program.

### **2.3. The Inland Wells**

The test used multiple wells at the Inland Farm including the pumping well (IW2), and five observation wells (IW1, IW3, IW4, IW5, and Obs. Well). Figures 2, 3, and 4 show the locations of these wells.

Except for IW1 all Inland Farm wells are open to the Sentinel Gap unit and the upper part of the underlying Sand Hollow unit of the Frenchman Springs Member of the Wanapum Basalt (Figure 5, Well Cross Sections and Table 1). IW1 extends deeper into the basalt aquifer system, fully penetrating the remainder of the Frenchman Springs Member, being open to all the Sand Hollow unit and the underlying Ginkgo unit. IW1 also extends below the Wanapum Basalt, into the upper part of the Sentinel Bluffs Member of the Grande Ronde Basalt.

Although IW1 encounters two additional flow top intervals below the bottoms of the other Inland wells, these deeper zones are not interpreted to be significant water producing intervals. When IW1 was drilled a change in water level was not observed when these deeper intervals were encountered. Following completion of the well up-hole or down-hole flow was not observed the well video and the lower 300 feet was observed to be very cloudy, suggesting the absence of a significant water producing interval below



those seen in the Sentinel Gap and upper Sand Hollow units. The lack of evidence for significant water production in the lower part of IW1 was the primary reason the other Inland wells were completed shallower.

**TABLE 1. INLAND WELL SUMMARY (FIGURE 5)**

| Well                         | Test Purpose | Distance to Pumping well (miles) | Ground Surface Elevation (ft amsl)* | Total Depth (ft amsl) | Open Interval (ft amsl) | Water Bearing Unit |
|------------------------------|--------------|----------------------------------|-------------------------------------|-----------------------|-------------------------|--------------------|
| Inland Well No. 2 (IW2)      | Pumping      | 0                                | 619                                 | -424                  | -70 to -424             | Mv(wfsg)           |
| Inland Well No. 1 (IW1)      | Observation  | 0.55                             | 608                                 | -842                  | -97 to -842             | Mv(wfsg) + Mv(gsb) |
| Inland Well No. 3 (IW3)      | Observation  | Not applicable, well not used    | 612                                 | -314                  | 55 to -314              | Mv(wfsg)           |
| Inland Well No. 4 (IW4)      | Observation  | 1.85                             | 613                                 | -353                  | 95 to -353              | Mv(wfsg)           |
| Inland Well No. 5 (IW5)      | Observation  | 1.15                             | 609                                 | -411                  | -96 to -411             | Mv(wfsg)           |
| Inland Obs. Well (Obs. Well) | Observation  | 1.3                              | 584                                 | -477                  | -142 to -477            | Mv(wfsg)           |

Notes:

Mv(wfsg) = Sentinel Gap unit, Frenchman Springs Member, Wanapum Basalt

Mv(gsb) = Grande Ronde Basalt

\*Elevation estimated from Google Earth™

### 3.0 AQUIFER TEST

#### 3.1. Introduction

The aquifer test was conducted at the beginning of the Inland Farm well operation season in May 2021. As a result, all Inland wells had not pumped since the end of the preceding 2020 irrigation season. For the test TMCf turned IW2 on for 3 full days and operated it at full capacity, delivering produced water to normal farm irrigation operations. At the end of the 3-day test TMCf turned IW2 off for the 3 following days while at the same time also leaving all Inland wells off. Following the end of that 3-day period TMCf began normal irrigation operations using the Inland wells as needed.

Water levels were recorded using TMCf's electronic pressure transducers installed in each of the wells and tied into a central SCADA system. Well No. 2 pumping rates were recorded using the Farm's flowmeter installed at the wellhead, which also is linked to the SCADA system. Pumping and water level data collection was done by TMCf personnel with the support of GeoEngineers. The data collected was provided to GeoEngineers by TMCf staff for this analysis.

The following sections describe pre-test, test, and post-test recovery data and findings. Hydrographs showing the entire data record (pre-test background, pumping test, and post-test recovery) are provided in Figure 6, Test Record Hydrographs. After the test it was discovered that the transducer in IW3 was not functioning; therefore, no data record for that well exists.



### 3.2. Pre-Test Background Water Levels

Pre-test background (pre-pumping) data collection began on April 17, 2021 and ended on May 17, 2021 when the pumping test started. Over the background period water levels were slightly increasing. The antecedent trend (rate of rise) for the Inland wells ranged from 0.031 to 0.037 ft/day. The antecedent trends for each well are provided in Table 2.

**TABLE 2. ANTECEDENT TRENDS BY WELL**

| Well                             | Antecedent Trend<br>(ft/day) |
|----------------------------------|------------------------------|
| Inland Well No. 2 (Pumping Well) | 0.032                        |
| Inland Well No. 1                | 0.036                        |
| Inland Well No. 3                | —                            |
| Inland Well No. 4                | 0.037                        |
| Inland Well No. 5                | 0.031                        |
| Inland Obs. Well                 | 0.036                        |

Note:

Background data for Inland Well No. 3 was not available

### 3.3. Pumping Period

Pumping began at IW2 on May 17, 2021 at 3:45pm PDST and continued to May 20, 2021 at 4:28 pm PDST. Figure 7, Inland Well No. 2 Drawdown and Pumping Rates, shows the IW2 hydrograph and pumping rate for the pumping and recovery periods. Water levels in IW2 appear noisy, with significant water level fluctuations corresponding to changes in pumping rate. Similar variability during the pumping period was not observed in the observation wells (Figure 6), supporting the conclusion that changes in flow rate caused the water level variability rather than other signals originating in the aquifer away from the pumping well. No significant barometric pressure changes were observed over the testing period, and no barometric corrections have been made.

The antecedent trend was not removed from the drawdown data because it would not have improved the evaluation. The change in water levels due to the antecedent trend were minimal when compared to the influence on water levels caused by pumping stress and the level of noise present during the pumping test. However, the antecedent trend was accounted for in the recovery analysis (Section 2.3 Recovery Period).

Drawdown and specific capacity (water level normalized to pumping rate) trends are compared in Figure 8, Cooper-Jacobs Straight Line Analysis. The specific capacity data shows a greater amplitude of high-frequency variability (noise appears to be introduced), though the amplitude of low-frequency changes that are clearly associated with rate variability is reduced relative to the drawdown trend. The introduction of noise combined with persistence of rate-related variability suggests some inaccuracy associated with either the water level data set or the rate data. Non-pumping background and recovery data suggest that flow meter readings lack precision resulting in both noise and an incomplete smoothing when the data is normalized. However, trends suitable for aquifer characteristic analysis can be derived from this test.



### 3.3.1. Cooper-Jacob Analysis

Figure 8 also shows the Cooper-Jacob straight-line analysis of the drawdown observed at Inland IW2. The Cooper-Jacob analysis assumes an infinite confined aquifer, with no boundary conditions. The Cooper-Jacob analysis was split into two parts based on the behavior of the specific capacity (plotted in orange) and drawdown (plotted in blue) observed during the test. Specific capacity is equal to the pumping rate divided by the drawdown. The specific capacities plotted in Figure 8 are the reported pumping rate for a given time step divided by the drawdown report for the same time step.

In the early time period, from 10 to about 350 minutes from the start of pumping, noise observed in the data is limited in magnitude, has a gentler slope than later time data, and the change in draw down (ds) over one log cycle is 2.1 feet. Beginning approximately 350 minutes into the test the drawdown slope increases and ds over one log cycle increases to slightly over 6 feet. The change in slope is interpreted to be a flow limiting boundary condition. By approximately 700 minutes into the test noise and variability in the data begins to increase

To estimate transmissivity from the Cooper-Jacob analysis a time weighted average pumping rate of 3,028 gpm was used. The resulting Cooper-Jacob transmissivity for the early time response and late time response is calculated to be 35.5 ft<sup>2</sup>/minute and 11.96 ft<sup>2</sup>/minute, respectively. The late time response reflects the influence of the boundary condition indicated by the change in slope.

### 3.3.2. AQTESOLV Analysis

AQTESOLV is another analytical tool for evaluating pumping tests and can include the observation well network and the variable pumping rates in the analytical solution. The variable pumping rates were simplified into three different periods (Table 3) based on visual behavior changes observed on the hydrographs shown in Figures 7 and 8.

**TABLE 3. SUMMARY OF AVERAGE PUMPING RATES USED FOR AQTESOLV**

| Pumping Phase                    | Elapsed Time Interval (minutes) | Average (gpm) | Maximum (gpm) | Minimum (gpm) | Standard Deviation | Median (gpm) |
|----------------------------------|---------------------------------|---------------|---------------|---------------|--------------------|--------------|
| Early                            | 20 to 100                       | 2960.3        | 3149.6        | 2843.5        | 54.0               | 2958.4       |
| Mid                              | 101 to 880                      | 2935.1        | 3092.0        | 2769.6        | 51.3               | 2936.1       |
| Late                             | 881 to 4342                     | 3042.3        | 3294.0        | 2744.4        | 97.1               | 3043.7       |
| Time Weighted Average for Test = |                                 |               |               |               |                    | 3028         |

An initial attempt was made using the diagnostic features of AQTESOLV such as a derivative plot to evaluate the pumping test for potential boundary conditions. However, the level of noise in the data prevented the use of the diagnostic features, and boundaries could not be determined from AQTESOLV. Therefore, a Theis confined aquifer solution with variable pumping rates and recovery was used. The AQTESOLV outputs summarized below are provided in Appendix B.

The AQTESOLV inputs for this analysis included:

- An aquifer thickness of 72 feet, based on the cumulative thickness of interflow zones shown on the geologic log (Figure 5) below the bottom of casing.



- An anisotropy ratio for vertical to radial hydraulic conductivity was assumed to be 1.

The Theis solution via AQTESOLV was used first to analyze the pumping well (IW 2) only. This allows for easier initial solution match curve fitting. The resulting transmissivity was 29 ft<sup>2</sup>/min. AQTESOLV does calculate a storativity; however, the calculation is more appropriate and accurate with the use of observation wells. The 29 ft<sup>2</sup>/min is very close to the results of the initial Cooper-Jacob straight-line analysis of 35 ft<sup>2</sup>/min.

A second AQTESOLV Theis analysis was conducted including the observation well network which consisted of IW2 (pumping) and test observation at IW 4, IW5, and the Obs well. These wells are interpreted to fully penetrate all the water bearing units penetrated by the pumping well. IW1 was not used in the transmissivity or storativity estimate due to its lack of fit with the other observation wells. This may be due to it being open deeper into the basalt aquifer system than the other Inland wells.

This analysis yielded an estimated transmissivity of 14.23 ft<sup>2</sup>/min, a storativity of 9.938E-5, and a specific storage of 7.16E-3. This estimated transmissivity is very close to the late-time Cooper-Jacob transmissivity estimate of 11.96 ft<sup>2</sup>/minute. This similarity is interpreted to be the result of a flow limiting boundary in the aquifer system, possibly one or more of the northwest-southeast trending faults mapped in the western Umatilla Basin.

### 3.4. Recovery Period

The pump was shut off, and the recovery period began on May 20 at 4:28 pm. Recovery water levels were observed for 3 days, ending on May 23, 2021 at 4:30pm. A recovery analysis of residual drawdown at the pumping well is shown in Figure 9. Figure 9 shows the measured uncorrected residual drawdown and the residual drawdown corrected for the pre-pumping antecedent trend. The slope change occurring around  $t/t' = 30$  indicates the influence of a negative boundary condition, consistent with the pumping period observation of a negative boundary.

The aquifer is projected to fully recover at  $t/t'$  equals 1 which suggests no change in storage occurred because of this test. However, that conclusion is (projected full recovery) is not consistent with historical observations of declining year-to-year static water levels and the negative boundary observed in the test results. The observed recovery from this test is likely because the flow restriction observed is not significant at the scale of this test (volume removed) and the volume removed during the average irrigation season is orders of magnitude greater than this test and those much larger seasonal withdrawals result in negative change in storage.

## 4.0 RESULTS AND CONCLUSIONS

The 72-hour pumping test at Inland Well No. 2 was used to characterize aquifer transmissivity, storativity, and evaluate the presence of negative aquifer boundaries. The test was analyzed using the Cooper-Jacob straight line analysis and the Theis solution as applied by AQTESOLV with and without the inclusion of observation well response. Hydrologic parameters estimated from early and late time Cooper-Jacob, Theis without observation wells, and Theis with observation well solutions are listed in Table 4. Transmissivity estimates ranged from 11.96 to 35.53 ft<sup>2</sup>/min. The Theis solution that included observations wells yielded an estimated transmissivity of 14.23 ft<sup>2</sup>/min.



**TABLE 4. RESULTS SUMMARY**

| Analytical Method                          | Wells Used                                     | Transmissivity <sup>2</sup><br>(ft <sup>2</sup> /min) | Hydraulic<br>Conductivity<br>(ft/min) | Storativity | Specific<br>Storage <sup>2</sup> |
|--------------------------------------------|------------------------------------------------|-------------------------------------------------------|---------------------------------------|-------------|----------------------------------|
| Cooper-Jacob Early and Mid-Time (Figure 5) | Inland Well No. 2                              | 35.53                                                 | 0.472                                 | NA          | NA                               |
| Cooper-Jacob Late Time (Figure 5)          | Inland Well No. 2                              | 11.96                                                 | 0.166                                 | NA          | NA                               |
| Theis (Appendix B)                         | Inland Well No. 2                              | 29                                                    | 0.403                                 | NA          | NA                               |
| Theis (Appendix B) <sup>1</sup>            | Inland Well Nos. 2, 4, 5, and Inland Obs. Well | 14.23                                                 | 0.194                                 | 9.94E-05    | 7.16E-03                         |

Notes:

<sup>1</sup> Inland Well No.1 and Inland Well No. 3 not used for analysis.

<sup>2</sup> Assumes and aquifer thickness of b= 72

A flow limiting or negative boundary is indicated by a slope change observed approximately 350 minutes after the start of pumping and at a  $t/t'$  of approximately 30 during recovery. The scale of this test is much smaller volumetrically than the typical irrigation season withdrawal. Consequently, the change in storage that results from an irrigation season was not observed in this test.

The test provides good evaluation of the transmissivity and storativity of the aquifer and confirms a negative boundary influence hydraulic response. These results will support development of the conceptual hydrogeologic model and allow good simulation of hydraulic response to recharge in the project area. The primary uncertainty that remains is with respect to the observed declining water levels that result from annual irrigation withdrawals. This test did not identify boundary conditions that resulted in a negative change in storage at this scale of withdrawal. This is likely because the test was not significant relative to the size of the aquifer. However, a project-scale conceptual model can be accurately developed using this test analysis. Projections of aquifer response to recharge (positive change in storage) can be developed from both historical data (annual pumping and change in static information) and using the observations made during recharge testing phases of the project.

## 5.0 LIMITATIONS

We have prepared this report for Threemile Canyon Farms, LLC for the Inland Farm Aquifer Recharge Project. Threemile Canyon Farms, LLC may distribute copies of this report to authorized agents and regulatory agencies as may be required for the Project.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices for hydrogeologic investigations in this area at the time this report was prepared. The conclusions, recommendations, and opinions presented in this report are based on our professional knowledge, judgment, and experience. No warranty, express or implied, applies to the services or this report.

Any electronic form, facsimile, or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments should be considered a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.



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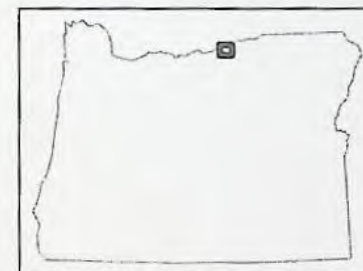






#### Legend

- TCMF Pumps
- Inland Wells
- TCMF Main Lines
- TCMF Submain Lines
- TCMF Circles
- TCMF Current Sampling Locations

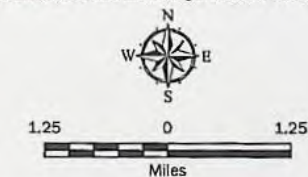


#### Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source:

Projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet



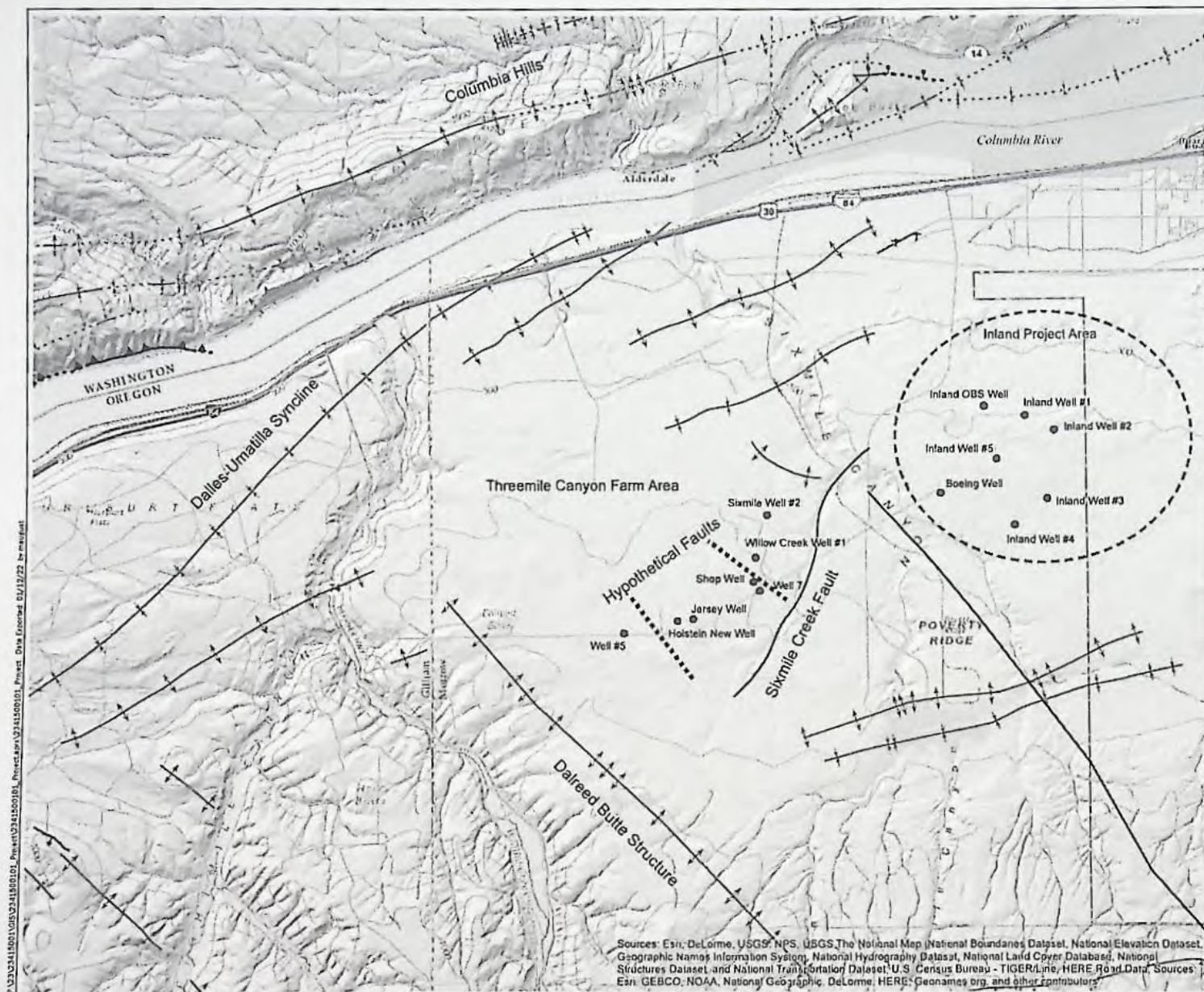
Threemile Canyon Farm Layout

Three Mile Canyon Farms  
Boardman, Oregon

**GEOENGINEERS**

Figure 2

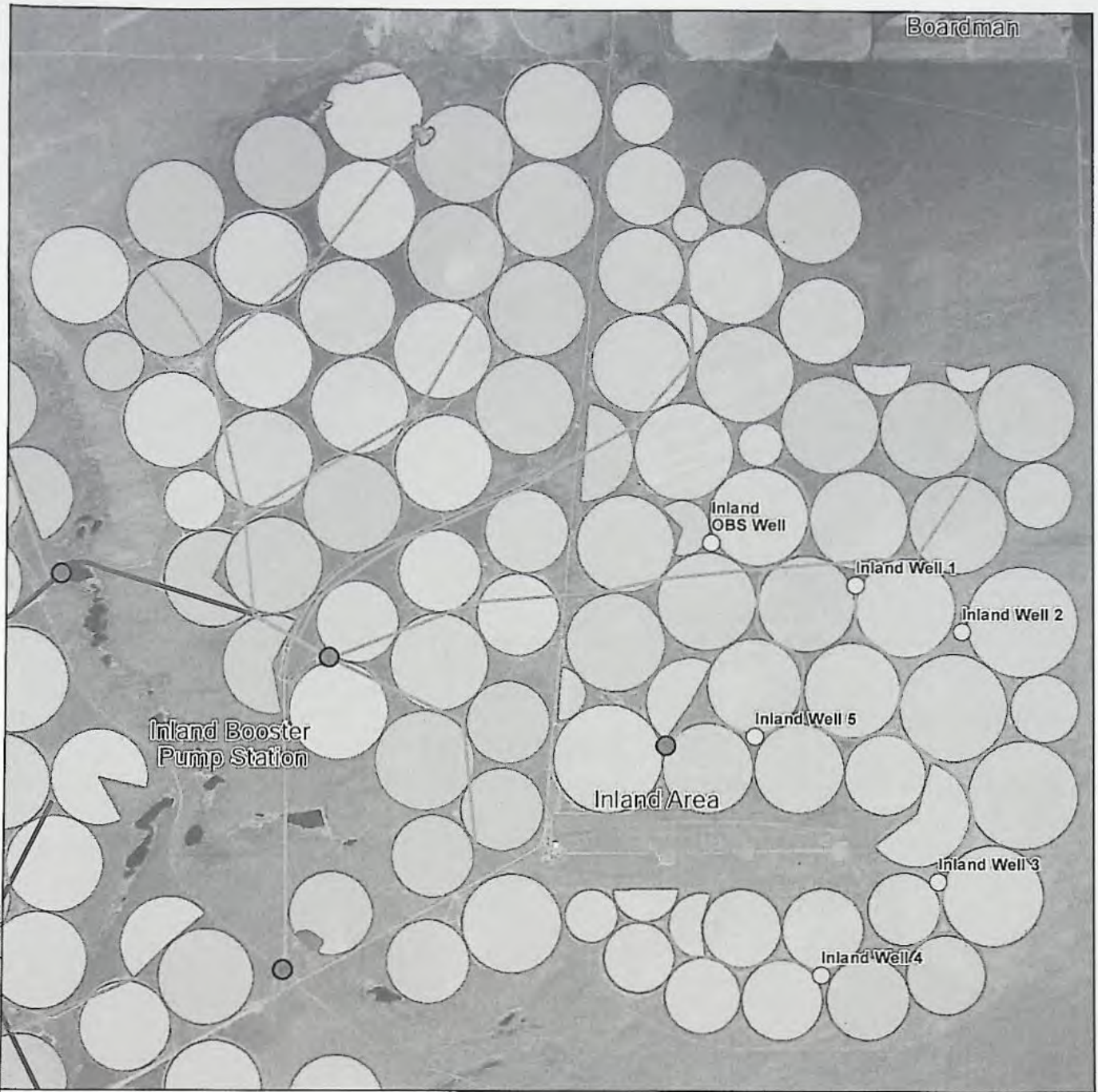




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Sources: Esri; DeLorme; USGS; NPS; USGS; The National Map; National Boundaries Dataset; National Elevation Dataset; Geographic Names Information System; National Hydrography Dataset; National Land Cover Database; National Structures Dataset; and National Transportation Dataset; U.S. Census Bureau - TIGERLine; HERE RealData; Sources: Esri; GEBCO; NOAA; National Geographic; DeLorme; HERE; Geonames.org; and other contributors.





**Legend**

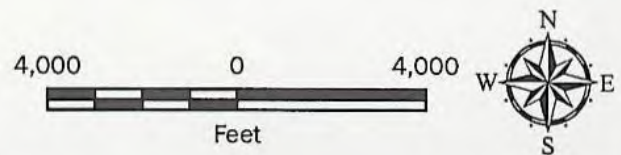
- TCMF Pumps
- Inland Wells
- TCMF Main Lines
- TCMF Submain Lines
- TCMF Circles

**Notes:**

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source:

Projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet



**Groundwater Well Locations**

Three Mile Canyon Farms  
Morrow County, Oregon

**GEOENGINEERS**

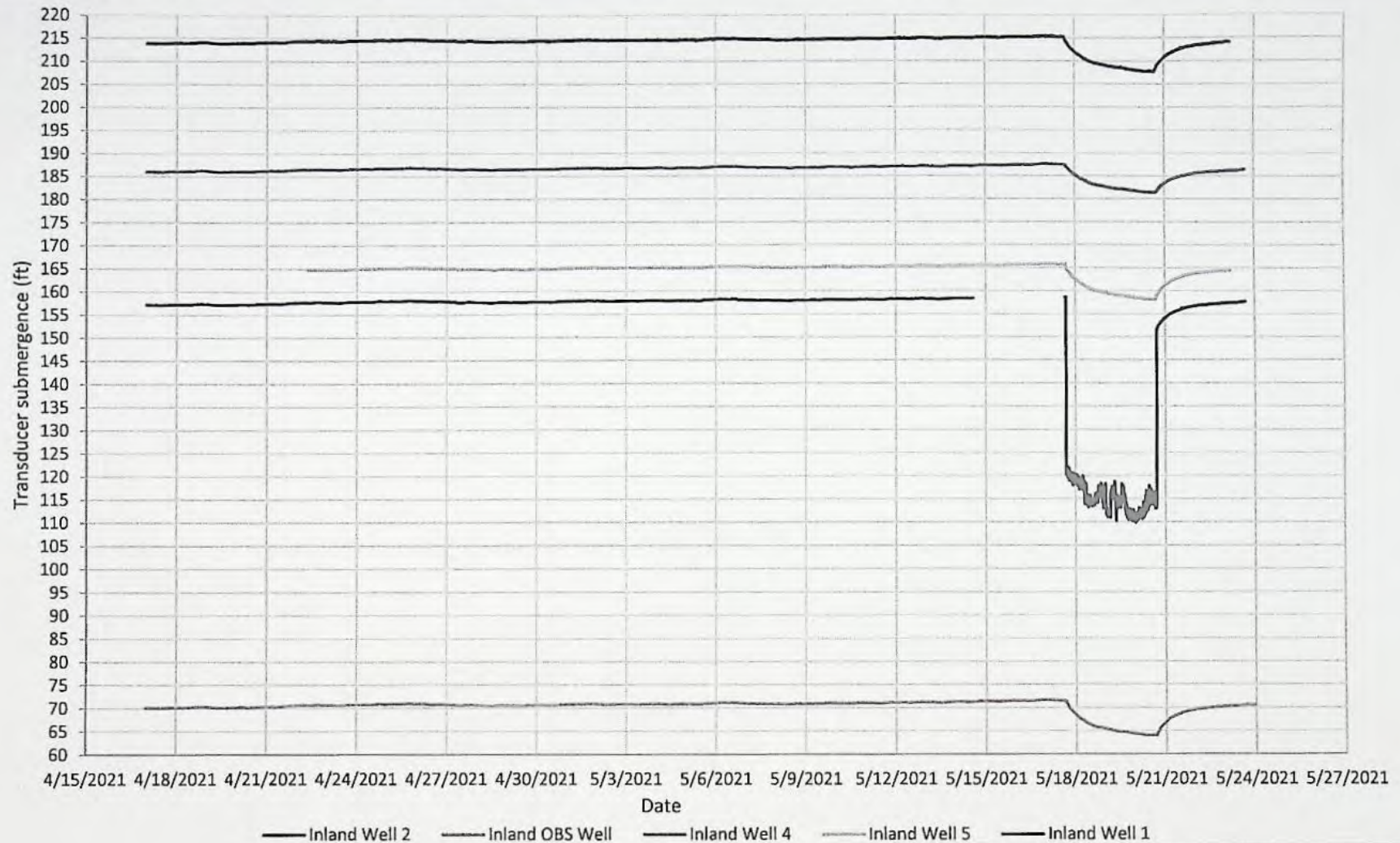
**Figure 4**

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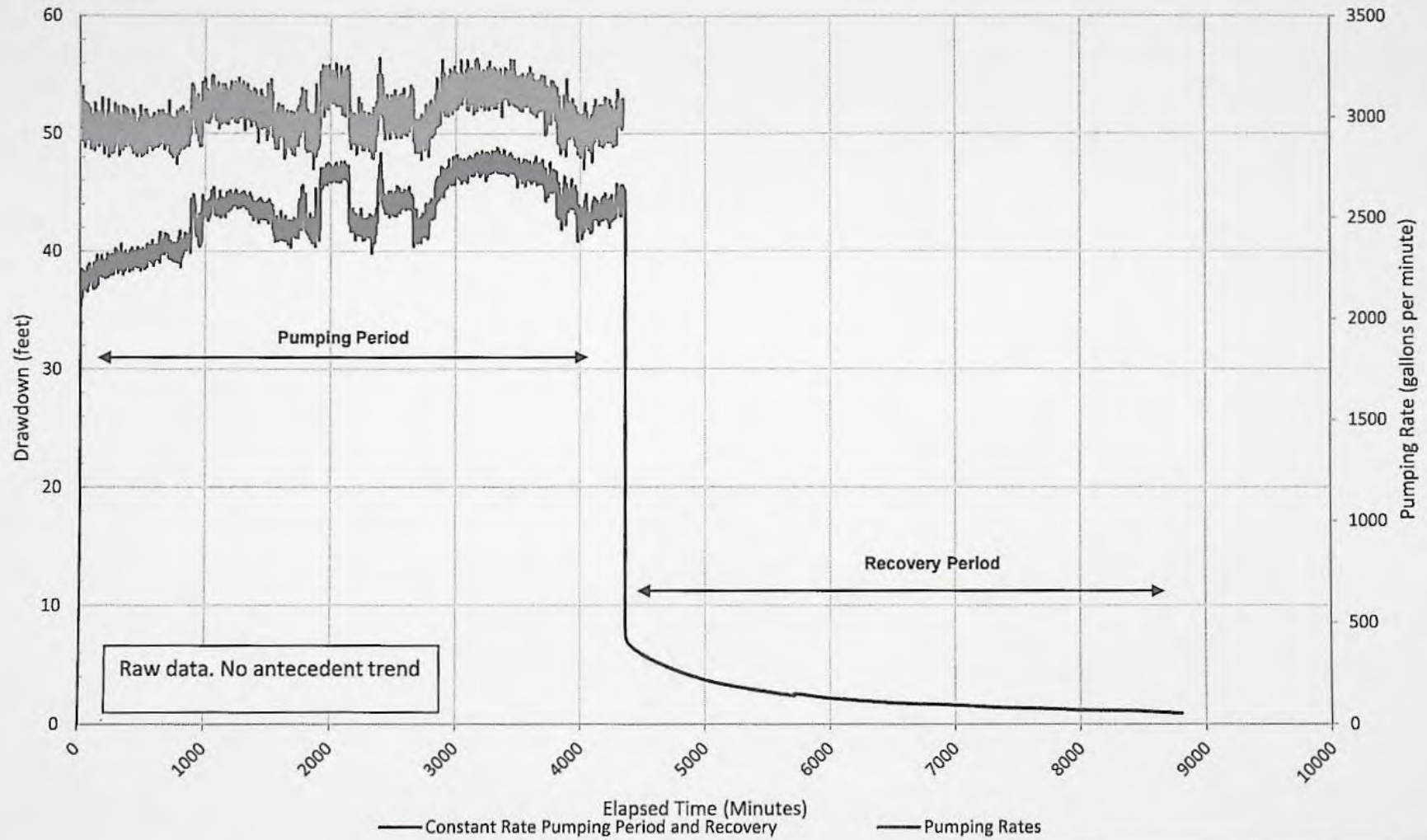
### Test Record Hydrographs

Threemile Canyon Farms  
Boardman, Oregon

**GEOENGINEERS**

Figure 6





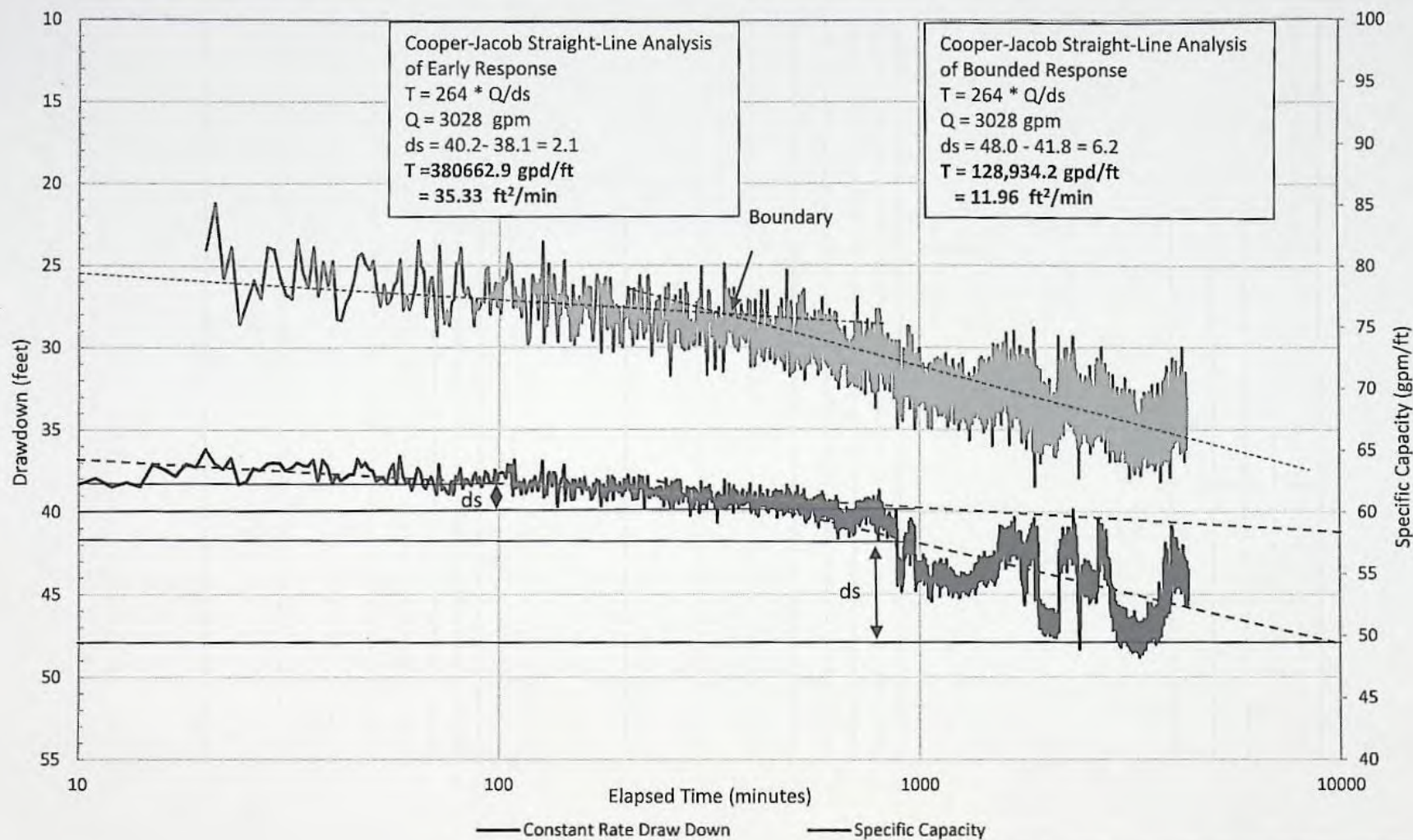
### Inland Well No. 2 Drawdown and Pumping Rates

Threemile Canyon Farms  
Boardman, Oregon

**GEOENGINEERS** 

Figure 7





### Cooper-Jacob Straight Line Analysis

Threemile Canyon Farms  
Boardman, Oregon

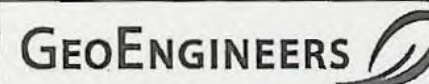
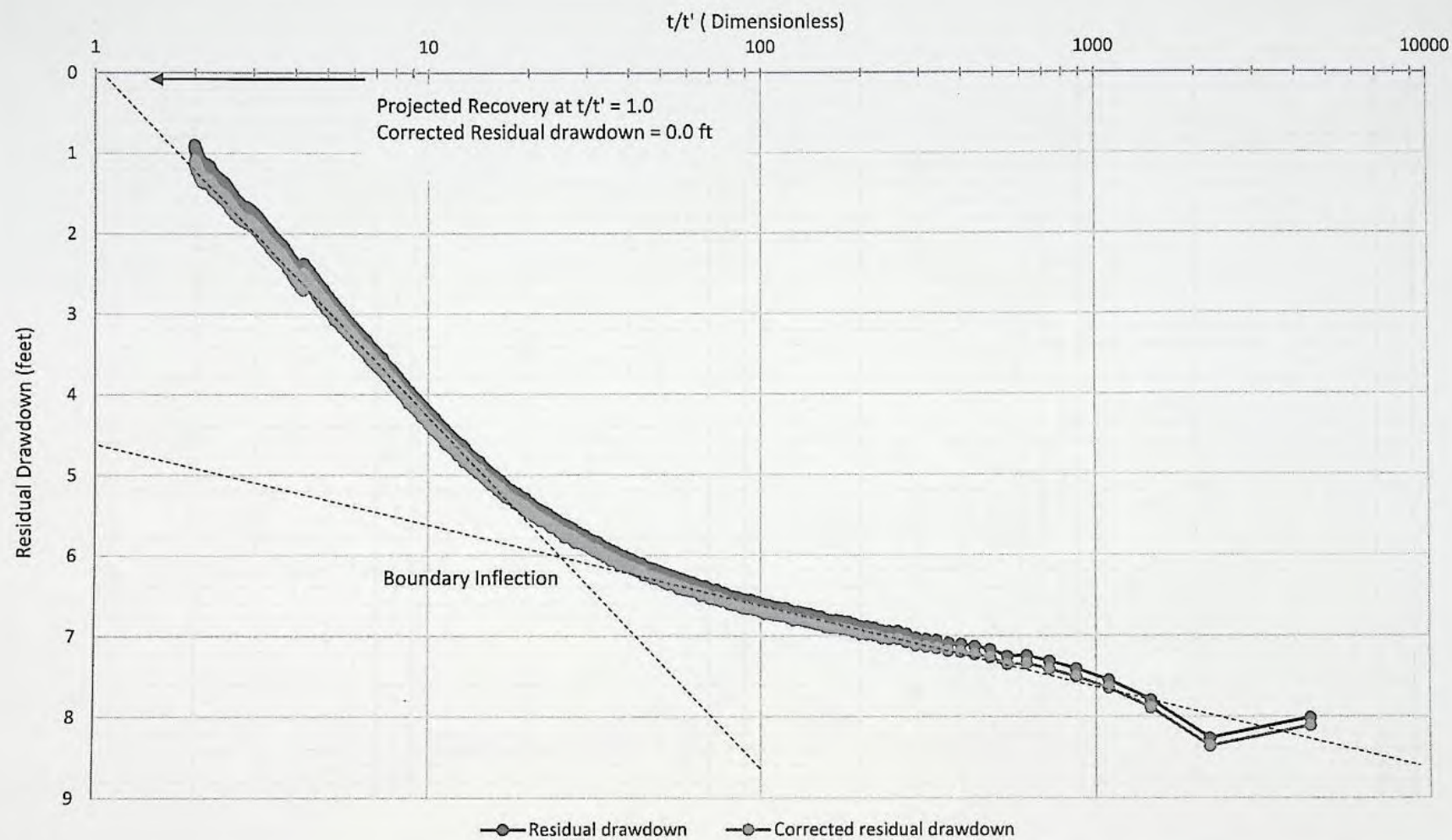


Figure 8





### Recovery Analysis

Threemile Canyon Farms  
Boardman, Oregon

**GEOENGINEERS** 

Figure 9







**APPENDIX A**  
**Well Logs**



# Geologic Log of: Inland Well #1

Project: TMCF Inland Wells

State Well ID: MORR 52037

Logged By: Jon Travis & Walter Burt R.G. Borehole Diameter: 24", 20", 10"

Location: NE, SE, sec. 2, T3N, R24E



Water Solutions, Inc.

8019 W. Quinault Ave, Suite 201

Kennewick, WA 99336

Phone: 509.735.7135

Fax: 509.735.7067

| Depth<br>(ft. bgs) | Lithology<br>Symbol | Lithologic Description                             | Elevation<br>(ft. amsl) | Geochemistry<br>Sample | Well Construction |
|--------------------|---------------------|----------------------------------------------------|-------------------------|------------------------|-------------------|
| 0                  |                     | Ground Surface                                     | 608.0                   |                        |                   |
|                    |                     | Flood Deposit                                      | 0.0                     |                        |                   |
|                    |                     | fine sand                                          | 588.0                   |                        |                   |
|                    |                     | silty fine sand                                    | 20.0                    |                        |                   |
|                    |                     |                                                    | 563.0                   |                        |                   |
|                    |                     | Alkali Canyon Formation                            | 45.0                    |                        |                   |
|                    |                     | tan clay                                           |                         |                        |                   |
| 100                |                     | gray clay                                          | 508.0                   |                        |                   |
|                    |                     | Elephant Mountain Member - Saddle Mountains Basalt | 100.0                   |                        |                   |
|                    |                     | red weathered flow top                             |                         |                        |                   |
|                    |                     | dense interior                                     |                         |                        |                   |
|                    |                     |                                                    | 442.0                   | 150                    |                   |
|                    |                     | Rattlesnake Ridge Member - Ellensburg Formation    | 166.0                   |                        |                   |
|                    |                     | gray clay                                          | 423.0                   |                        |                   |
|                    |                     | gray clay with invasive basalt lobes               | 185.0                   |                        |                   |
| 200                |                     |                                                    |                         |                        |                   |
|                    |                     | Pomona Member - Saddle Mountains Basalt            | 380.0                   |                        |                   |
|                    |                     | red weathered flow top                             | 228.0                   |                        |                   |
|                    |                     | dense interior                                     |                         |                        |                   |
|                    |                     |                                                    |                         | 270                    |                   |
| 300                |                     |                                                    |                         |                        |                   |
|                    |                     | Selah Member - Ellensburg Formation                | 263.0                   |                        |                   |
|                    |                     | green claystone                                    | 345.0                   |                        |                   |
|                    |                     |                                                    |                         |                        |                   |
|                    |                     |                                                    | 210.0                   |                        |                   |
| 400                |                     | Umatilla Member - Saddle Mountains Basalt          | 398.0                   |                        |                   |
|                    |                     | flow top                                           |                         |                        |                   |
|                    |                     | dense interior                                     |                         |                        |                   |
|                    |                     |                                                    |                         | 420                    |                   |
|                    |                     |                                                    |                         | 450                    |                   |
|                    |                     |                                                    |                         | 485                    |                   |
| 500                |                     |                                                    |                         |                        |                   |

Drilled By: Person Pump and Drilling

Drilling Method: mud/air rotary

Date Completed: 1/23/2013

Total Depth: 1450 ft.

Static Water Level: 190.97 ft bgs (1-29-2013 @ 16:00)

Page: 1 of 3



# Geologic Log of: Inland Well #1

Project: TMCF Inland Wells

State Well ID: MORR 52037

Logged By: Jon Travis & Walter Burt R.G. Borehole Diameter: 24", 20", 10"

Location: NE, SE, sec. 2, T3N, R24E



Water Solutions, Inc.

8019 W. Quinault Ave, Suite 201

Kennewick, WA 99336

Phone: 509.735.7135

Fax: 509.735.7067

| Depth<br>(ft. bgs) | Lithology<br>Symbol | Lithologic Description                                    | Elevation<br>(ft. amsl) | Geochemistry<br>Sample | Well Construction |
|--------------------|---------------------|-----------------------------------------------------------|-------------------------|------------------------|-------------------|
|                    |                     |                                                           | 60.0                    |                        |                   |
|                    |                     | Mabton Member - Ellensburg Formation                      | 548.0                   |                        |                   |
|                    |                     | green claystone                                           | 40.0                    |                        |                   |
|                    |                     | Priest Rapids Member - Wanapum Basalt                     | 568.0                   |                        |                   |
|                    |                     | flow top                                                  |                         |                        |                   |
| 600                |                     | dense interior                                            |                         | 605                    |                   |
|                    |                     |                                                           | -42.0                   |                        |                   |
|                    |                     | flow bottom                                               | 650.0                   |                        |                   |
|                    |                     | Quincy/Squaw Creek Member - Ellensburg Formation          |                         |                        |                   |
|                    |                     | small pebble gravel with quartzite and basalt lithologies |                         |                        |                   |
|                    |                     | green claystone                                           |                         |                        |                   |
| 700                |                     | formation was cemented due to hole instability 645'-705'  | -97.0                   |                        |                   |
|                    |                     | Frenchman Springs Member - Wanapum Basalt                 | 705.0                   |                        |                   |
|                    |                     | Basalt of Sentinel Gap - flow 1                           |                         |                        |                   |
|                    |                     | weathered top                                             |                         | 740                    |                   |
|                    |                     | dense interior                                            |                         |                        |                   |
|                    |                     |                                                           | -167.0                  |                        |                   |
|                    |                     | Basalt of Sentinel Gap - flow 2                           | 775.0                   |                        |                   |
|                    |                     | flow top breccia                                          | -187.0                  |                        |                   |
| 800                |                     | dense interior                                            | 795.0                   |                        |                   |
|                    |                     | internal vesicular zone                                   |                         |                        |                   |
|                    |                     | dense interior                                            |                         |                        |                   |
|                    |                     |                                                           |                         | 884                    |                   |
|                    |                     |                                                           | -332.0                  |                        |                   |
|                    |                     | Frenchman Springs Member - Wanapum Basalt                 | 940.0                   |                        |                   |
|                    |                     | Basalt of Sand Hollow - flow 1                            | -348.0                  |                        |                   |
|                    |                     | possible thin <1 ft thick interbed @ ~940                 | 956.0                   |                        |                   |
|                    |                     | flow top                                                  |                         | 980                    |                   |
|                    |                     | dense interior                                            |                         |                        |                   |
| 1000               |                     |                                                           |                         |                        |                   |

Drilled By: Person Pump and Drilling

Drilling Method: mud/air rotary

Date Completed: 1/23/2013

Total Depth: 1450 ft.

Static Water Level: 190.97 ft bgs (1-29-2013 @ 16:00)

Page: 2 of 3



# Geologic Log of: Inland Well #1

Project: TMCF Inland Wells

State Well ID: MORR 52037

Logged By: Jon Travis & Walter Burt R.G. Borehole Diameter: 24", 20", 10"

Location: NE, SE, sec. 2, T3N, R24E



Water Solutions, Inc.

8019 W. Quinault Ave, Suite 201  
Kennewick, WA 99336  
Phone: 509.735.7135  
Fax: 509.735.7067

| Depth<br>(ft. bgs) | Lithology<br>Symbol | Lithologic Description                       | Elevation<br>(ft. amsl) | Geochemistry<br>Sample | Well Construction |
|--------------------|---------------------|----------------------------------------------|-------------------------|------------------------|-------------------|
|                    |                     |                                              | -416.0                  |                        |                   |
|                    |                     | Basalt of Sand Hollow - flow 2               | 1024.0                  |                        |                   |
|                    |                     | flow top<br>dense interior                   |                         | 1080                   |                   |
| 100                |                     |                                              |                         |                        |                   |
| 1200               |                     |                                              |                         |                        |                   |
|                    |                     |                                              | -616.0                  |                        |                   |
|                    |                     | Unnamed Interbed<br>green claystone          | 1224.0                  |                        |                   |
|                    |                     | Frenchman Springs Member - Wanapum Basalt    | -649.0                  |                        |                   |
|                    |                     | Basalt of Ginkgo - flow 1                    | 1257.0                  |                        |                   |
|                    |                     | flow top<br>dense interior                   |                         | 1325                   |                   |
| 1300               |                     |                                              |                         |                        |                   |
|                    |                     |                                              | -771.5                  |                        |                   |
|                    |                     | Sentinel Bluffs Member - Grande Ronde Basalt | 1379.5                  |                        |                   |
|                    |                     | deeply weathered basalt                      |                         |                        |                   |
|                    |                     | vesicular oxidized flow top base             | -799.0                  |                        |                   |
|                    |                     | dense interior                               | 1407.0                  |                        |                   |
| 1400               |                     |                                              |                         |                        |                   |
|                    |                     |                                              | -842.0                  | 1440                   |                   |
|                    |                     |                                              | 1450.0                  |                        |                   |
| 1500               |                     |                                              |                         |                        |                   |

884'-1450' 10" open bore hole

Drilled By: Person Pump and Drilling

Drilling Method: mud/air rotary

Date Completed: 1/23/2013

Total Depth: 1450 ft.

Static Water Level: 190.97 ft bgs (1-29-2013 @ 16:00)

Page: 3 of 3



# Geologic Log of: Inland Well 2

Project: TMCF Inland Wells

State Well ID: MORR 52045

Logged By: Jon Travis & Walter Burt R.G. Borehole Diameter: 24", 20"

Location: SE, SW, sec. 1, T3N, R24E



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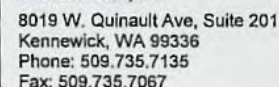
| Depth<br>(ft. bgs) | Lithology<br>Symbol | Lithologic Description                                                                                  | Elevation<br>(ft. amsl) | Geochemistry<br>Sample | Well Construction |
|--------------------|---------------------|---------------------------------------------------------------------------------------------------------|-------------------------|------------------------|-------------------|
| 0                  |                     | Ground Surface                                                                                          | 619.0                   |                        |                   |
|                    |                     | Flood Deposit<br>silty fine sand                                                                        | 0.0                     |                        |                   |
|                    |                     | Alkali Canyon<br>caliche<br>grayish brown clay - oxidized                                               |                         |                        |                   |
|                    |                     | gray clay                                                                                               | 539.0                   |                        |                   |
| 100                |                     |                                                                                                         | 80.0                    |                        |                   |
|                    |                     | Elephant Mountain Member - Saddle Mountains Basalt<br>weathered top<br>dense interior                   | 514.0                   |                        |                   |
|                    |                     |                                                                                                         | 105.0                   |                        |                   |
|                    |                     |                                                                                                         |                         | 140                    |                   |
|                    |                     | Rattlesnake Ridge Member - Ellensburg Formation<br>reddish brown clay                                   | 452.0                   |                        |                   |
|                    |                     |                                                                                                         | 167.0                   |                        |                   |
| 200                |                     | Pomona Member - Saddle Mountains Basalt<br>vesicular flow top<br>rafted baked sediment lens in flow top | 420.0                   |                        |                   |
|                    |                     |                                                                                                         | 199.0                   |                        |                   |
|                    |                     | dense interior                                                                                          | 377.0                   |                        |                   |
|                    |                     |                                                                                                         | 242.0                   |                        |                   |
| 300                |                     |                                                                                                         |                         | 300                    |                   |
|                    |                     | Selah Member - Ellensburg Formation<br>green clay                                                       | 283.0                   |                        |                   |
|                    |                     |                                                                                                         | 336.0                   |                        |                   |
|                    |                     |                                                                                                         | 240.0                   |                        |                   |
|                    |                     | Umatilla Member - Saddle Mountains Basalt<br>vesicular flow top                                         | 379.0                   |                        |                   |
| 400                |                     |                                                                                                         | 217.0                   |                        |                   |
|                    |                     | dense interior                                                                                          | 402.0                   | 400                    |                   |
|                    |                     |                                                                                                         |                         | 470                    |                   |
| 500                |                     |                                                                                                         | 113.0                   |                        |                   |
|                    |                     |                                                                                                         | 506.0                   |                        |                   |

Drilled By: Person Pump and Drilling  
Drilling Method: Air/Mud Rotary  
Date Completed: 4-3-2013

Total Depth: 1053 ft. (4-3-2013)  
Static Water Level: 199.5' bgs (3-1-2013)  
Page: 1 of 3



Location: SE, SW, sec. 1, T3N, R24E

Page: 2 of 3



# Geologic Log of: Inland Well 3

Project: TMCF Inland Wells

State Well ID: MORR 52132

Logged By: Jon Travis & Walter Burt R.G. Borehole Diameter: 30", 24", 20"

Location: NE, NW, sec. 13, T3N, R24E



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| Depth<br>(ft. bgs) | Lithology<br>Symbol | Lithologic Description                                                                                                    | Elevation<br>(ft. amsl)          | Geochemistry<br>Sample | Well Construction |
|--------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------|-------------------|
| 0                  |                     | Ground Surface                                                                                                            | 612.0                            |                        |                   |
|                    |                     | Flood Deposit<br>silty fine sand                                                                                          | 0.0<br>595.0                     |                        |                   |
|                    |                     | Alkali Canyon<br>caliche                                                                                                  | 17.0                             |                        |                   |
|                    |                     | grayish red brown clay - oxidized                                                                                         | 555.0                            |                        |                   |
|                    |                     | Elephant Mountain Member - Saddle Mountains Basalt<br>very weathered dense interior                                       | 57.0<br>526.0                    |                        |                   |
| 100                |                     | unweathered dense interior                                                                                                | 86.0                             |                        |                   |
|                    |                     | Rattlesnake Ridge Member - Ellensburg Formation<br>blue-green clay<br>unstable                                            | 470.0<br>142.0                   | 140                    |                   |
|                    |                     | Pomona Member - Saddle Mountains Basalt<br>vesicular flow top<br>rafted baked sediment lens in flow top<br>dense interior | 439.0<br>173.0                   |                        |                   |
| 200                |                     |                                                                                                                           |                                  |                        |                   |
|                    |                     | vesicular flow bottom                                                                                                     | 339.0<br>273.0                   |                        |                   |
|                    |                     | Selah Member - Ellensburg Formation<br>green claystone                                                                    |                                  |                        |                   |
| 300                |                     | Umatilla Member - Saddle Mountains Basalt<br>vesicular flow top<br>dense interior                                         |                                  |                        |                   |
|                    |                     |                                                                                                                           |                                  | 340                    |                   |
| 400                |                     |                                                                                                                           |                                  |                        |                   |
|                    |                     | Mabton Member - Ellensburg Formation<br>green claystone                                                                   | 178.0<br>434.0                   |                        |                   |
|                    |                     | Priest Rapids Member - Wanapum Basalt<br>vesicular flow top<br>dense interior                                             | 146.0<br>466.0<br>128.0<br>484.0 |                        |                   |
| 500                |                     |                                                                                                                           |                                  |                        |                   |

Drilled By: Person Pump and Drilling  
Drilling Method: Air/Mud Rotary  
Date Completed: 4/25/2013

Total Depth: 926 ft. (4/25/2013)  
Static Water Level: 189.8 feet bgs (4/29/2013)  
Page: 1 of 2



# Geologic Log of: Inland Well 3

Project: TMCF Inland Wells

State Well ID: MORR 52132

Logged By: Jon Travis & Walter Burt R.G. Borehole Diameter: 30", 24", 20"

Location: NE, NW, sec. 13, T3N, R24E



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| Depth<br>(ft. bgs) | Lithology<br>Symbol | Lithologic Description                                                                    | Elevation<br>(ft. amsl)   | Geochemistry<br>Sample | Well Construction |
|--------------------|---------------------|-------------------------------------------------------------------------------------------|---------------------------|------------------------|-------------------|
|                    |                     |                                                                                           | 59.0                      |                        |                   |
|                    |                     | Quincy/Squaw Creek Member - Ellensburg Formation<br>green claystone                       | 553.0                     |                        |                   |
|                    |                     | Frenchman Springs Member - Wanapum Basalt                                                 |                           |                        |                   |
|                    |                     | Basalt of Sentinel Gap<br>flow 1                                                          |                           |                        |                   |
| 600                |                     | flow top breccia<br>dense interior                                                        |                           |                        |                   |
|                    |                     | Basalt of Sentinel Gap<br>flow 2                                                          |                           |                        |                   |
|                    |                     | flow top breccia<br>dense interior                                                        | -46.0<br>658.0            |                        |                   |
| 700                |                     |                                                                                           |                           | 720                    |                   |
|                    |                     |                                                                                           | -167.0                    |                        |                   |
|                    |                     | Basalt of Sand Hollow<br>flow 1                                                           | 779.0<br>-183.0<br>795.0  |                        |                   |
| 800                |                     | vesicular flow top (flow lobe?)<br>dense interior<br>vesicular flow top<br>dense interior |                           |                        |                   |
|                    |                     | Basalt of Sand Hollow<br>flow 2                                                           | -256.0<br>868.0           | 850                    |                   |
|                    |                     | flow top breccia                                                                          |                           |                        |                   |
| 900                |                     | dense interior                                                                            | -296.0<br>908.0<br>-314.0 |                        |                   |
|                    |                     |                                                                                           | 926.0                     | 926                    |                   |
| 1000               |                     |                                                                                           |                           |                        |                   |

557'-926' - 20" open hole

Drilled By: Person Pump and Drilling

Drilling Method: Air/Mud Rotary

Date Completed: 4/25/2013

Total Depth: 926 ft. (4/25/2013)

Static Water Level: 189.8 feet bgs (4/29/2013)

Page: 2 of 2



# Geologic Log of: Inland Well 4

Project: TCMF Inland Wells

State Well ID: MORR 52131

Logged By: Jon Travis & Walter Burt R.G. Borehole Diameter: 30", 24", 20"

Location: NW, SE, sec. 14, T3N R24E



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| Depth<br>(ft. bgs) | Lithology<br>Symbol | Lithologic Description                             | Elevation<br>(ft. amsl) | Geochemistry<br>Sample | Well Construction |
|--------------------|---------------------|----------------------------------------------------|-------------------------|------------------------|-------------------|
| 0                  |                     | Ground Surface                                     | 613.0                   |                        |                   |
|                    |                     | Flood Deposit                                      | 0.0                     |                        |                   |
|                    |                     | silty fine sand                                    | 593.0                   |                        |                   |
|                    |                     | Alkali Canyon                                      | 20.0                    |                        |                   |
|                    |                     | caliche                                            | 566.0                   |                        |                   |
|                    |                     | grayish red brown clay - oxidized                  | 47.0                    |                        |                   |
|                    |                     | Elephant Mountain Member - Saddle Mountains Basalt |                         |                        |                   |
|                    |                     | very weathered dense interior                      |                         |                        |                   |
|                    |                     | weathered dense interior                           |                         |                        |                   |
| 100                |                     |                                                    | 471.0                   |                        |                   |
|                    |                     | Rattlesnake Ridge Member - Ellensburg Formation    | 142.0                   |                        |                   |
|                    |                     | blue-green clay                                    |                         |                        |                   |
|                    |                     | unstable                                           | 439.0                   |                        |                   |
|                    |                     | Pomona Member - Saddle Mountains Basalt            | 174.0                   |                        |                   |
|                    |                     | vesicular flow top                                 | 416.0                   |                        |                   |
|                    |                     | rafted baked sediment in flow top                  | 197.0                   |                        |                   |
| 200                |                     | dense interior                                     |                         |                        |                   |
|                    |                     |                                                    | 358.0                   | 230                    |                   |
|                    |                     | vesicular flow bottom                              | 255.0                   |                        |                   |
|                    |                     | Selah Member - Ellensburg Formation                | 333.0                   |                        |                   |
|                    |                     | green claystone                                    | 280.0                   |                        |                   |
| 300                |                     | Umatilla Member - Saddle Mountains Basalt          |                         | 287                    |                   |
|                    |                     | vesicular flow top                                 |                         |                        |                   |
|                    |                     | dense interior                                     |                         |                        |                   |
|                    |                     |                                                    | 217.0                   | 385                    |                   |
| 400                |                     | vesicular flow bottom                              | 396.0                   |                        |                   |
|                    |                     | Mabton Member - Ellensburg Formation               | 196.0                   |                        |                   |
|                    |                     | green claystone                                    | 417.0                   |                        |                   |
|                    |                     | Priest Rapids Member - Wanapum Basalt              |                         |                        |                   |
|                    |                     | vesicular flow top                                 |                         |                        |                   |
|                    |                     | dense interior                                     |                         | 455                    |                   |
|                    |                     |                                                    | 130.0                   |                        |                   |
| 500                |                     | Quincy/Squaw Creek Member - Ellensburg Formation   | 483.0                   |                        |                   |
|                    |                     | green claystone                                    |                         |                        |                   |

Drilled By: Person Pump and Drilling

Drilling Method: Air/Mud Rotary

Date Completed: 5-19-2013

Total Depth: 966 ft.

Static Water Level: 204.5 - 5-28-2013 (video log)

Page: 1 of 2



# Geologic Log of: Inland Well 4

Project: TMCF Inland Wells

State Well ID: MORR 52131

Logged By: Jon Travis & Walter Burt R.G. Borehole Diameter: 30", 24", 20"

Location: NW, SE, sec. 14, T3N R24E



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Fax: 509.735.7067

| Depth<br>(ft. bgs) | Lithology<br>Symbol | Lithologic Description                                                                             | Elevation<br>(ft. amsl) | Geochemistry<br>Sample | Well Construction |
|--------------------|---------------------|----------------------------------------------------------------------------------------------------|-------------------------|------------------------|-------------------|
|                    |                     | <b>Frenchman Springs Member- Wanapum Basalt</b>                                                    |                         |                        |                   |
|                    |                     | Basalt of Sentinel Gap flow 1                                                                      | 89.0                    | 515                    |                   |
|                    |                     | very thin flow top mainly dense interior                                                           | 524.0                   |                        |                   |
|                    |                     | Basalt of Sentinel Gap flow 2                                                                      |                         |                        |                   |
|                    |                     | vesicular flow top                                                                                 |                         |                        |                   |
| 600                |                     | Basalt of Sentinel Gap flow 3                                                                      | 28.0                    | 585                    |                   |
|                    |                     | flow top breccia                                                                                   | 585.0                   |                        |                   |
|                    |                     | dense interior                                                                                     | -25.0                   |                        |                   |
|                    |                     |                                                                                                    | 638.0                   |                        |                   |
| 700                |                     |                                                                                                    |                         | 695                    |                   |
|                    |                     | <b>Frenchman Springs Member- Wanapum Basalt</b>                                                    | -127.5                  |                        |                   |
|                    |                     | Basalt of Sand Hollow flow 1                                                                       | 740.5                   |                        |                   |
|                    |                     | flow top breccia                                                                                   |                         |                        |                   |
|                    |                     | dense interior                                                                                     | -168.0                  |                        |                   |
| 800                |                     | Basalt of Sand Hollow flow 2                                                                       | 781.0                   | 800                    |                   |
|                    |                     | vesicular flow top                                                                                 |                         |                        |                   |
|                    |                     | dense interior                                                                                     | -220.0                  |                        |                   |
|                    |                     | Basalt of Sand Hollow flow 3                                                                       | 833.0                   |                        |                   |
|                    |                     | complex flow top breccia / normal vesicular flow top possibly caused by proximity to the flow edge | -265.0                  |                        |                   |
| 900                |                     | dense interior with internal vuggy zones of varying thickness                                      | 878.0                   | 930                    |                   |
|                    |                     |                                                                                                    | -353.0                  |                        |                   |
|                    |                     |                                                                                                    | 966.0                   |                        |                   |
| 1000               |                     |                                                                                                    |                         |                        |                   |

518'-966' - 20" open hole

Drilled By: Person Pump and Drilling

Drilling Method: Air/Mud Rotary

Date Completed: 5-19-2013

Total Depth: 966 ft.

Static Water Level: 204.5 - 5-28-2013 (video log)

Page: 2 of 2



# Geologic Log of: Inland Well #5

Project: TMCF Inland Wells

State Well ID: MORR 52130

Logged By: Jon Travis & Walter Burt R.G. Borehole Diameter: 30", 24", 20"

Location: SE, NW, sec. 11, T3N, R24E



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| Depth<br>(ft. bgs) | Lithology<br>Symbol | Lithologic Description                                                              | Elevation<br>(ft. amsl) | Geochemistry<br>Sample | Well Construction |
|--------------------|---------------------|-------------------------------------------------------------------------------------|-------------------------|------------------------|-------------------|
| 0                  |                     | Ground Surface                                                                      | 608.0                   |                        |                   |
|                    |                     | Flood Deposit<br>fine sand<br>caliche                                               | 0.0                     |                        |                   |
|                    |                     | Alkali Canyon Formation<br>tan clay                                                 | 571.0<br>37.0           |                        |                   |
| 100                |                     | Elephant Mountain Member - Saddle Mountains Basalt<br>red weathered flow top        | 511.0<br>97.0           |                        |                   |
|                    |                     | dense interior                                                                      | 473.0<br>135.0<br>453.0 | 150                    |                   |
|                    |                     | Rattlesnake Ridge Member - Ellensburg Formation<br>brown clay                       | 155.0                   |                        |                   |
|                    |                     | gravelly green-brown clay                                                           | 423.0<br>185.0          |                        |                   |
| 200                |                     | Pomona Member - Saddle Mountains Basalt<br>red weathered flow top<br>dense interior |                         | 250                    |                   |
| 300                |                     |                                                                                     | 278.0                   |                        |                   |
|                    |                     | Selah Member - Ellensburg Formation<br>green claystone                              | 330.0                   |                        |                   |
|                    |                     |                                                                                     | 246.0                   |                        |                   |
|                    |                     | Umatilla Member - Saddle Mountains Basalt<br>flow top<br>dense interior             | 362.0                   |                        |                   |
| 400                |                     |                                                                                     | 193.0                   | 410                    |                   |
|                    |                     | dense interior with invasive baked claystone pods                                   | 415.0                   |                        |                   |
| 500                |                     |                                                                                     | 103.0<br>505.0          |                        |                   |

Drilled By: Person Pump and Drilling

Total Depth: 1020 ft.

Drilling Method: mud/air rotary/reverse circ.atic Water Level: 198.8' (5-16-2013)

Date Completed: 5-16-2013

Page: 1 of 3



# Geologic Log of: Inland Well #5

Project: TMCF Inland Wells

State Well ID: MORR 52130

Logged By: Jon Travis & Walter Burt R.G. Borehole Diameter: 30", 24", 20"

Location: SE, NW, sec. 11, T3N, R24E



Water Solutions, Inc.

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Fax: 509.735.7067

| Depth<br>(ft. bgs) | Lithology<br>Symbol | Lithologic Description                                              | Elevation<br>(ft. amsl) | Geochemistry<br>Sample | Well Construction |
|--------------------|---------------------|---------------------------------------------------------------------|-------------------------|------------------------|-------------------|
|                    |                     | Mabton Member - Ellensburg Formation<br>green claystone             | 71.0                    |                        |                   |
|                    |                     | Priest Rapids Member - Wanapum Basalt<br>flow top<br>dense interior | 537.0                   |                        |                   |
| 600                |                     |                                                                     | -5.0                    | 600                    |                   |
|                    |                     | invasive baked claystone pod<br>dense interior                      | 613.0                   |                        |                   |
|                    |                     |                                                                     | -55.0                   | 647                    |                   |
|                    |                     | Quincy/Squaw Creek Member - Ellensburg Formation<br>green claystone | 663.0                   |                        |                   |
|                    |                     | flow top                                                            | -82.0                   |                        |                   |
| 700                |                     | dense interior                                                      | 690.0                   |                        |                   |
|                    |                     | weathered dense interior                                            |                         |                        |                   |
|                    |                     | dense interior                                                      | -117.0                  | 720                    |                   |
|                    |                     | flow top breccia                                                    | 725.0                   |                        |                   |
|                    |                     | dense interior                                                      | -152.0                  | 760                    |                   |
| 800                |                     |                                                                     | 760.0                   |                        |                   |
|                    |                     |                                                                     |                         | 860                    |                   |
|                    |                     | flow top breccia                                                    | -280.0                  |                        |                   |
| 900                |                     |                                                                     | 888.0                   |                        |                   |
|                    |                     | dense interior                                                      | -304.0                  |                        |                   |
|                    |                     |                                                                     | 912.0                   |                        |                   |
|                    |                     | flow top breccia                                                    | -366.0                  |                        |                   |
|                    |                     |                                                                     | 974.0                   |                        |                   |
|                    |                     | dense interior                                                      | -385.0                  |                        |                   |
| 1000               |                     |                                                                     | 993.0                   |                        |                   |

20" open hole - 725'-1020'  
24" open hole 706'-725'

Drilled By: Person Pump and Drilling

Total Depth: 1020 ft.

Drilling Method: mud/air rotary/reverse circ. Water Level: 198.8' (5-16-2013)

Date Completed: 5-16-2013

Page: 2 of 3



# Geologic Log of: Inland Well #5

Project: TMCF Inland Wells

State Well ID: MORR 52130

Logged By: Jon Travis & Walter Burt R.G. Borehole Diameter: 30", 24", 20"

Location: SE, NW, sec. 11, T3N, R24E



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Fax: 509.735.7067

| Depth<br>(ft. bgs) | Lithology<br>Symbol | Lithologic Description | Elevation<br>(ft. amsl) | Geochemistry<br>Sample | Well Construction |
|--------------------|---------------------|------------------------|-------------------------|------------------------|-------------------|
|                    |                     |                        | -412.0                  |                        |                   |
|                    |                     |                        | 1020.0                  | 1020                   |                   |
| 100                |                     |                        |                         |                        |                   |
| 200                |                     |                        |                         |                        |                   |
| 300                |                     |                        |                         |                        |                   |
| 400                |                     |                        |                         |                        |                   |
| 500                |                     |                        |                         |                        |                   |

Drilled By: Person Pump and Drilling Total Depth: 1020 ft.

Drilling Method: mud/air rotary/reverse circ.atic Water Level: 198.8' (5-16-2013)

Date Completed: 5-16-2013

Page: 3 of 3



Amended

MORR 52037

MORR 52037

## STATE OF OREGON

## WATER SUPPLY WELL REPORT

(as required by ORS 537.765 &amp; OAR 690-205-0210)

WELL LABEL # L 96345

START CARD # 1017617

## (1) LAND OWNER

Owner Well I.D. Inland Well 1

First Name R.D.

Last Name Offut

Company Threemile Canyon Farms

Address 75906 Threemile Road

City Boardman

State OR

Zip 97818

## (2) TYPE OF WORK

☒ New Well ☐ Deepening ☐ Conversion☐ Alteration (repair/recondition) ☐ Abandonment

## (3) DRILL METHOD

☒ Rotary Air ☒ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud☒ Reverse Rotary ☐ Other

## (4) PROPOSED USE

☐ Domestic ☒ Irrigation ☐ Community☐ Industrial/Commercial☐ Livestock ☐ Dewatering☐ Thermal ☐ Injection ☐ Other

## (5) BORE HOLE CONSTRUCTION

Special Standard ☐ Attach copy

Depth of Completed Well 1,450 ft.

| BORE HOLE |      |       | SEAL     |      |     | Amt    | sacks/<br>lbs |
|-----------|------|-------|----------|------|-----|--------|---------------|
| Dia       | From | To    | Material | From | To  |        |               |
| 24        | 0    | 640   | Cement   | 0    | 640 | 34,800 | P             |
| 19        | 640  | 885   |          |      |     |        |               |
| 10        | 885  | 1,450 |          |      |     |        |               |

How was seal placed:

Method ☐ A ☒ B ☐ C ☐ D ☐ E☐ Other

Backfill placed from \_\_\_\_\_ ft. to \_\_\_\_\_ ft. Material \_\_\_\_\_

Filter pack from \_\_\_\_\_ ft. to \_\_\_\_\_ ft. Material \_\_\_\_\_ Size \_\_\_\_\_

Explosives used: ☐ Yes Type \_\_\_\_\_ Amount \_\_\_\_\_

## (6) CASING/LINER

| Casing                              | Liner                    | Dia | + | From | To  | Gauge | Stl                                 | Plstc                    | Wld                                 | Thrd                     |
|-------------------------------------|--------------------------|-----|---|------|-----|-------|-------------------------------------|--------------------------|-------------------------------------|--------------------------|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | 20  |   | 0    | 640 | .375  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/>            | <input type="checkbox"/> |     |   |      |     |       | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| <input type="checkbox"/>            | <input type="checkbox"/> |     |   |      |     |       | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| <input type="checkbox"/>            | <input type="checkbox"/> |     |   |      |     |       | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| <input type="checkbox"/>            | <input type="checkbox"/> |     |   |      |     |       | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| <input type="checkbox"/>            | <input type="checkbox"/> |     |   |      |     |       | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| <input type="checkbox"/>            | <input type="checkbox"/> |     |   |      |     |       | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| <input type="checkbox"/>            | <input type="checkbox"/> |     |   |      |     |       | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| <input type="checkbox"/>            | <input type="checkbox"/> |     |   |      |     |       | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s) \_\_\_\_\_Temp casing ☒ Yes Dia 30 From 0 To 14

## (7) PERFORATIONS/SCREENS

Perforations Method \_\_\_\_\_

Screens Type \_\_\_\_\_ Material \_\_\_\_\_

| Perf/S | Casing/Screen | Screen | Liner | Dia | From  | To     | Sern/slot | Slot      | # of | Tele/ |
|--------|---------------|--------|-------|-----|-------|--------|-----------|-----------|------|-------|
| green  | Liner         | Dia    | From  | To  | width | length | slots     | pipe size |      |       |
|        |               |        |       |     |       |        |           |           |      |       |
|        |               |        |       |     |       |        |           |           |      |       |
|        |               |        |       |     |       |        |           |           |      |       |
|        |               |        |       |     |       |        |           |           |      |       |
|        |               |        |       |     |       |        |           |           |      |       |
|        |               |        |       |     |       |        |           |           |      |       |
|        |               |        |       |     |       |        |           |           |      |       |
|        |               |        |       |     |       |        |           |           |      |       |
|        |               |        |       |     |       |        |           |           |      |       |

## (8) WELL TESTS: Minimum testing time is 1 hour

☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

| Yield gal/min | Drawdown | Drill stem/Pump depth | Duration (hr) |
|---------------|----------|-----------------------|---------------|
| 4,100         | 19       | 502                   | 72            |
|               |          |                       |               |
|               |          |                       |               |

Temperature 76 °F Lab analysis ☒ Yes By Anutek LabsWater quality concerns? ☐ Yes (describe below)

| From | To | Description | Amount | Units |
|------|----|-------------|--------|-------|
|      |    |             |        |       |
|      |    |             |        |       |
|      |    |             |        |       |

## (9) LOCATION OF WELL (legal description)

County MORROW Twp 3 N N/S Range 24 E E/W WM

Sec 2 NE 1/4 of the SE 1/4 Tax Lot 100

Tax Map Number \_\_\_\_\_ Lot \_\_\_\_\_

Lat 45° 46' 3.910" or 45.76775278 DMS or DD

Long -119° 46' 20.476" or -119.77235278 DMS or DD

☐ Street address of well ☒ Nearest address

Tower Road and Radar Range Road

## (10) STATIC WATER LEVEL

Date SWL(psi) + SWL(ft)

|                              |            |     |
|------------------------------|------------|-----|
| Existing Well / Predeepening |            |     |
| Completed Well               | 01-29-2013 | 191 |

Flowing Artesian? ☐ Dry Hole? ☐

## WATER BEARING ZONES

Depth water was first found 775

| SWL Date   | From  | To    | Est Flow | SWL(psi) | + SWL(ft) |
|------------|-------|-------|----------|----------|-----------|
| 11-10-2012 | 775   | 795   | 10,000   |          | 191       |
| 01-03-2013 | 940   | 956   | 10,000   |          | 191       |
| 01-07-2013 | 1,024 | 1,034 | 10,000   |          | 191       |
| 01-17-2013 | 1,234 | 1,257 | 10,000   |          | 191       |
| 01-22-2013 | 1,379 | 1,410 | 10,000   |          | 191       |

## (11) WELL LOG

Ground Elevation 608

| Material                                   | From | To        |
|--------------------------------------------|------|-----------|
| Notes: RECEIVED BY OWRD                    |      |           |
| Mud rotary drilling - 0-640ft              |      |           |
| Direct air rotary drilling - 640ft-795ft   |      |           |
| Reverse air rotary drilling - 795ft-1450ft |      |           |
|                                            |      |           |
| silty fine sand caliche at 14'             | 0    | 45        |
| tan clay                                   |      | SALEM, OR |
| weathered basalt                           | 103  | 110       |
| hard basalt                                |      | 166       |
| gray clay                                  |      | 228       |
| red weathered broken basalt                | 228  | 235       |
| hard basalt                                |      | 345       |
| green claystone                            |      | 398       |
| soft vesicular basalt                      |      | 404       |
| hard basalt black glassy                   |      | 548       |
| green claystone                            |      | 568       |
| soft vesicular basalt                      |      | 578       |
| hard basalt                                |      | 650       |
| soft slightly vesicular basalt             |      | 655       |

Date Started 09-08-2012

Completed 01-23-2013

## (unbonded) Water Well Constructor Certification

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

License Number \_\_\_\_\_

Date \_\_\_\_\_

Password: (if filing electronically) \_\_\_\_\_

Signed \_\_\_\_\_

## (bonded) Water Well Constructor Certification

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

License Number 1934

Date 03-21-2013

Password (if filing electronically) \_\_\_\_\_

Signed \_\_\_\_\_

Contact Info (optional) \_\_\_\_\_

ORIGINAL - WATER RESOURCES DEPARTMENT

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

Form Version: 0.96







**WATER SUPPLY WELL REPORT -**  
**continuation page**

START CARD # 1018379

## BORE HOLE

| Dia | From | To |
|-----|------|----|
|-----|------|----|

SEAL

sacks/  
lbs[illegible]

| From | To | Material | Size |
|------|----|----------|------|
|------|----|----------|------|

|  |  |  |  |
|--|--|--|--|
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

| Casing | Liner | Dia | + | From | To | Gauge | Stl | Plstc | Wld | Thrd |
|--------|-------|-----|---|------|----|-------|-----|-------|-----|------|
|--------|-------|-----|---|------|----|-------|-----|-------|-----|------|

|   |   |   |   |
|---|---|---|---|
| ○ | □ | □ | □ |
| ○ | □ | □ | □ |
| ○ | □ | □ | □ |
| ○ | □ | □ | □ |

| Perf/S | Casing/ | Screen |      |    | Scrn/slot | Slot   | # of  | Tele/     |
|--------|---------|--------|------|----|-----------|--------|-------|-----------|
| creen  | Liner   | Dia    | From | To | width     | length | slots | pipe size |

[illegible]

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

|  |  |  |  |
|--|--|--|--|
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

| From | To | Description | Amount | Units |
|------|----|-------------|--------|-------|
|------|----|-------------|--------|-------|

[illegible]

### Water Bearing Zones

[illegible]

### Material

| Material                    | From  | To    |
|-----------------------------|-------|-------|
| soft vesicular basalt       | 556   | 567   |
| hard basalt                 | 567   | 641   |
| green claystone             | 641   | 665   |
| soft vesicular basalt       | 665   | 668   |
| hard basalt slightly broken | 668   | 705   |
| broken red vesicular basalt | 705   | 727   |
| hard basalt                 | 727   | 924   |
| soft vesicular basalt       | 924   | 927   |
| hard basalt                 | 927   | 930   |
| soft vesicular basalt       | 930   | 947   |
| hard basalt                 | 947   | 998   |
| brown, red, black claystone | 998   | 1,005 |
| broken red vesicular basalt | 1,005 | 1,037 |
| hard basalt                 | 1,037 | 1,053 |

RECEIVED BY QWRD

~~APR 11 2013~~

~~SALEM, OR~~

## Comments/Remarks



# MORR 52130

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

WELL LABEL # L 107446  
START CARD # 1019188

(1) LAND OWNER Owner Well I.D. Inland Well 5  
First Name R.D. Last Name Offut  
Company Threemile Canyon Farms  
Address 75906 Threemile Road  
City Boardman State OR Zip 97818

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

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

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

(5) BORE HOLE CONSTRUCTION Special Standard ☐ (Attach copy)  
Depth of Completed Well 1,020 ft.

| BORE HOLE |      |       | SEAL     |      |     | Amt | lbs |
|-----------|------|-------|----------|------|-----|-----|-----|
| Dia       | From | To    | Material | From | To  |     |     |
| 30        | 0    | 110   | Cement   | 0    | 110 | 150 | S   |
| 24        | 110  | 725   | Cement   | 0    | 706 | 853 | S   |
| 20        | 725  | 1,020 |          |      |     |     |     |

How was seal placed: Method ☐ A ☒ B ☐ C ☐ D ☐ E  
☐ Other

Backfill placed from ft to ft. Material  
Filter pack from ft to ft. Material Size

Explosives used: ☐ Yes Type Amount

| (6) CASING/LINER                    |                                     | Dia |  | From |  | To  |  | Gauge |  | Std                                 |                          | Plstc                               |                          | Wld                                 |                          | Thrd                     |                          |
|-------------------------------------|-------------------------------------|-----|--|------|--|-----|--|-------|--|-------------------------------------|--------------------------|-------------------------------------|--------------------------|-------------------------------------|--------------------------|--------------------------|--------------------------|
| Casing                              | Liner                               |     |  |      |  |     |  |       |  |                                     |                          |                                     |                          |                                     |                          |                          |                          |
| <input checked="" type="checkbox"/> | <input type="checkbox"/>            | 26  |  | 0    |  | 110 |  | .375  |  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> | 20  |  | 1    |  | 706 |  | .375  |  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s)

Temp casing ☐ Yes Dia From To

## (7) PERFORATIONS/SCREENS

Perforations Method  
Screens Type Material

| Perf/S | Casing/Screen | Liner | Dia | From | To | Scm/slot | Slot   | # of  | Tele/     |
|--------|---------------|-------|-----|------|----|----------|--------|-------|-----------|
| reen   |               |       |     |      |    | width    | length | slots | pipe size |
|        |               |       |     |      |    |          |        |       |           |
|        |               |       |     |      |    |          |        |       |           |
|        |               |       |     |      |    |          |        |       |           |
|        |               |       |     |      |    |          |        |       |           |
|        |               |       |     |      |    |          |        |       |           |
|        |               |       |     |      |    |          |        |       |           |
|        |               |       |     |      |    |          |        |       |           |
|        |               |       |     |      |    |          |        |       |           |
|        |               |       |     |      |    |          |        |       |           |

## (8) WELL TESTS: Minimum testing time is 1 hour

☐ Pump ☐ Bailor ☒ Air ☐ Flowing Artesian  
Yield gal/min Drawdown Drill stem/Pump depth Duration (hr)  
5,000 730 1

Temperature 73 °F Lab analysis ☒ Yes By Ametek Labs

Water quality concerns? ☐ Yes (describe below)

| From | To | Description | Amount | Units |
|------|----|-------------|--------|-------|
|      |    |             |        |       |
|      |    |             |        |       |
|      |    |             |        |       |

## (9) LOCATION OF WELL (legal description)

County MORROW Twp 3 N N/S Range 24 E E/W WM  
Sec 11 SE 1/4 of the NW 1/4 Tax Lot 100  
Tax Map Number Lot  
Lat ° ' " or 45.756662 DMS or DD  
Long ° ' " or -119.782785 DMS or DD  
☐ Street address of well ☒ Nearest address

Tower Road and Radar Range Road

## (10) STATIC WATER LEVEL

| Existing Well / Predeepening | Date       | SWL (psi) | SWL (ft) |
|------------------------------|------------|-----------|----------|
| Completed Well               | 07-11-2013 |           | 246.7    |
| Flowing Artesian?            |            |           |          |
| Dry Hole?                    |            |           |          |

WATER BEARING ZONES Depth water was first found 185

| SWL Date   | From | To  | Est Flow | SWL (psi) | SWL (ft) |
|------------|------|-----|----------|-----------|----------|
| 05-12-2013 | 185  | 195 | 30       |           | 60       |
| 05-13-2013 | 313  | 330 | 80       |           | 101.2    |
| 06-30-2013 | 725  | 760 | 5,000    |           | 231.25   |
| 07-09-2013 | 888  | 912 | 5,000    |           | 248.25   |
| 07-11-2013 | 974  | 993 | 5,000    |           | 246.66   |

## (11) WELL LOG

Ground Elevation 608

| Material                                                 | From | To  |
|----------------------------------------------------------|------|-----|
| Notes:                                                   |      |     |
| Mud rotary drilling - 0-110ft and 387ft-706ft            |      |     |
| Direct air rotary drilling - 110ft-307ft and 706ft-725ft |      |     |
| Reverse air rotary drilling - 725ft-1020ft               |      |     |
| silty fine sand caliche at 17                            | 0    | 14  |
| caliche                                                  | 14   | 37  |
| tan clay                                                 | 37   | 97  |
| weathered vesicular basalt                               | 97   | 135 |
| hard basalt                                              | 135  | 155 |
| blue green clay becoming gravelly at 185                 | 155  | 195 |
| weathered soft vesicular basalt                          | 195  | 202 |
| hard basalt                                              | 202  | 330 |
| green claystone                                          | 330  | 362 |
| soft vesicular basalt                                    | 362  | 370 |
| hard basalt glassy texture                               | 370  | 505 |
| green claystone                                          | 505  | 537 |
| soft vesicular basalt                                    | 537  | 542 |
| hard basalt                                              | 542  | 613 |
| baked claystone                                          | 613  | 618 |

Date Started 04-28-2013 Completed 07-25-2013

## (unbonded) Water Well Constructor Certification

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

License Number 1937 Date 8-19-13  
Password: (if filing electronically)  
Signed [Signature]

## (bonded) Water Well Constructor Certification

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

License Number 1934 Date 8-26-13  
Password: (if filing electronically)  
Signed [Signature]  
Contact Info (optional)

ORIGINAL - WATER RESOURCES DEPARTMENT

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

Form Version: 0.96



START CARD # 1019188

### Water Bearing Zones

| From | To | Material | Size |
|------|----|----------|------|
|      |    |          |      |
|      |    |          |      |
|      |    |          |      |

(11) WELL LOG

[illegible][illegible]

| Perf/S | Casing/ | Screen |      |    | Scrn/slot | Slot   | # of  | Tele/     |
|--------|---------|--------|------|----|-----------|--------|-------|-----------|
| creen  | Liner   | Dia    | From | To | width     | length | slots | pipe size |

[illegible][illegible]

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

|  |  |  |  |
|--|--|--|--|
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

| From | To | Description | Amount | Units |
|------|----|-------------|--------|-------|
|------|----|-------------|--------|-------|

[illegible]

## Comments/Remarks

Water Levels from the production zones fluctuate due to nearby pumping wells

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AUG 30 2013

SALEM, OR



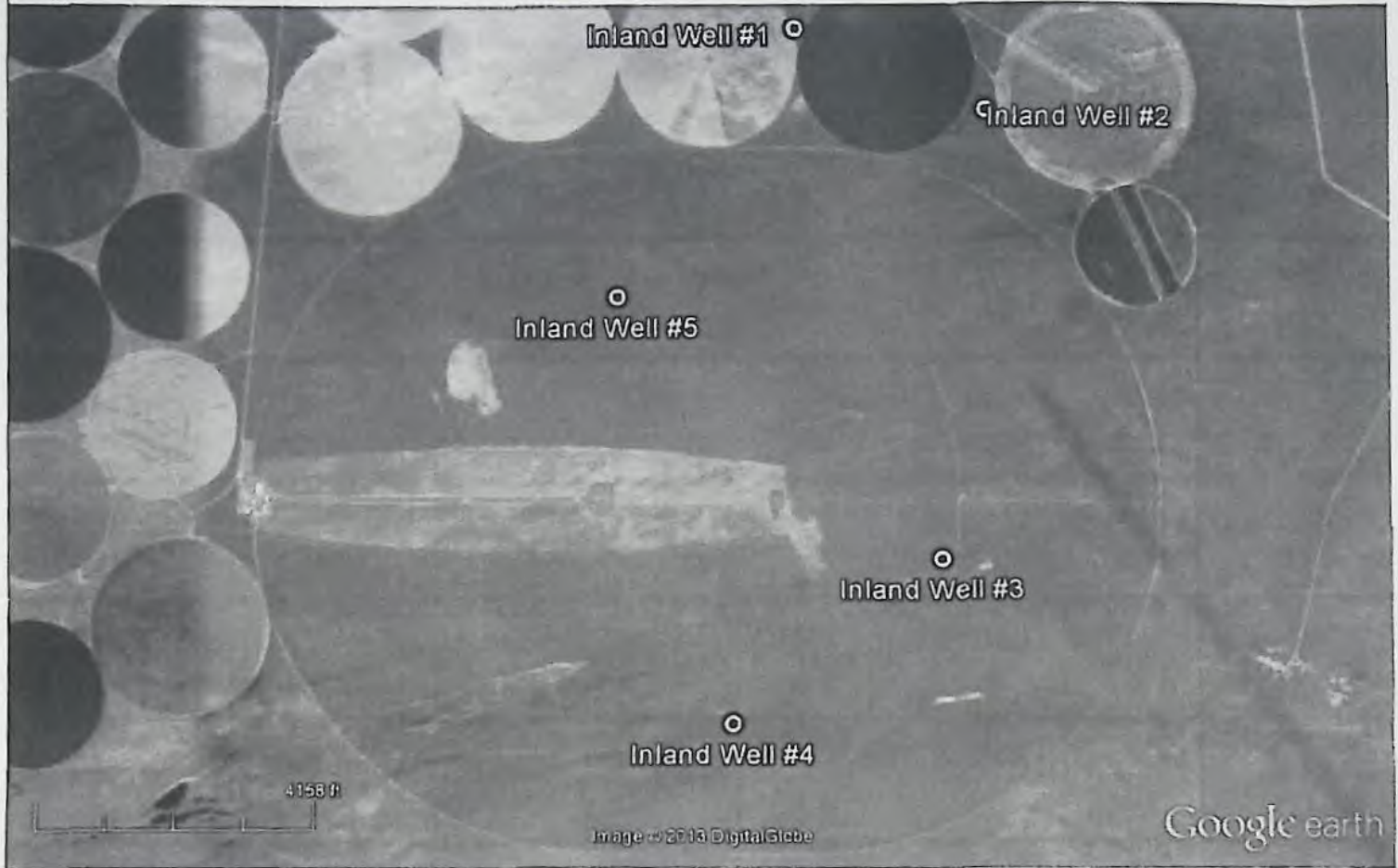
# MORR 52130

WATER SUPPLY WELL REPORT -  
continuation page

WELL I.D. # L \_\_\_\_\_

START CARD # 1019188

Map of well



RECEIVED BY OWRD

AUG 30 2013

SALEM, OR



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

WELL LABEL # L 96347

START CARD # 1019114

## (1) LAND OWNER

Owner Well I.D. Inland Well 3

First Name R.D. Last Name Offut  
Company Threemile Canyon Farms  
Address 75906 Threemile Road  
City Boardman State OR Zip 97818

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

## (3) DRILL METHOD

☒ Rotary Air ☒ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud  
☒ Reverse Rotary ☐ Other

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

(5) BORE HOLE CONSTRUCTION Special Standard ☐ (Attach copy)

Depth of Completed Well 926 ft.

| BORE HOLE |      |     | SEAL     |      |     | sacks/ |     |
|-----------|------|-----|----------|------|-----|--------|-----|
| Dia       | From | To  | Material | From | To  | Amt    | lbs |
| 30        | 0    | 86  | Cement   | 0    | 86  | 88     | S   |
| 24        | 86   | 610 | Cement   | 0    | 545 | 558    | S   |

How was seal placed: Method ☐ A ☒ B ☐ C ☐ D ☐ E  
☐ Other

Backfill placed from ft. to ft. Material

Filter pack from ft. to ft. Material Size

Explosives used: ☐ Yes Type Amount

## (6) CASING/LINER

| Casing/Liner                        | Dia | From | To  | Gauge | Std                                 | Plstc                    | Wld                                 | Thrd                     |
|-------------------------------------|-----|------|-----|-------|-------------------------------------|--------------------------|-------------------------------------|--------------------------|
| <input checked="" type="checkbox"/> | 26  | 0    | 86  | .375  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> | 20  | 1    | 545 | .375  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s)Temp casing ☐ Yes Dia From To

## (7) PERFORATIONS/SCREENS

Perforations Method

Screens Type Material

| Perf/S | Casing/Screen | Liner | Dia | From | To | Scm/slot | Slot   | # of  | Tele/     |
|--------|---------------|-------|-----|------|----|----------|--------|-------|-----------|
| cren   | lin           |       |     |      |    | width    | length | slots | pipe size |
|        |               |       |     |      |    |          |        |       |           |
|        |               |       |     |      |    |          |        |       |           |
|        |               |       |     |      |    |          |        |       |           |
|        |               |       |     |      |    |          |        |       |           |
|        |               |       |     |      |    |          |        |       |           |

## (8) WELL TESTS: Minimum testing time is 1 hour

| <input checked="" type="radio"/> Pump | <input type="radio"/> Bailer | <input type="radio"/> Air | <input type="radio"/> Flowing Artesian |
|---------------------------------------|------------------------------|---------------------------|----------------------------------------|
| Yield gal/min                         | Drawdown                     | Drill stem/Pump depth     | Duration (hr)                          |
| 4,000                                 | 21                           | 502                       | 77                                     |

Temperature 71 °F Lab analysis ☒ Yes By Anatek LabsWater quality concerns? ☐ Yes (describe below)

| From | To | Description | Amount | Units |
|------|----|-------------|--------|-------|
|      |    |             |        |       |
|      |    |             |        |       |

## (9) LOCATION OF WELL (legal description)

County MORROW Twp 3 N N/S Range 24 E E/W WM  
Sec 13 NE 1/4 of the SE 1/4 Tax Lot 100  
Tax Map Number Lot  
Lat " or 45.74593 DMS or DD  
Long " or -119.763893 DMS or DD  
☐ Street address of well ☒ Nearest address

Tower Road and Radar Range Road

## (10) STATIC WATER LEVEL

| Date                         | SWL (psi)  | + SWL (ft) |
|------------------------------|------------|------------|
| Existing Well / Predeepening |            |            |
| Completed Well               | 05-11-2013 | 189.8      |

Flowing Artesian? ☐ Dry Hole? ☐

## WATER BEARING ZONES

Depth water was first found 153

| SWL Date   | From | To  | Est Flow | SWL (psi) | + SWL (ft) |
|------------|------|-----|----------|-----------|------------|
| 03-05-2013 | 153  | 173 | 100      |           | 62         |
| 03-09-2013 | 264  | 279 | 200      |           | 185        |
| 04-10-2013 | 563  | 658 | 5,000    |           | 192.75     |
| 04-21-2013 | 785  | 795 | 5,000    |           | 191.3      |
| 04-24-2013 | 868  | 906 | 5,000    |           | 191.3      |

## (11) WELL LOG

Ground Elevation 608

| Material                                  | From | To  |
|-------------------------------------------|------|-----|
| Notes:                                    |      |     |
| Mud rotary drilling - 0-86ft              |      |     |
| Direct air rotary drilling - 86ft-620ft   |      |     |
| Reverse air rotary drilling - 620ft-926ft |      |     |
| silty fine sand caliche at 17             | 0    | 17  |
| red/brown clay                            | 17   | 57  |
| weathered basalt                          | 57   | 86  |
| hard basalt                               | 86   | 142 |
| blue green clay                           | 142  | 153 |
| soft vesicular basalt                     | 153  | 173 |
| hard basalt                               | 173  | 282 |
| green claystone                           | 282  | 292 |
| soft vesicular basalt                     | 292  | 300 |
| hard basalt glassy texture                | 300  | 434 |
| green claystone                           | 434  | 466 |
| soft vesicular basalt                     | 466  | 484 |
| hard basalt                               | 484  | 553 |
| green claystone (thin >1ft)               | 553  | 554 |

Date Started 02-25-2013 Completed 04-25-2013

## (unbonded) Water Well Constructor Certification

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

License Number 1937 Date 08-19-2013

Password: (if filing electronically)

Signed

## (bonded) Water Well Constructor Certification

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

License Number 1934 Date 08-19-2013

Password: (if filing electronically)

Signed

Contact Info (optional)

ORIGINAL - WATER RESOURCES DEPARTMENT

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

Form Version: 0.96



## MORR 52132

**WATER SUPPLY WELL REPORT -**  
**continuation page**

WELL I.D. # L 96347

START CARD # 1019114

### (5) BORE HOLE CONSTRUCTION

[illegible]

## FILTER PACK

| From | To | Material | Size |
|------|----|----------|------|
|      |    |          |      |
|      |    |          |      |
|      |    |          |      |

## (6) CASING/LINER

[illegible]

### (7) PERFORATIONS/SCREENS

[illegible]

**(8) WELL TESTS:** Minimum testing time is 1 hour

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

## Water Quality Concerns

[illegible]

### (10) STATIC WATER LEVEL

### Water Bearing Zones

[illegible]

## (11) WELL LOG

[illegible]

## Comments/Remarks

RECEIVED BY OWRD

AUG 30 2013

SALEM, OR.



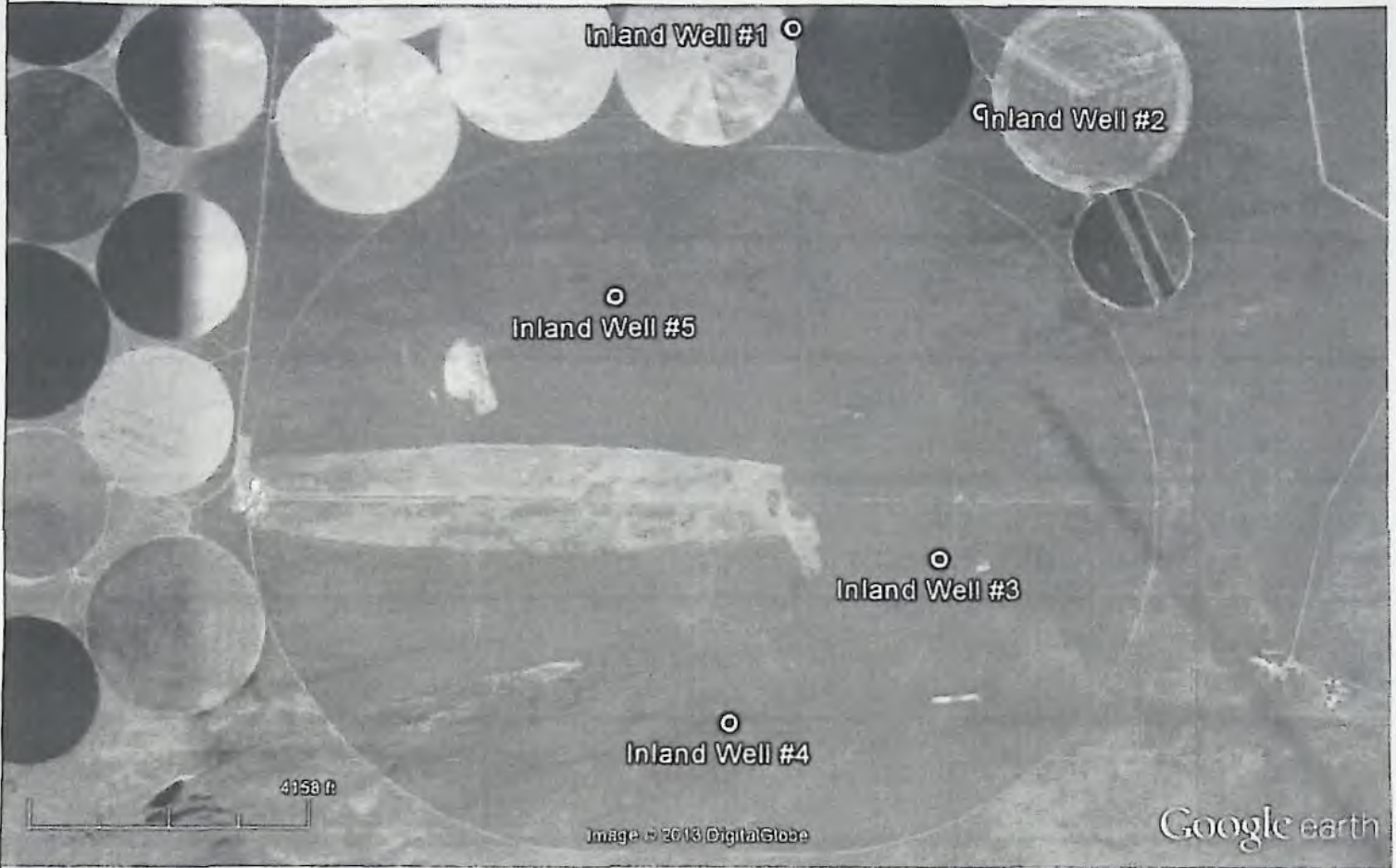
# MORR 52132

WATER SUPPLY WELL REPORT -  
continuation page

WELL I.D. # L 96347

START CARD # 1019114

Map of well



RECEIVED BY OWRD

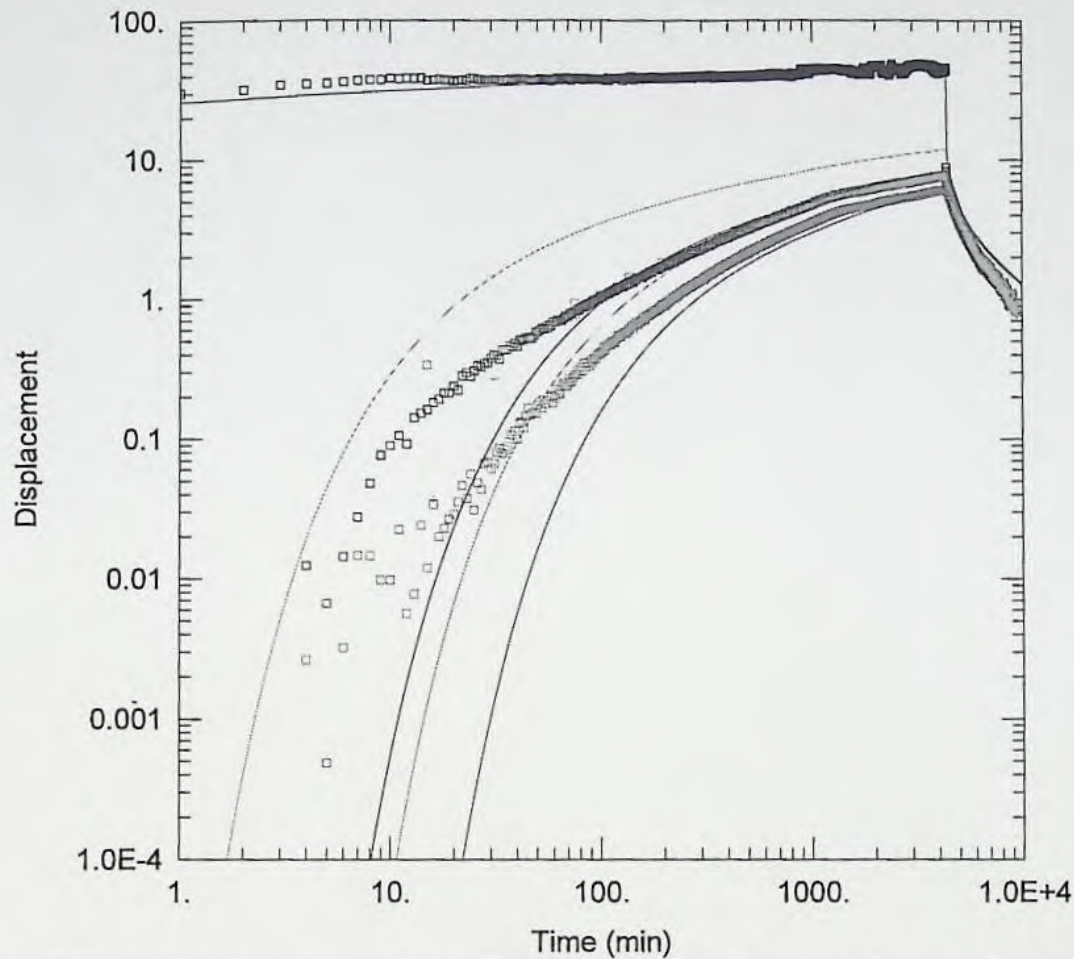
AUG 30 2013

SALEM, OR



**APPENDIX B**  
**AQTESOLV Results**





### INLAND WELL AR PROJECT

Data Set: C:\...\Pumping Well and obs wells.aqt

Date: 11/18/21

Time: 09:28:47

### PROJECT INFORMATION

Company: GeoEnigeers Inc.  
 Client: Three Mile Canyon Farms  
 Project: 23415.001.07  
 Location: TMCF Boardman OR  
 Test Well: Inland Well No.2  
 Test Date: 05/17/2021

### WELL DATA

#### Pumping Wells

| Well Name        | X (ft) | Y (ft) |
|------------------|--------|--------|
| Inland Well No.2 | 0      | 0      |

#### Observation Wells

| Well Name           | X (ft) | Y (ft) |
|---------------------|--------|--------|
| □ Inland Well No.2  | 0      | 0      |
| □ Inland Well No. 4 | -3696  | -9240  |
| □ Inland Well No. 5 | -5280  | -2904  |
| □ Inland Obs. Well  | -6600  | 2112   |
| ✦ Inland Well No. 1 | -2640  | 792    |

### SOLUTION

Aquifer Model: Confined

Solution Method: Theis

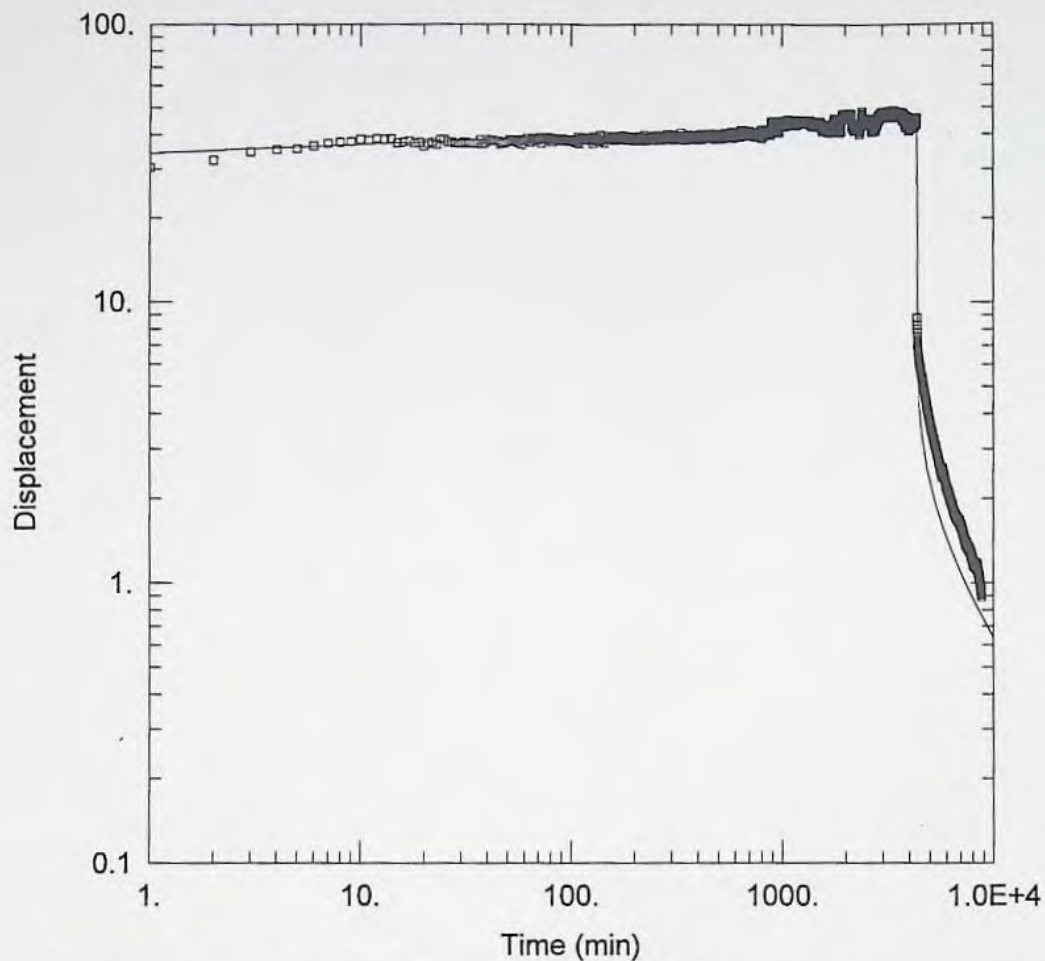
$T = 14.23 \text{ ft}^2/\text{min}$

$S = 9.938\text{E-}5$

$Kz/Kr = 1.$

$b = 72. \text{ ft}$





### INLAND WELL AR PROJECT

Data Set: C:\...\Pumping Well Only.aqt

Date: 11/18/21

Time: 09:26:37

### PROJECT INFORMATION

Company: GeoEnigeers Inc.  
 Client: Three Mile Canyon Farms  
 Project: 23415.001.07  
 Location: TMCF Boardman OR  
 Test Well: Inland Well No.2  
 Test Date: 05/17/2021

### WELL DATA

#### Pumping Wells

| Well Name        | X (ft) | Y (ft) |
|------------------|--------|--------|
| Inland Well No.2 | 0      | 0      |

#### Observation Wells

| Well Name          | X (ft) | Y (ft) |
|--------------------|--------|--------|
| □ Inland Well No.2 | 0      | 0      |

### SOLUTION

Aquifer Model: Confined

Solution Method: Theis

T = 28.93 ft<sup>2</sup>/min

S = 5.916E-13

Kz/Kr = 1.

b = 72. ft







LL 1725 Pr. App



3 Mile Canyon AR Pre-APP

9-20-2017

In Molly Kevin Phil Brown ~~David~~ Dave Nazy

Phil Richerson

Jer,

OHA WQ requirements = can't do ASR  
now pursuing AR

- stabilize gw declines in 5 Inland farms Wells  
w/ ~~re~~ recharge

- no recovery contemplated

Fr Spring of Wanapum. = primary source

DEQ : if chlorinate, DBP's will occur, doesn't  
meet anti-degradation

but DO might  $\uparrow$  oxygen,  $\therefore$  bioclogging

what about die-offs



Table C-1 Phase 1 Pilot Testing Plan

| Cycle    | Cycle 1 (First Spring) |                 |                         | Cycle 2 (First Spring) |                    |                         | Cycle 3* (First Fall) |                    |                         | Cycle 4 (Second Spring) |                    |                      |
|----------|------------------------|-----------------|-------------------------|------------------------|--------------------|-------------------------|-----------------------|--------------------|-------------------------|-------------------------|--------------------|----------------------|
|          | Rate<br>(gpm)          | Duration (Days) | Total<br>Volume<br>(MG) | Rate<br>(gpm)          | Duration<br>(Days) | Total<br>Volume<br>(MG) | Rate<br>(gpm)         | Duration<br>(Days) | Total<br>Volume<br>(MG) | Rate<br>(gpm)           | Duration<br>(Days) | Total Volume<br>(MG) |
| Recharge | 2,500                  | 4.5             | 16.2                    | 2,500                  | 45                 | 162.0                   | 2,500                 | 45                 | 162.0                   | 2,500                   | 45                 | 162.0                |
| Storage  | --                     | 3               | --                      | --                     | ~90                | --                      | --                    | ~180               | --                      | --                      | ~90                | --                   |
| Recovery | 3,000                  | 3.80            | 16.20                   |                        |                    |                         |                       |                    |                         |                         |                    |                      |

Notes:

MG = Million Gallons

This schedule reflects Cycle's 1 and 2 starting in the first 60-day recharge window for the year (i.e. April/May) and Cycle 3 will continue during the second 60-day recharge window (September/October). Cycle 3, and additional cycles durations and volumes may vary based on crop demand and farming needs.

\* The first AR report will be completed after the Cycle 3 injection period.



Table C-3 Phase 1 Water Quality Monitoring Plan

| Cycle                      | Cycle 1                                                                                                             | Cycle 2                                                                                   | Cycle 3*                                                                              |
|----------------------------|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Recharge<br>(Source Water) | Day 1 - FS (within 4 hours of onset)<br>Day 4 - DBP, BAC                                                            | Day 1 - FS (within 4 hours of onset)<br>Day 23 - GC, M, DBP, BAC<br>Day 40 - DBP, BAC     | Day 1 - GC, M, DBP, BAC<br>Day 30 - GC, M, DBP, BAC<br>Day 60 (end of injection) - FS |
| Storage                    | --                                                                                                                  | --                                                                                        | --                                                                                    |
| Stored Water<br>Sampling   | Day 1 - FS (within in an hour of onset)<br>Day 2 - GC, M, DBP, BAC<br>Day 3 - GC, M, DBP, BAC (at 100%<br>recovery) | Day 1 -FS (within in an hour of onset)<br>Day 23 - GC, M, BAC<br>Day 40 - GC, M, DBP, BAC | No recovery will occur at the<br>end of Cycle 3                                       |

Notes:

\* Cycle 3 storage will occur from end of fall through early spring at which point recharge will restart

FS = Full Suite (all parameters listed in Table 3)



Table C-4 Full Analytical Suite

| ANALYTE GROUP / Analyte       | Units                     | Drinking Water Standard / Criteria |
|-------------------------------|---------------------------|------------------------------------|
| <b>GENERAL CHEMISTRY (GC)</b> |                           |                                    |
| Alkalinity (total)            | mg CaCO <sub>3</sub> /L   |                                    |
| Ammonia                       | mg/L as N                 |                                    |
| Bicarbonate                   | mg/L as CaCO <sub>3</sub> |                                    |
| Carbonate                     | mg/L as CaCO <sub>3</sub> |                                    |
| Chemical Oxygen Demand        | mg/L                      |                                    |
| Chloride                      | mg/L                      | 250                                |
| Dissolved Organic Carbon      | mg/L                      |                                    |
| Fluoride                      | mg/L                      | 2.0 (SMCL), 4.0 (MCL)              |
| Hardness                      | mg CaCO <sub>3</sub> /L   | 250 (SMCL)                         |
| Nitrate+Nitrite (total N)     | mg/L as N                 | 10                                 |
| Nitrate-N                     | mg/L as N                 | 10                                 |
| Nitrite-N                     | mg/L as N                 | 1                                  |
| Orthophosphate as P           | mg/L                      |                                    |
| Oxidation-Reduction Potential | millivolts                |                                    |
| pH                            | pH units                  | 6.5 to 8.5 (SMCL)                  |
| Phosphorous (total)           | mg/L                      |                                    |
| Silica (as SiO <sub>2</sub> ) | mg/L                      |                                    |
| Specific Conductance          | µS/cm                     | 700 (SMCL)                         |
| Sulfate                       | mg/L                      | 250 (SMCL)                         |
| Sulfide                       | mg/L                      |                                    |
| Total Dissolved Solids        | mg/L                      | 500 (SMCL)                         |
| Total Organic Carbon          | mg/L                      |                                    |
| Total Suspended Solids        | mg/L                      |                                    |
| Turbidity                     | NTU                       | 1                                  |
| <b>METALS (M)</b>             |                           |                                    |
| Aluminum                      | mg/L                      | 0.05 - 0.2 (SMCL)                  |
| Antimony                      | mg/L                      | 0.006                              |
| Arsenic                       | mg/L                      | 0.010                              |
| Barium                        | mg/L                      | 2                                  |
| Beryllium                     | mg/L                      | 0.004                              |
| Cadmium                       | mg/L                      | 0.005                              |
| Calcium                       | mg/L                      |                                    |
| Chromium                      | mg/L                      | 0.1                                |
| Copper                        | mg/L                      | 1.3**                              |
| Iron                          | mg/L                      | 0.3 (SMCL)                         |
| Iron (dissolved)              | mg/L                      |                                    |
| Lead                          | mg/L                      | 0.015**                            |
| Magnesium                     | mg/L                      |                                    |
| Manganese                     | mg/L                      | 0.05 (SMCL)                        |
| Manganese (dissolved)         | mg/L                      |                                    |
| Mercury                       | mg/L                      | 0.002                              |
| Nickel                        | mg/L                      | MCL being re-evaluated by EPA      |
| Potassium                     | mg/L                      |                                    |
| Selenium                      | mg/L                      | 0.05                               |
| Silver                        | mg/L                      | 0.1 (SMCL)                         |



Table C-4 Full Analytical Suite

| ANALYTE GROUP / Analyte                                            | Units          | Drinking Water Standard / Criteria |
|--------------------------------------------------------------------|----------------|------------------------------------|
| Sodium                                                             | mg/L           | 20**                               |
| Thallium                                                           | mg/L           | 0.002                              |
| Uranium                                                            | mg/L           | 0.03                               |
| Zinc                                                               | mg/L           | 5                                  |
| <b>DISINFECTION BY-PRODUCTS &amp; RESIDUAL DISINFECTANTS (DBP)</b> |                |                                    |
| Bromate                                                            | mg/L           | 0.01                               |
| Chlorite                                                           | mg/L           | 1                                  |
| Residual Chlorine                                                  | mg/L           | 4                                  |
| Dibromoacetic Acid (HAA)                                           | µg/L           | See total HAA's                    |
| Dichloroacetic Acid (HAA)                                          | µg/L           | See total HAA's                    |
| Monobromoacetic Acid (HAA)                                         | µg/L           | See total HAA's                    |
| Monochloroacetic Acid (HAA)                                        | µg/L           | See total HAA's                    |
| Trichloroacetic Acid (HAA)                                         | µg/L           | See total HAA's                    |
| Total Haloacetic Acids (Total HAA's)                               | µg/L           | 60                                 |
| Bromodichloromethane (THM)                                         | µg/L           | See Total THM's                    |
| Bromoform (THM)                                                    | µg/L           | See Total THM's                    |
| Chloroform (THM)                                                   | µg/L           | 70                                 |
| Dibromochloromethane (THM)                                         | µg/L           |                                    |
| Total Trihalomethane (TTHM)                                        | µg/L           | 80                                 |
| <b>MISCELLANEOUS (MISC)</b>                                        |                |                                    |
| Color                                                              | Color units    | 15                                 |
| Corrosivity                                                        | Standard units | Non-corrosive                      |
| MBAS (foaming agents)                                              | mg/L           | 0.5 (SMCL)                         |
| Cyanide (HCN)                                                      | mg/L           | 0.2                                |
| Odor                                                               | T.O.N          | 3 Threshold Nos.                   |
| <b>BACTERIOLOGICALS (BAC)</b>                                      |                |                                    |
| E. Coli                                                            | cfu/100mL      |                                    |
| Fecal Coliform (Presence/Absence)                                  | cfu/100mL      | absent                             |
| Heterotrophic Plate Count                                          | cfu/100mL      |                                    |
| Total Coliform (Presence/Absence)                                  | cfu/100mL      | absent                             |
| <b>RADIOLOGICALS (RAD)</b>                                         |                |                                    |
| Gross Alpha                                                        | pCi/L          | 15                                 |
| Gross Beta                                                         | pCi/L          | 15                                 |
| Radium-226                                                         | pCi/L          | 5 (combined Radium-226 and -228)   |
| Radium-228                                                         | pCi/L          |                                    |
| Radon                                                              | pCi/L          |                                    |
| <b>SYNTHETIC ORGANIC CHEMICALS (SOC)</b>                           |                |                                    |
| Alachlor                                                           | µg/L           | 2                                  |
| Atrazine                                                           | µg/L           | 3                                  |
| Benzo(a)pyrene                                                     | µg/L           | 0.2                                |
| Carbofuran                                                         | µg/L           | 40                                 |
| Chlordane, Technical                                               | µg/L           | 2                                  |
| Dalapon                                                            | µg/L           | 200                                |
| Dibromochloropropane                                               | µg/L           | 0.2                                |



Table C-4 Full Analytical Suite

| ANALYTE GROUP / Analyte                          | Units | Drinking Water Standard / Criteria |
|--------------------------------------------------|-------|------------------------------------|
| Dinoseb                                          | µg/L  | 7                                  |
| Dioxin (2,3,7,8-TCDD)                            | µg/L  | 0.00003                            |
| Diquat                                           | µg/L  | 20                                 |
| Di(2-Ethylhexyl)-Adipate                         | µg/L  | 400                                |
| Di(2-Ethylhexyl)-Phthalate                       | µg/L  | 6                                  |
| Endothall                                        | µg/L  | 100                                |
| Endrin                                           | µg/L  | 2                                  |
| Ethylene Dibromine                               | µg/L  | 0.05                               |
| Glyphosate                                       | µg/L  | 700                                |
| Heptachlor                                       | µg/L  | 0.4                                |
| Heptachlor Epoxide                               | µg/L  | 0.2                                |
| Hexachlorobenzene                                | µg/L  | 1                                  |
| Hexachlorocyclopentadiene                        | µg/L  | 50                                 |
| Lindane (BHC - GAMMA)                            | µg/L  | 0.2 as total PAH's                 |
| Methoxychlor                                     | µg/L  | 40                                 |
| Oxamyl (Vydate)                                  | µg/L  | 200                                |
| Picloram                                         | µg/L  | 500                                |
| Aroclor 1016 (PCB)                               | µg/L  | 0.5 as total PCB's                 |
| Aroclor 1221 (PCB)                               | µg/L  | 0.5 as total PCB's                 |
| Aroclor 1232 (PCB)                               | µg/L  | 0.5 as total PCB's                 |
| Aroclor 1242 (PCB)                               | µg/L  | 0.5 as total PCB's                 |
| Aroclor 1248 (PCB)                               | µg/L  | 0.5 as total PCB's                 |
| Aroclor 1254 (PCB)                               | µg/L  | 0.5 as total PCB's                 |
| Aroclor 1260 (PCB)                               | µg/L  | 0.5 as total PCB's                 |
| Pentachlorophenol                                | µg/L  | 1                                  |
| Simazine                                         | µg/L  | 4                                  |
| Toxaphene                                        | µg/L  | 3                                  |
| 2,4 - D                                          | µg/L  | 70                                 |
| 2,4,5 - TP (SILVEX)                              | µg/L  | 50                                 |
| <b>VOLATILE ORGANIC CHEMICALS (VOC)</b>          |       |                                    |
| Benzene                                          | µg/L  | 5                                  |
| Carbon Tetrachloride                             | µg/L  | 5                                  |
| cis -1,2- Dichloroethylene                       | µg/L  | 70                                 |
| Methylene Chloride (Dichloromethane)             | µg/L  | 5                                  |
| Ethylbenzene                                     | µg/L  | 700                                |
| Monochlorobenzene                                | µg/L  | 100                                |
| 1,2 Dichlorobenzene ( <i>o</i> -Dichlorobenzene) | µg/L  | 600                                |
| 1,4 Dichlorobenzene ( <i>p</i> -dichlorobenzene) | µg/L  | 75                                 |
| Styrene                                          | µg/L  | 100                                |
| Tetrachloroethylene                              | µg/L  | 5                                  |
| Toluene                                          | µg/L  | 1000                               |
| trans - 1,2-Dichloroethylene                     | µg/L  | 100                                |
| Trichloroethylene                                | µg/L  | 5                                  |
| Vinyl Chloride                                   | µg/L  | 2                                  |



Table C-4 Full Analytical Suite

| ANALYTE GROUP / Analyte       | Units   | Drinking Water Standard / Criteria |
|-------------------------------|---------|------------------------------------|
| Total Xylenes                 | µg/L    | 10000                              |
| 1,1 - Dichloroethylene        | µg/L    | 7                                  |
| 1,1,1 - Trichloroethane       | µg/L    | 200                                |
| 1,1,2 - Trichloroethane       | µg/L    | 5                                  |
| 1,2 - Dichloroethane          | µg/L    | 5                                  |
| 1,2 - Dichloropropane         | µg/L    | 5                                  |
| 1,2,4, - Trichlorobenzene     | µg/L    | 70                                 |
| <b>FIELD PARAMETERS (FP)</b>  |         |                                    |
| Temperature                   | Celcius |                                    |
| Conductivity                  | µS/cm   |                                    |
| Dissolved Oxygen              | mg/L    |                                    |
| pH                            | Units   |                                    |
| Turbidity                     | NTU     |                                    |
| Oxidation-Reduction Potential | mV      |                                    |

**Notes:**

--+ Indicated analyte is listed on the EPA Contaminant Candidate List

\*\* Action level set by the Environmental Protection Agency

MCL = Maximum Contaminant Level

SMCL = Secondary Maximum Contaminant Level

MDL = Method Detection Limit

RL = Reporting Limit

pCi/L = Picocuries per liter

µg/L = Micrograms per liter

µS/cm = Micro-Siemens per centimeter

mg/L = Milligrams per liter

NTU = Nephelometric turbidity unit

MV = Millivolts



call in # 1-800-768-2983

code 591-0264 #

**WOODY Jennifer L \* WRD**

---

**From:** Lindsey, Kevin <klindsey@eaest.com>  
**Sent:** Wednesday, September 13, 2017 9:01 AM  
**To:** WOODY Jennifer L \* WRD; RICHERSON Phil; Harris, Greg  
**Cc:** Reid, Molly; Travis, Jonathon; Brown, Phillip; Lindsey, Kevin  
**Subject:** Sept 20 TMC Inland AR Pre-App meeting  
**Attachments:** Attachemnt C\_PilotTestingPlan\_DRAFT\_AR\_edit\_1.docx; Tables\_AR\_edit1.xlsx

All,

The purpose of this e-mail is two-fold: (1) to provide additional information for discussion at the pre-app meeting and (2) provide a brief agenda.

With respect to additional information:

- Several weeks ago we sent out an updated table providing water quality information on the proposed source water (Columbia River) and Wanapum aquifer groundwater (storage zone).
  - This table included new data collected in early summer 2017, updating data provided in late 2016 as part of the old ASR LL application.
  - We also removed dairy water supply wells from it to keep it focused on the project to be discussed.
- Building on that data and in view of the proposed Inland AR project objective, to stabilize and/or reverse the observed late winter static water level declines in the Inland wells, **attached to this e-mail** is a proposed test plan.
  - This proposed plan is a revision of the old ASR LLK app test plan.
  - Yellow highlights in it are some of the specific testing topics we would like to discuss in the AR LL pre-app meeting.

With respect to planned agenda, it includes the following:

1. Convene meeting at 11:00 at TMCF office.
2. Intros and objective of meeting, which is to:
  - a. Introduce the objective of the proposed Inland AR project, which is as noted above (to stabilize and/or reverse the observed late winter static water level declines in the Inland wells), and discuss specific technical issues for the project per the AR rules, and as they differ from previous ASR LL app.
3. Topics we have identified include the following:
  - a. Water rights.
  - b. Source water and groundwater quality data, including treatment and antidegradation objectives.
  - c. Test plan content.
4. Other AR application topics requiring discussion.
5. Meeting wrap-up, which include decisions/concurrence on path forward to complete the application.
6. Meeting ends, 12:30.

I will finalize the agenda early next week. If there are other topics to add to it please let me know.

✈ That's it for now. See/talk to you all next Wednesday, the 20<sup>th</sup>.

Kevin

**Kevin Lindsey**  
Principal Hydrogeologist





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Kennewick, WA 99336

Cell: 509-947-5729

Email: [klindsey@eaest.com](mailto:klindsey@eaest.com)

**IMPROVING THE QUALITY OF THE ENVIRONMENT IN WHICH WE LIVE, ONE PROJECT AT A TIME®**



Before printing, think about ENVIRONMENTAL responsibility

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## AR LIMITED LICENSE WATER QUALITY TEST RESULTS

same well

|                                                      |                                  |                      | WILLOW CREEK/COLUMBIA RIVER SOURCE WATER |         |   |               |         |   |               |         |   |               |         |   | RRI            | Wanapum Groundwater |           |          |               |        |        |         |               |        |         |   |
|------------------------------------------------------|----------------------------------|----------------------|------------------------------------------|---------|---|---------------|---------|---|---------------|---------|---|---------------|---------|---|----------------|---------------------|-----------|----------|---------------|--------|--------|---------|---------------|--------|---------|---|
|                                                      |                                  |                      | PRE-FILTER                               |         |   | POST-FILTER   |         |   | PRE FILTER    |         |   | POST FILTER   |         |   | INLAND BOOSTER |                     | Carty Res |          | I-WELL 5      |        |        |         | Inland Well 5 |        |         |   |
|                                                      |                                  |                      | 10/10/2013                               |         |   | 10/10/2013    |         |   | 8/15/2016     |         |   | 8/15/2016     |         |   | 6/20/2017      |                     | Dec-16    |          | 8/16/2016     |        |        |         | 6/21/2017     |        |         |   |
|                                                      |                                  |                      | Lab ID: 131011061-001                    |         |   | 131011061-002 |         |   | 160816027-001 |         |   | 160816027-002 |         |   | 170621069-001  |                     |           |          | 160817045-001 |        |        |         | 170622027-001 |        |         |   |
| Analyte                                              | OHA DW Standards                 | Oregon DEQ Standards | MRL                                      | Result  | Q | MRL           | Result  | Q | MRL           | Result  | Q | MRL           | Result  | Q | MRL            | Result              | Q         | Result   | Result        | MRL    | MRL    | Result  | Q             | MRL    | Result  | Q |
| INORGANIC CHEMICALS (IOCs)                           |                                  |                      |                                          |         |   |               |         |   |               |         |   |               |         |   |                |                     |           |          |               |        |        |         |               |        |         |   |
| Alkalinity (as CaCO <sub>3</sub> ) (mg/L)            |                                  |                      | 5                                        | 124     |   | 5             | 129     |   | 5             | 55      |   | 5             | 52.6    |   | 5              | 57.4                |           |          |               | 5      | 5      | 186     |               | 5      | 188     |   |
| Aluminum (total) (mg/L)                              | 0.05-0.2 (SMCL)                  |                      | 0.01                                     | 0.142   |   | 0.01          | 0.07    |   | 0.01          | 0.320   |   | 0.01          | 0.162   |   | 0.01           | 0.17                |           | 0.07     | <0.02         | 0.01   | 0.01   | ND      |               | 0.01   | ND      |   |
| Antimony (total) (mg/L)                              | 0.006 (MCL)                      |                      | 0.001                                    | ND      |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001          | ND                  |           |          |               | 0.001  | 0.001  | ND      |               | 0.001  | ND      |   |
| Arsenic (total) (mg/L)                               | 0.010 (MCL)                      | 0.050 (DEQ MML)      | 0.001                                    | 0.0028  |   | 0.001         | 0.00294 |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001          | 0.00182             |           | 0.002    | 0.01          | 0.001  | 0.001  | ND      |               | 0.001  | ND      |   |
| Barium (total) (mg/L)                                | 2 (MCL)                          | 1 (DEQ MML)          | 0.001                                    | 0.11    |   | 0.001         | 0.104   |   | 0.001         | 0.0286  |   | 0.001         | 0.0262  |   | 0.001          | 0.0281              |           |          |               | 0.001  | 0.001  | 0.0232  |               | 0.001  | 0.0256  |   |
| Bicarbonate (as CaCO <sub>3</sub> ) (mg/L)           |                                  |                      | 5                                        | 124     |   | 5             | 129     |   | 5             | 55      |   | 5             | 52.6    |   | 5              | 57.4                |           | 129      | 190           | 5      | 5      | 186     |               | 5      | 188     |   |
| Beryllium (total) (mg/L)                             | 0.004 (MCL)                      |                      | 0.001                                    | ND      |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001          | ND                  |           |          | <0.3          | 0.001  | 0.001  | ND      |               | 0.001  | ND      |   |
| Cadmium (total) (mg/L)                               | 0.005 (MCL)                      | 0.01 (DEQ MML)       | 0.001                                    | ND      |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001          | ND                  |           | <0.002   | <0.0005       | 0.001  | 0.001  | ND      |               | 0.001  | ND      |   |
| Calcium (total) (mg/L)                               |                                  |                      | 0.1                                      | 32.3    |   | 0.1           | 31.5    |   | 0.1           | 16.6    |   | 0.1           | 16.6    |   | 0.1            | 17.7                |           | 32       | 40            | 0.1    | 0.1    | 7.43    |               | 0.1    | 7.16    |   |
| Carbonate (as CaCO <sub>3</sub> ) (mg/L)             |                                  |                      | 5                                        | ND      |   | 5             | ND      |   | 5             | ND      |   | 5             | ND      |   | 5              | ND                  |           |          |               | 5      | 5      | ND      |               | 5      | ND      |   |
| Chloramine (mg/L)                                    |                                  |                      |                                          |         |   |               |         |   |               |         |   |               |         |   | 0.05           | ND                  |           |          |               |        |        |         |               | 0.05   | ND      |   |
| Chloride (total) (mg/L)                              | 250 (SMCL)                       | 250 (DEQ MML)        | 0.1                                      | 17      |   | 0.1           | 17.3    |   | 0.1           | 1.71    |   | 0.1           | 1.72    |   | 0.1            | 7.2                 |           | 16.5     | 16            | 0.1    | 0.1    | 37.1    |               | 0.1    | 36.4    |   |
| Chromium (total) (mg/L)                              | 0.1 (MCL)                        | 0.05 (DEQ MML)       | 0.001                                    | ND      |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001          | 0.00124             |           | <0.001   | <0.005        | 0.001  | 0.001  | 0.00152 |               | 0.001  | 0.00173 |   |
| Copper (total) (mg/L)                                | 1.3 (Action Level)<br>1.0 (SMCL) | 1.0 (DEQ MML)        | 0.001                                    | 0.00713 |   | 0.001         | 0.00424 |   | 0.001         | 0.00144 |   | 0.001         | ND      |   | 0.001          | 0.00196             |           | 0.004    | 0.007         | 0.001  | 0.001  | 0.00199 |               | 0.001  | 0.00183 |   |
| Cyanide (total) (mg/L)                               | 0.2 (MCL)                        |                      | NR                                       | ND      |   | NR            | ND      |   | 0.01          | ND      |   | 0.01          | ND      |   | 0.01           | ND                  |           |          |               | NR     | 0.01   | ND      |               | 0.01   | ND      |   |
| Fluoride (total) (mg/L)                              | 4 (MCL), 2.0 (SMCL)              | 4 (DEQ MML)          | 0.1                                      | 0.446   |   | 0.1           | 0.447   |   | 0.1           | 0.100   |   | 0.1           | 0.101   |   | 0.1            | 0.113               |           | 0.47     | 0.6           | 0.1    | 0.1    | 1.83    |               | 0.1    | 1.76    |   |
| Hardness (as CaCO <sub>3</sub> ) (mg/L)              | 250 (SMCL)                       |                      | 10                                       | 154     |   | 10            | 150     |   | 10            | 59.6    |   | 10            | 59.5    |   | 10             | 80.9                |           |          |               | 10     | 10     | 28.5    |               | 10     | 28.2    |   |
| Iron (total) (mg/L)                                  | 0.3 (SMCL)                       | 0.3 (DEQ MML)        | 0.01                                     | 0.0665  |   | 0.01          | 0.0337  |   | 0.01          | 0.381   |   | 0.01          | 0.185   |   | 0.01           | 0.186               |           | 0.21     | <0.031        | 0.01   | 0.01   | ND      |               | 0.01   | ND      |   |
| Lead (total) (mg/L)                                  | 0.015 (MCL)                      | 0.05 (DEQ MML)       | 0.001                                    | 0.00137 |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001          | ND                  |           |          | <0.032        | 0.001  | 0.001  | ND      |               | 0.001  | ND      |   |
| Magnesium (total) (mg/L)                             |                                  |                      | 0.1                                      | 17.8    |   | 0.1           | 17.4    |   | 0.1           | 4.40    |   | 0.1           | 4.36    |   | 0.1            | 8.9                 |           | 15.3     | 23            | 0.1    | 0.1    | 2.40    |               | 0.1    | 2.49    |   |
| Manganese (total) (mg/L)                             | 0.05 (SMCL)                      | 0.05 (DEQ MML)       | 0.001                                    | 0.014   |   | 0.001         | ND      |   | 0.001         | 0.0111  |   | 0.001         | ND      |   | 0.001          | 0.0185              |           |          |               | 0.001  | 0.001  | ND      |               | 0.001  | ND      |   |
| Mercury (total inorganic) (mg/L)                     | 0.002 (MCL)                      | 0.002 (DEQ MML)      | 0.0001                                   | ND      |   | 0.0001        | ND      |   | 0.0001        | ND      |   | 0.0001        | ND      |   | 0.0001         | ND                  |           | <0.00008 | <0.00005      | 0.0001 | 0.0001 | ND      |               | 0.0001 | ND      |   |
| Nickel (total) (mg/L)                                | 0.1**                            |                      | 0.001                                    | 0.00393 |   | 0.001         | 0.00206 |   | 0.001         | 0.00155 |   | 0.001         | 0.00102 |   | 0.001          | 0.00209             |           |          |               | 0.001  | 0.001  | ND      |               | 0.001  | ND      |   |
| Nitrate (as N) (mg/L)                                | 10 (MCL)                         | 10 (DEQ MML)         | 0.1                                      | ND      |   | 0.1           | ND      |   | 0.1           | ND      |   | 0.1           | ND      |   | 0.1            | 2.58                |           | <0.025   | 0.01          | 0.1    | 0.1    | ND      |               | 0.1    | ND      |   |
| Nitrite (mg/L)                                       | 1 (MCL)                          |                      | 0.1                                      | ND      |   | 0.1           | ND      |   | 0.1           | ND      |   | 0.1           | ND      |   | 0.1            | ND                  |           |          |               | 0.1    | 0.1    | ND      |               | 0.1    | ND      |   |
| Nitrate+Nitrite (total N) (mg/L)                     | 10 (MCL)                         |                      | 0.1                                      | ND      |   | 0.1           | ND      |   | 0.1           | ND      |   | 0.1           | ND      |   | 0.1            | 2.58                |           |          |               | 0.1    | 0.1    | ND      |               | 0.1    | ND      |   |
| Perchlorate (ug/L)                                   |                                  |                      |                                          |         |   |               |         |   | 0.05          | 0.202   |   | 0.05          | 0.203   |   | 0.05           | 0.337               |           |          |               |        | 0.05   | ND      |               | 0.05   | ND      |   |
| Phosphate (mg/L)                                     |                                  |                      | NA                                       | ND      |   | NA            | ND      |   | 0.1           | ND      |   | 0.1           | ND      |   | 0.1            | ND                  |           |          |               | NA     | 0.1    | ND      |               | 0.1    | ND      |   |
| Phosphorus (total) (mg/L)                            |                                  |                      | NA                                       | 0.02    |   | NA            | 0.0109  |   | 0.01          | ND      |   | 0.01          | ND      |   | 0.01           | ND                  |           |          |               | NA     | 0.01   | ND      |               | 0.01   | ND      |   |
| Potassium (mg/L)                                     |                                  |                      | 0.1                                      | 5.22    |   | 0.1           | 5.04    |   | 0.1           | 0.919   |   | 0.1           | 0.892   |   | 0.1            | 1.35                |           | 4.4      |               | 0.1    | 0.1    | 18.2    |               | 0.1    | 17.3    |   |
| Selenium (total) (mg/L)                              | 0.05 (MCL)                       | 0.01 (DEQ MML)       | 0.001                                    | ND      |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001          | ND                  |           |          | <0.005        | 0.001  | 0.001  | ND      |               | 0.001  | ND      |   |
| Silica (mg/L)                                        |                                  |                      | 0.1                                      | 5.63    |   | 0.1           | 4.96    |   | 0.1           | 8.71    |   | 0.1           | 7.83    |   | 0.1            | 10.5                |           | 2.1      | 39            | 0.1    | 0.1    | 64.4    |               | 0.1    | 64.6    |   |
| Silicon (mg/L)                                       |                                  |                      | NR                                       | 2.63    |   | NR            | 2.32    |   | 0.1           | 4.07    |   | 0.1           | 3.66    |   | 0.1            | 5.04                |           | 5.6      |               | NR     | 0.1    | 30.1    |               | 0.1    | 30.2    |   |
| Silver (total) (mg/L)                                | 0.1 (SMCL)                       | 0.05 (DEQ MML)       | 0.001                                    | ND      |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001          | ND                  |           |          |               | 0.001  | 0.001  | ND      |               | 0.001  | ND      |   |
| Sodium (mg/L)                                        |                                  |                      | 0.1                                      | 26.1    |   | 0.1           | 26      |   | 0.1           | 3.47    |   | 0.1           | 3.46    |   | 0.1            | 8.19                |           | 24       | 32            | 0.1    | 0.1    | 75.3    |               | 0.1    | 78.5    |   |
| Sulfate (mg/L)                                       | 250 (SMCL)                       | 250 (DEQ MML)        | 0.1                                      | 50.7    |   | 0.1           | 50.7    |   | 0.1           | 9.55    |   | 0.1           | 9.61    |   | 0.1            | 14.6                |           | 55       | 31            | 0.1    | 0.1    | 1.33    |               | 0.1    | 0.352   |   |
| Sulfide (mg/L)                                       |                                  |                      |                                          |         |   |               |         |   |               |         |   |               |         |   | 0.48           | ND                  |           |          |               |        |        |         |               | 0.99   | ND      |   |
| Thallium (mg/L)                                      | 0.002 (MCL)                      |                      | 0.001                                    | ND      |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001          | ND                  |           |          |               | 0.001  | 0.001  | ND      |               | 0.001  | ND      |   |
| Uranium (mg/L)                                       |                                  |                      |                                          |         |   |               |         |   | 0.001         | ND      |   | 0.001         | ND      |   | 0.001          | 0.00189             |           |          |               |        | 0.001  | ND      |               | 0.001  | ND      |   |
| Zinc (total) (mg/L)                                  | 5 (SMCL)                         | 5 (DEQ MML)          | 0.001                                    | 0.066   |   | 0.001         | 0.00141 |   | 0.001         | 0.00793 |   | 0.001         | 0.00123 |   | 0.001          | 0.00228             |           | <0.004   | 0.002         | 0.001  | 0.001  | 0.00159 |               | 0.001  | 0.00166 |   |
| FIELD PARAMETERS                                     |                                  |                      |                                          |         |   |               |         |   |               |         |   |               |         |   |                |                     |           |          |               |        |        |         |               |        |         |   |
| pH (pH units)                                        | 6.5-8.5 (SMCL)                   | 6.5-8.5 (DEQ MML)    | NA                                       | 8.42    |   | NA            | 8.48    |   | NA            | 8.1     |   | NA            | 8.2     |   | NA             | 7.52                |           | 8.3      | 8             | NA     | NA     | 8.42    |               | NA     | 8.07    |   |
| Specific Conductance (µ S/cm)                        |                                  |                      | NA                                       | 342.1   |   | NA            | 341.1   |   | NA            | 123     |   | NA            | 124     |   | NA             |                     |           |          | 473           | NA     | NA     | 462     |               | NA     |         |   |
| Turbidity (NTUs)                                     | 1 (MCL)                          | 1 (DEQ MML)          | NA                                       | NA      |   | NA            | NA      |   | NA            | NA      |   | NA            | NA      |   | NA             |                     |           |          |               | NA     | NA     |         |               | NA     |         |   |
| Temperature (°C)                                     |                                  |                      | NA                                       | 18.9    |   | NA            | 18.9    |   | NA            | 21.14   |   | NA            | 21.24   |   | NA             |                     |           |          |               | NA     | NA     | 23.37   |               | NA     |         |   |
| Dissolved Oxygen (mg/L)                              |                                  |                      | NA                                       | 9.66    |   | NA            | 9.28    |   | NA            | 8.68    |   | NA            | 8.88    |   | NA             |                     |           |          |               | NA     | NA     | 0.27    |               | NA     |         |   |
| Oxidation-reduction potential (mV)                   |                                  |                      | NA                                       | 185.5   |   | NA            | 216.1   |   | NA            | -174.8  |   | NA            | -164.9  |   | NA             |                     |           |          |               | NA     | NA     | -374.1  |               | NA     |         |   |
| MISCELLANEOUS                                        |                                  |                      |                                          |         |   |               |         |   |               |         |   |               |         |   |                |                     |           |          |               |        |        |         |               |        |         |   |
| Asbestos (million fibers per liter longer than 10um) | 7 (MCL)                          |                      |                                          |         |   |               |         |   |               |         |   |               |         |   |                |                     |           |          |               |        |        |         |               |        |         |   |



AR LIMITED LICENSE WATER QUALITY TEST RESULTS

|                                                          |                  |                      | WILLOW CREEK/COLUMBIA RIVER SOURCE WATER |        |   |               |        |   |               |        |   |               |        |   | RRI            |        | Wanapum Groundwater |               |        |           |      |               |      |               |        |               |    |  |
|----------------------------------------------------------|------------------|----------------------|------------------------------------------|--------|---|---------------|--------|---|---------------|--------|---|---------------|--------|---|----------------|--------|---------------------|---------------|--------|-----------|------|---------------|------|---------------|--------|---------------|----|--|
|                                                          |                  |                      | PRE-FILTER                               |        |   | POST-FILTER   |        |   | PRE FILTER    |        |   | POST FILTER   |        |   | INLAND BOOSTER |        |                     | Carty Res     |        | I-WELL 5  |      |               |      | Inland Well 5 |        |               |    |  |
|                                                          |                  |                      | 10/10/2013                               |        |   | 10/10/2013    |        |   | 8/15/2016     |        |   | 8/15/2016     |        |   | 6/20/2017      |        |                     | Dec-16        |        | 8/16/2016 |      |               |      | 6/21/2017     |        |               |    |  |
|                                                          |                  |                      | Lab ID:                                  |        |   | 131011061-001 |        |   | 131011061-002 |        |   | 160816027-001 |        |   | 160816027-002  |        |                     | 170621069-001 |        |           |      | 160817045-001 |      |               |        | 170622027-001 |    |  |
| Analyte                                                  | OHA DW Standards | Oregon DEQ Standards | MRL                                      | Result | Q | MRL           | Result | Q | MRL           | Result | Q | MRL           | Result | Q | MRL            | Result | Q                   | Result        | Result | MRL       | MRL  | Result        | Q    | MRL           | Result | Q             |    |  |
| 1,1,2-Trichloroethane (ug/L)                             | 5 (MCL)          |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | ND     |               |    |  |
| 1,1-Dichloroethane (ug/L)                                |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| 1,2-Dichloroethane (ug/L)                                | 5 (MCL)          | 5 (DEQ MML)          | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | ND     |               |    |  |
| 1,1-Dichloropropene (ug/L)                               |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| 1,1-Dichloroethene (ug/L)                                |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| 1,2,3-Trichlorobenzene (ug/L)                            |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| 1,2,4-Trichlorobenzene (ug/L)                            | 70 (MCL)         |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | ND     |               |    |  |
| 1,2-Dichloropropane (ug/L)                               | 5 (MCL)          |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | ND     |               |    |  |
| 1,2,3-Trichloropropane (ug/L)                            |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| 1,2-Dibromoethane (EDB) (ug/L)                           |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| 1,3,5-Trimethylbenzene (ug/L)                            |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| 1,2,4-Trimethylbenzene (ug/L)                            |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| 1,2-Dichlorobenzene (ug/L)                               |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| 1,3-Dichlorobenzene (ug/L)                               |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| 1,3-Dichloropropane (ug/L)                               |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| 1,3-Dichloropropene (ug/L)                               |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| 1,4-Dichlorobenzene (ug/L)                               |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| 2,2-Dichloropropane (ug/L)                               |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| 2-Chlorotoluene (ug/L)                                   |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| 4-Chlorotoluene (ug/L)                                   |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Acetone (ug/L)                                           |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 2.5            | ND     |                     |               |        |           |      |               |      | 2.5           | ND     |               |    |  |
| Benzene (ug/L)                                           | 5 (MCL)          | 5 (DEQ MML)          | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | ND     |               |    |  |
| Bromobenzene (ug/L)                                      |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Bromochloromethane (ug/L)                                |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Bromomethane (ug/L)                                      |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Carbon tetrachloride (ug/L)                              | 5 (MCL)          | 5 (DEQ MML)          | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | ND     |               |    |  |
| Chlorobenzene (ug/L)                                     | 100 (MCL)        |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | ND     |               |    |  |
| Chloroethane (ug/L)                                      |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Chloromethane (ug/L)                                     |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| cis-1,2-Dichloroethylene (ug/L)                          | 70 (MCL)         |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | NA     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | NA     |               |    |  |
| cis-1,2-Dichloroethene (ug/L)                            |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| cis-1,3-Dichloropropene (ug/L)                           |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Dacthal (ug/L)                                           |                  |                      |                                          |        |   |               |        |   | 0.02          | ND     |   | 0.02          | ND     |   | 0.02           | 0.05   |                     |               |        |           | 0.02 |               |      | 0.02          | ND     |               |    |  |
| Dichloromethane (Methylene Chloride) (ug/L)              | 5 (MCL)          |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | ND     |               |    |  |
| Dibromomethane (ug/L)                                    |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Dichlorodifluoromethane (ug/L)                           |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Ethylbenzene (ug/L)                                      | 700 (MCL)        |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | ND     |               |    |  |
| o-Dichlorobenzene (1,2-) (ug/L)                          | 600 (MCL)        |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | ND     |               |    |  |
| p-Dichlorobenzene (1,4-) (ug/L)                          | 75 (MCL)         | 75 (DEQ MML)         | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | ND     |               |    |  |
| Hexachlorobutadiene (ug/L)                               |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Isopropylbenzene (ug/L)                                  |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Methyl-t-butyl ether (MTBE) (ug/L)                       |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| n-Butylbenzene (ug/L)                                    |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| n-Propylbenzene (ug/L)                                   |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| p-Isopropyltoluene (ug/L)                                |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| sec-Butylbenzene (ug/L)                                  |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Styrene (ug/L)                                           | 100 (MCL)        |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | ND     |               |    |  |
| tert-Butylbenzene (ug/L)                                 |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Tetrachloroethylene (PCE) (ug/L)                         | 5 (MCL)          |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | NA     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | NA     |               |    |  |
| Tetrachloroethene (ug/L)                                 |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Toluene (ug/L)                                           | 1000 (MCL)       |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | ND     |               |    |  |
| trans-1,2-Dichloroethylene (ug/L)                        | 100 (MCL)        |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | NA     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | NA     |               |    |  |
| trans-1,2-Dichloroethene (ug/L)                          |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| trans-1,3-Dichloropropene (ug/L)                         |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Trichloroethylene (TCE) (ug/L)                           | 5 (MCL)          | 5 (DEQ MML)          | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | NA     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | NA     |               |    |  |
| Trichloroethene (ug/L)                                   |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Trichlorofluoromethane (ug/L)                            |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |               |        |           |      |               |      | 0.5           | ND     |               |    |  |
| Vinyl chloride (ug/L)                                    | 2 (MCL)          | 2 (DEQ MML)          | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     |               |        | 0.5       | 0.5  | ND            |      | 0.5           | ND     |               |    |  |
| m+p-Xylene (ug/L)                                        |                  |                      | 10                                       | ND     |   | 10            | ND     |   | 10            | ND     |   | 10            | ND     |   | 0.5            | ND     |                     |               |        | 10        | 10   | ND            |      | 0.5           | ND     |               |    |  |
| o-Xylene (ug/L)                                          |                  |                      | 10                                       | ND     |   | 10            | ND     |   | 10            | ND     |   | 10            | ND     |   | 0.5            | ND     |                     |               |        | 10        | 10   | ND            |      | 0.5           | ND     |               |    |  |
| Xylenes (total) (ug/L)                                   | 10,000 (MCL)     |                      | 10                                       | ND     |   | 10            | ND     |   | 10            | ND     |   | 10            | ND     |   | 0.5            | ND     |                     |               |        | 10        | 10   | ND            |      | 0.5           | ND     |               |    |  |
| DISINFECTION BY-PRODUCTS (DBPs) & RESIDUAL DISINFECTANTS |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   |                |        |                     |               |        |           |      |               |      |               |        |               |    |  |
| Chlorine (as Cl <sub>2</sub> ) (mg/L)                    | 4 (MRDL)         |                      |                                          |        |   |               |        |   | 0.05          | ND     |   | 0.05          | ND     |   | 0.05           | ND     |                     |               |        |           |      |               | 0.05 | ND            |        | 0.05          | ND |  |
| Chlorine Dioxide (mg/L)                                  |                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.25           | ND     |                     |               |        |           |      |               |      | 0.25          | ND     |               |    |  |
| Bromate (mg/L)                                           | 0.01 (MCL)       |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.001          | ND     |                     |               |        |           |      |               |      | 0.001         | ND     |               |    |  |



## AR LIMITED LICENSE WATER QUALITY TEST RESULTS

|                                         |                          |                      | WILLOW CREEK/COLUMBIA RIVER SOURCE WATER |        |   |               |        |   |               |        |   |               |        |   | RRI            |        | Wanapum Groundwater |        |               |      |        |        |               |      |        |   |
|-----------------------------------------|--------------------------|----------------------|------------------------------------------|--------|---|---------------|--------|---|---------------|--------|---|---------------|--------|---|----------------|--------|---------------------|--------|---------------|------|--------|--------|---------------|------|--------|---|
|                                         |                          |                      | PRE-FILTER                               |        |   | POST-FILTER   |        |   | PRE FILTER    |        |   | POST FILTER   |        |   | INLAND BOOSTER |        | Carty Res           |        | I-WELL 5      |      |        |        | Inland Well 5 |      |        |   |
|                                         |                          |                      | 10/10/2013                               |        |   | 10/10/2013    |        |   | 8/15/2016     |        |   | 8/15/2016     |        |   | 6/20/2017      |        | Dec-16              |        | 8/16/2016     |      |        |        | 8/21/2017     |      |        |   |
|                                         |                          |                      | Lab ID: 131011061-001                    |        |   | 131011061-002 |        |   | 160816027-001 |        |   | 160816027-002 |        |   | 170621069-001  |        |                     |        | 160817045-001 |      |        |        | 170622027-001 |      |        |   |
| Analyte                                 | OHA DW Standards         | Oregon DEQ Standards | MRL                                      | Result | Q | MRL           | Result | Q | MRL           | Result | Q | MRL           | Result | Q | MRL            | Result | Q                   | Result | Result        | MRL  | MRL    | Result | Q             | MRL  | Result | Q |
| Chlorite (mg/L)                         | 1 (MCL)                  |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.01           | ND     |                     |        |               |      |        |        |               | 0.01 | ND     |   |
| Chloroacetic Acid (ug/L)                | Regulated as total HAA's |                      | 2                                        | ND     |   | 2             | ND     |   | 2             | ND     |   | 2             | ND     |   | 2              | NA     |                     |        |               | 2    | 2      | ND     |               | 2    | NA     |   |
| Bromoacetic Acid (ug/L)                 | Regulated as total HAA's |                      | 1                                        | ND     |   | 1             | ND     |   | 1             | ND     |   | 1             | ND     |   | 1              | NA     |                     |        |               | 1    | 1      | ND     |               | 1    | NA     |   |
| Dichloroacetic Acid (ug/L)              | Regulated as total HAA's |                      | NR                                       | ND     |   | NR            | ND     |   | 1             | ND     |   | 1             | ND     |   | 1              | ND     |                     |        |               | NR   | 1      | ND     |               | 1    | ND     |   |
| Trichloroacetic Acid (ug/L)             | Regulated as total HAA's |                      | NR                                       | ND     |   | NR            | ND     |   | 1             | ND     |   | 1             | ND     |   | 1              | ND     |                     |        |               | NR   | 1      | ND     |               | 1    | ND     |   |
| Dibromoacetic Acid (ug/L)               | Regulated as total HAA's |                      | NR                                       | ND     |   | NR            | ND     |   | 1             | ND     |   | 1             | ND     |   | 1              | ND     |                     |        |               | NR   | 1      | ND     |               | 1    | ND     |   |
| Total Haloacetic Acids (HAA-5) (ug/L)   | 60 (MCL)                 |                      | NR                                       | ND     |   | NR            | ND     |   | 1             | ND     |   | 1             | ND     |   | 1              | ND     |                     |        |               | NR   | 1      | ND     |               | 1    | ND     |   |
| Monobromoacetic Acid (ug/L)             |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 1              | ND     |                     |        |               |      |        |        | 1             | ND   |        |   |
| Monochloroacetic Acid (ug/L)            |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 2              | ND     |                     |        |               |      |        |        | 2             | ND   |        |   |
| Chloroform (ug/L)                       | Regulated as total THM's |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     | <0.001 |               | 0.5  | 0.5    | ND     |               | 0.5  | ND     |   |
| Bromodichloromethane (ug/L)             | Regulated as total THM's |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     | <0.001 |               | 0.5  | 0.5    | ND     |               | 0.5  | ND     |   |
| Dibromochloromethane (ug/L)             | Regulated as total THM's |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     | <0.001 |               | 0.5  | 0.5    | ND     |               | 0.5  | ND     |   |
| Bromoform (ug/L)                        | Regulated as total THM's |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     | <0.001 |               | 0.5  | 0.5    | ND     |               | 0.5  | ND     |   |
| Total Trihalomethanes (TTHM) (ug/L)     | 80 (MCL)                 | 10 (DEQ MML)         | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5           | ND     |   | 0.5            | ND     |                     |        |               | 0.5  | 0.5    | ND     |               | 0.5  | ND     |   |
| MICROBIAL                               |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   |                |        |                     |        |               |      |        |        |               |      |        |   |
| Total Coliforms (cell count per 100 mL) | < 5% positive            | <1/100mL             |                                          |        |   |               |        |   | 1             | P      |   | 1             | P      |   | 1              |        |                     |        |               | 1    | ABSENT |        |               | 1    |        |   |
| Fecal Coliforms (cell count per 100 mL) | Confirmed presence       | Confirmed presence   |                                          |        |   |               |        |   |               |        |   |               |        |   |                |        |                     |        |               |      |        |        |               |      |        |   |
| E. Coli (cell count per 100 mL)         | Confirmed presence       | Confirmed presence   |                                          |        |   |               |        |   | 1             | P      |   | 1             | P      |   | 1              |        |                     |        |               | 1    | ABSENT |        |               | 1    |        |   |
| SYNTHETIC ORGANIC COMPOUNDS (SOCs)      |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   |                |        |                     |        |               |      |        |        |               |      |        |   |
| 2,4-D (ug/L)                            | 7 (MCL)                  | 10 (DEQ MML)         | 0.1                                      | ND     |   | 0.1           | ND     |   | 0.1           | ND     |   | 0.1           | ND     |   | 0.1            | ND     |                     |        |               | 0.1  | 0.1    | ND     |               | 0.1  | ND     |   |
| 2,4-DB (ug/L)                           |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 1              | ND     |                     |        |               |      |        |        | 1             | ND   |        |   |
| 4,4-DDD (ug/L)                          |                          |                      | 1                                        | ND     |   | 1             | ND     |   | 1             | ND     |   | 1             | ND     |   | 1              | ND     |                     |        |               | 1    | 1      | ND     |               | 1    | ND     |   |
| 4,4-DDE (ug/L)                          |                          |                      | 1                                        | ND     |   | 1             | ND     |   | 1             | ND     |   | 1             | ND     |   | 1              | ND     |                     |        |               | 1    | 1      | ND     |               | 1    | ND     |   |
| 4,4-DDT (ug/L)                          |                          |                      | 0.01                                     | ND     |   | 0.01          | ND     |   | 0.01          | ND     |   | 0.01          | ND     |   | 0.01           | ND     |                     |        |               | 0.01 | 0.01   | ND     |               | 0.01 | ND     |   |
| 2,4,5-T (ug/L)                          |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.1            | ND     |                     |        |               |      |        |        | 0.1           | ND   |        |   |
| 2,4,5-TP (Silvex) (ug/L)                | 5 (MCL)                  | 10 (DEQ MML)         |                                          |        |   |               |        |   | 0.2           | ND     |   | 0.2           | ND     |   | 0.2            | ND     |                     |        |               |      | 0.2    | ND     |               | 0.2  | ND     |   |
| 2,4,6-Trichlorophenol (ug/L)            |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 1              | NA     |                     |        |               |      |        |        | 1             | NA   |        |   |
| 2-Fluorobiphenyl (ug/L)                 |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   |                | ND     |                     |        |               |      |        |        |               | ND   |        |   |
| 3,5-Dichlorobenzoic Acid (ug/L)         |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |        |               |      |        |        | 0.5           | ND   |        |   |
| 3-Hydrocarbofuran (ug/L)                |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 2              | ND     |                     |        |               |      |        |        | 2             | ND   |        |   |
| Acifluorfen (ug/L)                      |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 2              | ND     |                     |        |               |      |        |        | 2             | ND   |        |   |
| Aldicarb (ug/L)                         |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |        |               |      |        |        | 0.5           | ND   |        |   |
| Aldicarb Sulfone (ug/L)                 |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 1              | ND     |                     |        |               |      |        |        | 1             | ND   |        |   |
| Aldicarb Sulfoxide (ug/L)               |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 1              | ND     |                     |        |               |      |        |        | 1             | ND   |        |   |
| Aldrin (ug/L)                           |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Alachlor (Lasso) (mg/L)                 | 0.002 (MCL)              |                      |                                          |        |   |               |        |   | 0.2           | ND     |   | 0.2           | ND     |   | 0.2            | ND     |                     |        |               | 0.2  | ND     |        | 0.2           | ND   |        |   |
| Alpha-BHC (ug/L)                        |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Beta-BHC (ug/L)                         |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Delta-BHC (ug/L)                        |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Acenaphthene (ug/L)                     |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Acenaphthene-d10 (ug/L)                 |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   |                | ND     |                     |        |               |      |        |        |               | ND   |        |   |
| Acenaphthylene (ug/L)                   |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Anthracene (ug/L)                       |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Atrazine (mg/L)                         | 0.003 (MCL)              |                      |                                          |        |   |               |        |   | 0.1           | ND     |   | 0.1           | ND     |   | 0.1            | ND     |                     |        |               | 0.1  | ND     |        | 0.1           | ND   |        |   |
| Baygon (ug/L)                           |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 1              | ND     |                     |        |               |      |        |        | 1             | ND   |        |   |
| Bentazon (ug/L)                         |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.5            | ND     |                     |        |               |      |        |        | 0.5           | ND   |        |   |
| Benzo(ghi)perylene (ug/L)               |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Benzo(a)anthracene (ug/L)               |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Benzo(b)fluoranthene (ug/L)             |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Benzo(k)fluoranthene                    |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Benzo(a)pyrene (mg/L)                   | 0.0002 (MCL)             |                      |                                          |        |   |               |        |   | 0.02          | ND     |   | 0.02          | ND     |   | 0.02           | ND     |                     |        |               | 0.02 | ND     |        | 0.02          | ND   |        |   |
| Bromacil (ug/L)                         |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Bromoxynil (ug/L)                       |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Butachlor (ug/L)                        |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.4            | ND     |                     |        |               |      |        |        | 0.4           | ND   |        |   |
| Butylbenzylphthalate (ug/L)             |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.4            | ND     |                     |        |               |      |        |        | 0.4           | ND   |        |   |
| Chloropyrifos (ug/L)                    |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Chrysene (ug/L)                         |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Chrysene-d12 (ug/L)                     |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   |                | ND     |                     |        |               |      |        |        |               | ND   |        |   |
| Cyanizine (ug/L)                        |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Carbaryl (ug/L)                         |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 2              | ND     |                     |        |               |      |        |        | 2             | ND   |        |   |
| Carbofuran (mg/L)                       | 0.04 (MCL)               |                      |                                          |        |   |               |        |   | 0.9           | ND     |   | 0.9           | ND     |   | 0.9            | ND     |                     |        |               | 0.9  | ND     |        | 0.9           | ND   |        |   |
| Chloramben (ug/L)                       |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.2            | ND     |                     |        |               |      |        |        | 0.2           | ND   |        |   |
| Chlordane (mg/L)                        | 0.002 (MCL)              |                      |                                          |        |   |               |        |   | 0.2           | ND     |   | 0.2           | ND     |   | 0.2            | ND     |                     |        |               | 0.2  | ND     |        | 0.2           | ND   |        |   |
| Dalapon (mg/L)                          | 0.2 (MCL)                |                      |                                          |        |   |               |        |   | 1             | ND     |   | 1             | ND     |   | 1              | ND     |                     |        |               | 1    | ND     |        | 1             | ND   |        |   |
| Dieldrin (ug/L)                         |                          |                      |                                          |        |   |               |        |   |               |        |   |               |        |   | 0.1            | ND     |                     |        |               |      |        |        | 0.1           | ND   |        |   |



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|                                     |                    |                      | WILLOW CREEK/COLUMBIA RIVER SOURCE WATER |        |   |               |        |   |               |        |               |       |                |   |      |                     | RRI<br>FGE Well<br>000<br>Jul-05 | Wanapum Groundwater |        |     |               |        |      |      |        |      |    |  |
|-------------------------------------|--------------------|----------------------|------------------------------------------|--------|---|---------------|--------|---|---------------|--------|---------------|-------|----------------|---|------|---------------------|----------------------------------|---------------------|--------|-----|---------------|--------|------|------|--------|------|----|--|
|                                     |                    |                      | PRE-FILTER                               |        |   | POST-FILTER   |        |   | PRE FILTER    |        | POST FILTER   |       | INLAND BOOSTER |   |      | Carty Res<br>Dec-16 |                                  | I-WELL 5            |        |     | Inland Well 5 |        |      |      |        |      |    |  |
|                                     |                    |                      | 10/10/2013                               |        |   | 10/10/2013    |        |   | 8/15/2016     |        | 8/15/2016     |       | 6/20/2017      |   |      |                     |                                  | 8/16/2016           |        |     | 6/21/2017     |        |      |      |        |      |    |  |
|                                     |                    |                      | 131011061-001                            |        |   | 131011061-002 |        |   | 160816027-001 |        | 160816027-002 |       | 170621069-001  |   |      |                     |                                  | 160817045-001       |        |     | 170622027-001 |        |      |      |        |      |    |  |
| Analyte                             | OHA DW Standards   | Oregon DEQ Standards | MRL                                      | Result | Q | MRL           | Result | Q | MRL           | Result | Q             | MRL   | Result         | Q | MRL  | Result              | Q                                | Result              | Result | MRL | MRL           | Result | Q    | MRL  | Result | Q    |    |  |
| Dicamba (ug/L)                      |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      | 0.2  | ND     |      |    |  |
| Dichloroprop (ug/L)                 |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.1  | ND                  |                                  |                     |        |     |               |        |      | 0.1  | ND     |      |    |  |
| Diazinon (ug/L)                     |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      | 0.2  | ND     |      |    |  |
| Bis-(2-Ethylhexyl) adipate (mg/L)   | 0.4 (MCL)          |                      |                                          |        |   |               |        |   | 0.2           | ND     |               | 0.2   | ND             |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      | 0.2  | ND     |      |    |  |
| Bis-(2-Ethylhexyl) phthalate (mg/L) | 0.006 (MCL)        |                      |                                          |        |   |               |        |   | 0.6           | ND     |               | 0.6   | ND             |   | 0.6  | ND                  |                                  |                     |        |     |               |        | 0.2  | ND   | 0.2    | ND   |    |  |
| Dibromochloropropane (DBCP) (mg/L)  | 0.0002 (MCL)       |                      |                                          |        |   |               |        |   | 0.02          | ND     |               | 0.02  | ND             |   | 0.02 | ND                  |                                  |                     |        |     |               |        | 0.6  | ND   | 0.6    | ND   |    |  |
| Dibenz(a,h)anthracene (ug/L)        |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        | 0.02 | ND   | 0.02   | ND   |    |  |
| Diethylphthalate (ug/L)             |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.4  | ND                  |                                  |                     |        |     |               |        |      |      | 0.4    | ND   |    |  |
| Dimethylphthalate (ug/L)            |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.4  | ND                  |                                  |                     |        |     |               |        |      |      | 0.4    | ND   |    |  |
| Di-n-butylphthalate (ug/L)          |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.1  | ND                  |                                  |                     |        |     |               |        |      |      | 0.4    | ND   |    |  |
| Dinoseb (mg/L)                      | 0.007 (MCL)        |                      |                                          |        |   |               |        |   | 0.2           | ND     |               | 0.2   | ND             |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.1    | ND   |    |  |
| Dioxin (2,3,7,8-TCDD) (mg/L)        | 0.00000003 (MCL)   |                      |                                          |        |   |               |        |   |               |        |               |       |                |   |      | NA                  |                                  |                     |        |     |               |        | 0.2  | ND   | 0.2    | ND   |    |  |
| Diquat (mg/L)                       | 0.02 (MCL)         |                      |                                          |        |   |               |        |   | 0.4           | ND     |               | 0.4   | ND             |   | 0.4  | ND                  |                                  |                     |        |     |               |        |      |      |        | NA   |    |  |
| Endothall (mg/L)                    | 0.1 (MCL)          |                      |                                          |        |   |               |        |   | 9             | ND     |               | 9     | ND             |   | 9    | ND                  |                                  |                     |        |     |               |        |      | 9    | ND     | 9    | ND |  |
| Endrin (ug/L)                       | 2 (MCL)            | 0.2 (DEQ MML)        | 0.02                                     | ND     |   | 0.02          | ND     |   | 0.02          | ND     |               | 0.02  | ND             |   | 0.02 | ND                  |                                  |                     |        |     | 0.02          | 0.02   | ND   |      | 0.02   | ND   |    |  |
| EPTC (ug/L)                         |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.3  | ND                  |                                  |                     |        |     |               |        |      |      | 0.3    | ND   |    |  |
| Ethylene dibromide (EDB) (ug/L)     | 0.05 (MCL)         |                      | 0.001                                    | ND     |   | 0.001         | ND     |   | 0.001         | ND     |               | 0.001 | ND             |   | 0.01 | ND                  |                                  |                     |        |     | 0.001         | 0.001  | ND   |      | 0.01   | ND   |    |  |
| Ethyl Parathion (ug/L)              |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.2    | ND   |    |  |
| Fluoranthene (ug/L)                 |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.2    | ND   |    |  |
| Fluorene (ug/L)                     |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.2    | ND   |    |  |
| Glyphosate (mg/L)                   | 0.7 (MCL)          |                      |                                          |        |   |               |        |   | 5             | ND     |               | 5     | ND             |   | 5    | ND                  |                                  |                     |        |     |               |        |      | 5    | ND     | 5    | ND |  |
| g-Chlordane (ug/L)                  |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.2    | ND   |    |  |
| Heptachlor (mg/L)                   | 0.0004 (MCL)       |                      |                                          |        |   |               |        |   | 0.04          | ND     |               | 0.04  | ND             |   | 0.04 | ND                  |                                  |                     |        |     |               |        |      | 0.04 | ND     | 0.04 | ND |  |
| Dieldrin (ug/L)                     |                    |                      | 0.2                                      | ND     |   | 0.2           | ND     |   | 0.2           | ND     |               | 0.2   | ND             |   | 0.2  | ND                  |                                  |                     |        |     | 0.2           | 0.2    | ND   |      | 0.2    | ND   |    |  |
| Heptachlor epoxide (ug/L)           | 0.2 (MCL)          |                      | 0.04                                     | ND     |   | 0.04          | ND     |   | 0.04          | ND     |               | 0.04  | ND             |   | 0.04 | ND                  |                                  |                     |        |     | 0.04          | 0.04   | ND   |      | 0.04   | ND   |    |  |
| Hexachlorobenzene (ug/L)            | 1 (MCL)            |                      | 0.2                                      | ND     |   | 0.2           | ND     |   | 0.2           | ND     |               | 0.2   | ND             |   | 0.2  | ND                  |                                  |                     |        |     | 0.2           | 0.2    | ND   |      | 0.2    | ND   |    |  |
| Hexachlorocyclopentadiene (mg/L)    | 0.05 (MCL)         |                      |                                          |        |   |               |        |   | 0.1           | ND     |               | 0.1   | ND             |   | 0.1  | ND                  |                                  |                     |        |     |               |        |      | 0.1  | ND     | 0.1  | ND |  |
| Indeno(1,2,3-cd)pyrene (ug/L)       |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.2    | ND   |    |  |
| Lindane (BHC-gamma) (mg/L)          | 0.0002 (MCL)       | 0.004 (DEQ MML)      |                                          |        |   |               |        |   | 0.02          | ND     |               | 0.02  | ND             |   | 0.02 | ND                  |                                  |                     |        |     | 0.02          | 0.02   | ND   |      | 0.02   | ND   |    |  |
| Malathion (ug/L)                    |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.2    | ND   |    |  |
| MCPA (ug/L)                         |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.2    | ND   |    |  |
| Methiocarb (ug/L)                   |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 1    | ND                  |                                  |                     |        |     |               |        |      |      | 1      | ND   |    |  |
| Methomyl (ug/L)                     |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 1    | ND                  |                                  |                     |        |     |               |        |      |      | 1      | ND   |    |  |
| Methoxychlor (mg/L)                 | 0.04 (MCL)         | 0.100 (DEQ MML)      |                                          |        |   |               |        |   | 0.2           | ND     |               | 0.2   | ND             |   | 0.2  | ND                  |                                  |                     |        |     |               |        | 0.2  | ND   | 0.2    | ND   |    |  |
| Metolachlor (ug/L)                  |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 1    | ND                  |                                  |                     |        |     |               |        |      |      | 1      | ND   |    |  |
| Metribuzin (ug/L)                   |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.2    | ND   |    |  |
| Naphthalene (ug/L)                  |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.5  | ND                  |                                  |                     |        |     |               |        |      |      | 0.5    | ND   |    |  |
| Naphthalene-d8 (ug/L)               |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.5  | ND                  |                                  |                     |        |     |               |        |      |      | 0.5    | ND   |    |  |
| Oxamyl (Vydate) (mg/L)              | 0.2 (MCL)          |                      |                                          |        |   |               |        |   | 2             | ND     |               | 2     | ND             |   | 2    | ND                  |                                  |                     |        |     |               |        | 2    | ND   | 2      | ND   |    |  |
| Parathion (ug/L)                    |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.2    | ND   |    |  |
| Pendimethalin (ug/L)                |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.2    | ND   |    |  |
| Permethrin (ug/L)                   |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.2    | ND   |    |  |
| Perylene-d12 (ug/L)                 |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   |      | ND                  |                                  |                     |        |     |               |        |      |      |        | ND   |    |  |
| Phenanthrene (ug/L)                 |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.2    | ND   |    |  |
| Phenanthrene-d10 (ug/L)             |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   |      | ND                  |                                  |                     |        |     |               |        |      |      |        | ND   |    |  |
| Prometon (ug/L)                     |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.2    | ND   |    |  |
| Pronamide (ug/L)                    |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.2    | ND   |    |  |
| Propachlor (ug/L)                   |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.1  | ND                  |                                  |                     |        |     |               |        |      |      | 0.1    | ND   |    |  |
| Pyrene (ug/L)                       |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 0.2  | ND                  |                                  |                     |        |     |               |        |      |      | 0.2    | ND   |    |  |
| Pentachlorophenol (mg/L)            | 0.001 (MCL)        |                      |                                          |        |   |               |        |   | 0.04          | ND     |               | 0.04  | ND             |   | 0.04 | ND                  |                                  |                     |        |     |               |        |      | 0.04 | ND     | 0.04 | ND |  |
| Picloram (mg/L)                     | 0.5 (MCL)          |                      |                                          |        |   |               |        |   | 0.1           | ND     |               | 0.1   | ND             |   | 0.1  | ND                  |                                  |                     |        |     |               |        |      | 0.1  | ND     | 0.1  | ND |  |
| Propoxur (ug/L)                     |                    |                      |                                          |        |   |               |        |   |               |        |               |       |                |   | 1    | ND                  |                                  |                     |        |     |               |        |      |      | 1      | ND   |    |  |
| Aroclor 1016 (ug/L)                 | Regulated as total |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |               | 0.5   | ND             |   | 0.5  | ND                  |                                  |                     |        |     | 0.5           | 0.5    | ND   |      | 0.5    | ND   |    |  |
| Aroclor 1221 (ug/L)                 | Regulated as total |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |               | 0.5   | ND             |   | 0.5  | ND                  |                                  |                     |        |     | 0.5           | 0.5    | ND   |      | 0.5    | ND   |    |  |
| Aroclor 1232 (ug/L)                 | Regulated as total |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |               | 0.5   | ND             |   | 0.5  | ND                  |                                  |                     |        |     | 0.5           | 0.5    | ND   |      | 0.5    | ND   |    |  |
| Aroclor 1242 (ug/L)                 | Regulated as total |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |               | 0.5   | ND             |   | 0.5  | ND                  |                                  |                     |        |     | 0.5           | 0.5    | ND   |      | 0.5    | ND   |    |  |
| Aroclor 1248 (ug/L)                 | Regulated as total |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |               | 0.5   | ND             |   | 0.5  | ND                  |                                  |                     |        |     | 0.5           | 0.5    | ND   |      | 0.5    | ND   |    |  |
| Aroclor 1254 (ug/L)                 | Regulated as total |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |               | 0.5   | ND             |   | 0.5  | ND                  |                                  |                     |        |     | 0.5           | 0.5    | ND   |      | 0.5    | ND   |    |  |
| Aroclor 1260 (ug/L)                 | Regulated as total |                      | 0.5                                      | ND     |   | 0.5           | ND     |   | 0.5           | ND     |               | 0.5   | ND             |   | 0.5  | ND                  |                                  |                     |        |     | 0.5           | 0.5    | ND   |      | 0.5    | ND   |    |  |
| Total Aroclors - (PCBs) (ug/L)      | 0.5 (MCL)          |                      |                                          |        |   |               |        |   | 0.5           | ND     |               | 0.5   | ND             |   | 0.5  | ND                  |                                  |                     |        |     | 0.5           | 0.5    | ND   |      | 0.5    |      |    |  |



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|                          |                                              |                      | WILLOW CREEK/COLUMBIA RIVER SOURCE WATER |        |   |               |        |   |               |               |   |               |                |   |                |               | RRI       | Wanapum Groundwater |               |      |     |               |   |      |               |   |
|--------------------------|----------------------------------------------|----------------------|------------------------------------------|--------|---|---------------|--------|---|---------------|---------------|---|---------------|----------------|---|----------------|---------------|-----------|---------------------|---------------|------|-----|---------------|---|------|---------------|---|
|                          |                                              |                      | PRE-FILTER                               |        |   | POST-FILTER   |        |   | PRE FILTER    |               |   | POST FILTER   |                |   | INLAND BOOSTER |               | Carty Res |                     | I-WELL 5      |      |     | Inland Well 5 |   |      |               |   |
|                          |                                              |                      | 10/10/2013                               |        |   | 10/10/2013    |        |   | 8/15/2016     |               |   | 8/15/2016     |                |   | 6/20/2017      |               | Dec-16    |                     | 8/16/2016     |      |     | 6/21/2017     |   |      |               |   |
|                          |                                              |                      | 131011061-001                            |        |   | 131011061-002 |        |   | 160816027-001 |               |   | 160816027-002 |                |   | 170621069-001  |               |           |                     | 160817045-001 |      |     | 170622027-001 |   |      |               |   |
| Analyte                  | OHA DW Standards                             | Oregon DEQ Standards | MRL                                      | Result | Q | MRL           | Result | Q | MRL           | Result        | Q | MRL           | Result         | Q | MRL            | Result        | Q         | Result              | Result        | MRL  | MRL | Result        | Q | MRL  | Result        | Q |
| Trifluralin (ug/L)       |                                              |                      |                                          |        |   |               |        |   |               |               |   |               |                |   | 0.2            | ND            |           |                     |               | 2    | 2   | ND            |   | 0.2  | ND            |   |
| Toxaphene (ug/L)         | 3 (MCL)                                      | 0.005 (DEQ MML)      | 2                                        | ND     |   | 2             | ND     |   | 2             | ND            |   | 2             | ND             |   | 1              | ND            |           |                     |               |      |     |               | 1 | ND   |               |   |
| RADIOLOGICALS            |                                              |                      |                                          |        |   |               |        |   |               |               |   |               |                |   |                |               |           |                     |               |      |     |               |   |      |               |   |
| Gross Alpha (pCi/L)      | 15 (MCL)                                     | 15 (DEQ MML)         |                                          |        |   |               |        |   | 1             | 1.19 ± 0.738  |   | 1             | 0.401 ± 0.499  |   | 1              | 2.11+/-0.869  |           |                     |               | 1    |     | 0.604 ± 1.56  |   | 1    | 0.553+/-1.03  |   |
| Gross Beta (pCi/L)       | 4 mrem/year (official)<br>50 pCi/L (trigger) | 50 pCi/L (DEQ MML)   |                                          |        |   |               |        |   | 1             | 1.48 ± 0.742  |   | 1             | 0.696 ± 0.461  |   | 1              | 0.95+/-0.5    |           |                     |               | 1    |     | 2.59 ± 1.69   |   | 1    | 6.9+/-1.67    |   |
| Radium 226 (pCi/L)       |                                              |                      |                                          |        |   |               |        |   | 1             | 0.025 ± 0.074 |   | 1             | 0.098 ± 0.126  |   | 1              | 0.191+/-0.295 |           |                     |               | 1    |     | 0.049 ± 0.105 |   | 1    | 0.296+/-0.352 |   |
| Radium 228 (pCi/L)       |                                              |                      |                                          |        |   |               |        |   | 1             | 0.754 ± 0.649 |   | 1             | -0.068 ± 0.327 |   | 1              | 0.489+/-0.185 |           |                     |               | 1    |     | 0.844 ± 0.358 |   | 1    | 0.838+/-0.201 |   |
| Radium 226/228 (pCi/L)   | 5 (MCL)                                      |                      |                                          |        |   |               |        |   | 1             | 0.0332        |   | 1             | -1.441         |   | 1              |               |           |                     |               | 1    |     | 0.0581        |   | 1    |               |   |
| Uranium Activity (pCi/L) | 30 (MCL)                                     |                      |                                          |        |   |               |        |   | 0.67          | ND            |   | 0.67          | ND             |   | 0.67           | 1.27          |           |                     |               | 0.67 |     | ND            |   | 0.67 | ND            |   |
| Radon (pCi/L)            | 300 (Advisory)                               |                      |                                          |        |   |               |        |   |               | 6.69 ± 24     |   |               | -9.99 ± 23     |   |                |               |           |                     |               |      |     | 183 ± 30      |   |      |               |   |

Exceeds DEQ water quality standard

Greater than 50% of DEQ water quality standard

SMCL: Secondary Maximum Contaminant Level

Q: Laboratory data qualifier

NA: Not Applicable

ND: Non Detect

NR: Not Reported

µg/L: Micrograms per liter

µS/cm: Micro-Siemens per centimeter

mg/L: Milligrams per liter

#: Copper has an Action Level of 1.3 and a SMCL of 1.0

\*\* MCL being re-evaluated by EPA

†: Corrosivity analysis by Langelier Index

††: Proposed standard

MCL: Maximum Contaminant Level

MRL: Method Reporting Limit





EA Engineering, Science, and Technology, Inc., PBC

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**ATTACHMENT C**  
**Threemile Canyon Farms – Inland AR Pilot Testing Program**  
**Pilot Test Work Plan**

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**INTRODUCTION AND BACKGROUND**

Threemile Canyon Farms (TMCF) is requesting an Aquifer Recharge (AR) Limited License to develop an AR program at their facility. The development of AR will begin at Inland Well 1 (Figure C-1) with the potential for further development at other wells.

This document describes the testing program for initial AR cycles at Inland Well #1 and includes the following:

- Pilot Testing Equipment and Infrastructure
- Pilot Testing Program Overview
- Water Level Monitoring
- Water Quality Monitoring and Sampling
- Reporting

Water quality in the basalts at TMCF is generally good, and therefore our approach to initial testing phases does not assume that storage zone development is necessary. Consequently, this testing plan is developed to address the long-term hydraulic response within the aquifer and compatibility between source water and native groundwater.

**PILOT TESTING EQUIPMENT AND INFRASTRUCTURE**

This section provides a conceptual design for the AR testing infrastructure that will be used to inject water into Inland Well #1. The well will need to be retrofit prior for injection, and a description of the final wellhead system will be submitted to OWRD and DEQ prior to injection operations.

**Wellhead and System Modification**

Inland Well #1 currently operates as a water supply well and is outfitted with line shaft turbine pump. The wellhead/system modifications to be implemented as part of the well retrofit for AR are described below.

**Injection System**

Treated surface water will be conveyed to the AR wellhead using the existing above-ground piping/distribution system. The in-well injection control system will consist of a separate injection drop-pipe fit with a designed orifice plate engineered to provide back-pressure sufficient to prevent cascading water at the anticipated system pressures, water levels, and injection rates. The wellhead will have a flow control valve, bi-directional flow meter, water level access tube, pressure relief valve, pressure gauge, transducer access tube and sampling port. TMCF will conduct an engineering analysis to evaluate the potential for the line-shaft turbine to spin backwards and generate electricity during injection. If this is determined to be an economic



approach to energy recovery, the drop-pipe/orifice plate approach to injection control will be abandoned and recharge will be controlled inside the pump column. Final injection control design will be submitted to OWRD/DEQ for approval prior to construction for injection testing.

### PILOT TESTING PROGRAM OVERVIEW

The goal of pilot testing is to confirm AR feasibility at TCMF and provide data to inform both OWRD and the facility the requirements for system expansion. The objectives of the first AR cycles are to:

- Evaluate the aquifer response to injection and assess the long term hydraulic properties of the aquifer;
- Assess the response of TCMF observation wells to AR at Inland Well #1;
- Evaluate the short and long term response at the wellhead to AR, and;
- Assess geochemical compatibility between the source water and native groundwater.
- Assess mortality of biological components in the stored source water.

The data collected during initial testing cycles will be used to inform longer term AR operation plans for long-term AR operations. The response at other TCMF production wells (Figure C-1) will be carefully monitored so that interference estimates can be incorporated into expansion plans.

#### Pilot Testing Program

The following cycle testing program developed for Inland Well #1 is also summarized in Table C-1:

- **Baseline Monitoring** - Baseline monitoring will begin a minimum of two weeks before the start of AR to measure background water level trends prior to AR injection testing. Water levels will be measured manually at least once during the baseline phase to verify transducer data. Baseline water quality will be collected from the AR well prior to the start of the first AR injection cycle.
- **Cycle 1** - Cycle 1 will inject and recover 16.2 million gallons (MG) over an approximately two-week period. The injection period is planned to be 4.5 days at 2,500 gpm. Following the injection period there will be a storage period of 3 days followed by a pumping event at 3,000 gpm to recover the full 16.2 MG and obtain a water quality samples. This cycle will assess both the effects of AR on water levels, aquifer water quality, and biological mortality.
- **Cycle 2** - Cycle 2 will approximate planned operational-scale AR. It will consist of recharging 45 days at 2,500 gpm for roughly 162 MG. During and following the Cycle 2 injection period water quality will be collected at the AR well and at observation wells.
- **Cycle 3** - Cycle 3 will begin as soon as water is available after Cycle 2. The estimated total stored volume is 162 MG after 45 days of recharge at 2,500 gpm. If this recharge occurs during the fall shoulder-season, this volume will remain in storage through the winter until the next injection cycle that begins the following spring.
- **Cycles 4 and subsequent** - Additional cycles will consist of recharge in the spring window (when water is available) followed by normal irrigation season pumping throughout the summer using existing valid TCMF groundwater rights, and recharge



again in the fall. Water stored in the fall months will be stored until the following spring, where additional recharge will continue until the normal summer irrigation season pumping season begins.

### Monitoring Well Network

TMCF has an existing production well network equipped with pressure transducers. Table C-2 describes those wells, their distance from Inland Well #1, and well construction information. The well locations are shown in Figure C-1. In total, six wells will be monitored in addition to Inland Well #1 with the nearest observation well (Inland Well #2) located 3,082 feet to the southeast.

- Inland Well #1 (MORR 52307) = AR well to start
- Inland Well #2 (MORR 52045)
- Inland Well #3 (MORR 52132)
- Inland Well #4 (MORR 52131)
- Inland Well #5 (MORR 52130)
- Inland OBS Well (MORR 52279)
- Well 7 (Well ID pending)

### WATER LEVEL MONITORING

Water levels will be monitored to assess buildup during injection and drawdown during pumping and evaluate the presence of potential aquifer boundary conditions. TMCF will monitor each well (six wells in addition to Inland Well #1) with pressure transducers verified with periodic manual measurements. Data will be tracked through TMCF supervisory control and data acquisition system (SCADA). Pressure transducers will be factory calibrated prior to use and pressure ratings will be selected based on the potential anticipated water level changes at each monitoring location. Manual water levels will be used to confirm transducer data and will be used as backup should a transducer fail. Barometric pressure will also be recorded with a dedicated barometric sensor and the barometric efficiency of monitored wells will be evaluated and corrections will be made as needed to facilitate response assessments.

Well #1 measurement frequency will be set to a logarithmic scale, and set at an hourly interval at other monitoring locations. A summary of the water level monitoring program is described below:

- Baseline
  - AR Well – Continuous electronic measurements will be taken every 15 minutes via automated pressure transducer during the baseline period to evaluate for antecedent trends prior to AR. At a minimum, three manual measurements will be collected over the baseline period to corroborate the transducer data.
  - Observations Wells – Continuous electronic measurements will be collected at 15 minute intervals via automated pressure transducer. Three manual measurements will also be collected from each observation well during the baseline period.
- Injection
  - AR Well – Continuous electronic, manual measurements on a logarithmic expansion interval starting at less than one minute up to a maximum of every 15



minutes. A minimum of three manual measurements will be collected the first week of injection. Manual measurements will be collected weekly after the first week.

- Observations Wells – Automated pressure transducers will be set to record every 10 minutes at the start of injection. The frequency may be increased as injection continues but will not exceed hourly measurements. A minimum of three manual measurements will be collected the first week of AR and weekly thereafter.
- Storage
  - AR Well – Continuous electronic measurements will be taken every hour via automated pressure transducer. At a minimum, manual measurements will be collected monthly to corroborate transducer data.
  - Observations Wells – Continuous electronic measurements will be collected at hourly intervals via automated pressure transducer. At a minimum, manual measurements will be collected monthly to corroborate transducer data.
- Recovery
  - AR Well – Continuous electronic, manual measurements on a logarithmic expansion interval starting at less than one minute up to a maximum of every 15 minutes. A minimum of three manual measurements will be collected the first week of injection. Manual measurements will be collected weekly after the first week.
  - Observations Wells – Automated pressure transducers will be set to record every 10 minutes at the start of recovery. The frequency may be increased as recovery continues but will not exceed hourly measurements. A minimum of three manual measurements will be collected the first week of AR and weekly thereafter.

During baseline monitoring and aquifer testing, all manual measurements will be recorded in the field notebook.

### WATER QUALITY MONITORING AND SAMPLING

Water quality monitoring will be completed to compare source and recovered water to drinking water quality standards. The water quality information will be used to assess the injection and recovered water compatibility with respect to chemical precipitation and dissolution reactions that have the potential to alter recovered water quality or well performance. A Quality Assurance and Quality Control (QA/QC) plan is provided in Attachment F as a supplement to this Attachment.

*need to  
reference  
anti-  
degradation*

The proposed water quality monitoring plan is shown in Table C-3, and the analytical suite is detailed in Table C-4. The analytical program includes cations, anions, metals, and applicable biological analytes. This list may be refined after initial treatability studies are completed and the final treatment method for surface water is established.

Field parameter measurements of the source and recovered water will be collected at a recharge/recovery well (initially Well #1) concurrent with all manual water level measurements and sampling events during injection and recovery activities. Temperature, specific conductance, pH, turbidity, oxidation-reduction potential and dissolved oxygen will be recorded electronically



along with manual measurements recorded in the field notebook. Additional field parameters (i.e. total suspended solids, free chlorine, and total chlorine) may be monitored depending on their levels observed in treated surface water or groundwater. If necessary, these parameters will be measured using a Hach™ field test kit or other in-line sensor.

### **REPORTING**

An initial report documenting the results of Cycles 1, 2, and 3 will be provided to OWRD and DEQ. The report will include a description the AR operations, analytical results, and hydraulic monitoring. Subsequent reports (i.e. Cycle 4, and additional cycles) will include the results from spring recharge, summer recovery, and fall recharge.

Data including field measurements, laboratory reports, and electronic transducer data files will be provided in OWRD format in the final Phase 1 report.

### **Figures**

C-1      Location Map

### **Tables**

C-1      Phase 1 Pilot Testing Plan  
C-2      Observation Wells  
C-3      Phase 1 Water Quality Monitoring Plan  
C-4      Full Analytical Suite



## Figures