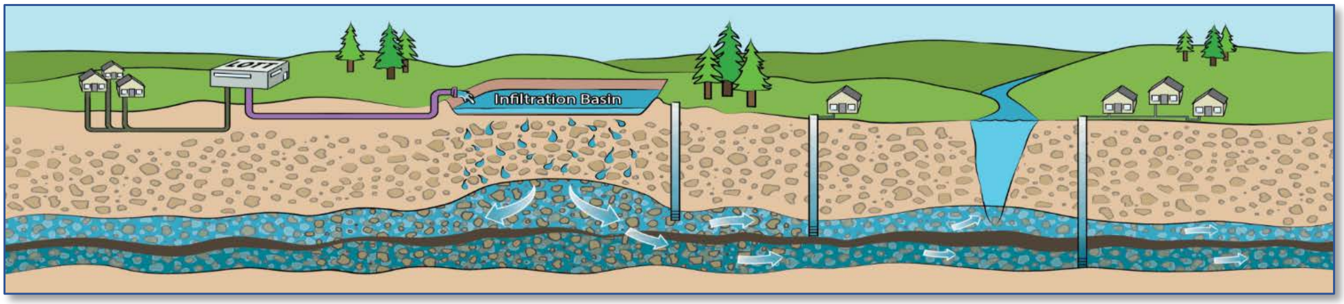
Tracer Test and Water Quality Monitoring (Task 2.1.3)

LOTT Clean Water Alliance Reclaimed Water Infiltration Study

Report

OCTOBER 30, 2019



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Acronyms and Abbreviations

BDOC	biodegradable dissolved organic carbon
bgs	below ground surface
btoc	below top of casing
C/Co	relative concentrations
Cty	County
d	day(s)
DBP	disinfection by-product
DEET	diethyltoluamide
DO	dissolved oxygen
ECD	electron capture detector
EDA	ethylene diamine preservative
EEA	Eurofins Eaton Analytical
EPA	U.S. Environmental Protection Agency
ft	foot/feet
ga	gallon(s)
GC	gas chromatograph
gpm	gallon(s) per minute
HAA	haloacetic acids
H_2SO_4	sulfuric acid
HCL	hydrochloric acid
HDR	HDR Engineering, Inc.
ICL	Israel Chemicals, Ltd.
ID	identification
IEUA	Inland Empire Utilities Agency
KBr	potassium bromide
kg	kilogram(s)
L	liter(s)
LCS	laboratory control samples
LOTT	LOTT Clean Water Alliance
m^3	cubic meter(s)
MG	million gallons
mg	milligram(s)
mgd	million gallons per day
mL	milliliter(s)
mmol	millimole(s)
mol	moles of a substance
MRL	minimum reporting limit
MS/MSD	matrix spike/matrix spike duplicate

Acronyms and Abbreviations

MWRWP	Martin Way Reclaimed Water Plant
MW	monitoring well
NA	not applicable
NaBr	sodium bromide
NAVD88	North American Vertical Datum of 1988
ND	non-detect
NDMA	N-Nitrosodimethylamine
NGVD	National Geodedic Vertical Datum of 1929
NS	not sampled
ORP	oxidation-reduction potential
patm	picoatmosphere
PFAS	polyfluoroalkyl substances
PFCs	perfluorochemicals, perfluorocarbons, perfluorinated compounds
PFOS/PFOA	perfluorooctanesulfonic acid/perfluorooctanoic acid
Pfu	plaque forming unit(s)
Pmol	pico mole(s)
ppt	part(s) per trillion
PVC	polyvinyl chloride
psi	pound(s) per square inch
PTFE	polytetrafluoroethylene (Teflon®)
Q1;Q2;Q3;Q4	Water Quality Monitoring Quarter 1;2;3;4
QA/QC	quality assurance/quality control
Qc	Pre-Vashon Coarse Deposits
Qf	Kitsap Formation
Qgof/Qgos	Late Vashon Sediments in Woodland Creek Valley
Qvr/Qgo	Alluvium Vashon Recessional Gravel Outwash
Qvt/Qgt	Vashon Till
Qva/Qga	Vashon Advance Outwash
R1;R2	Reclaimed Water Sample 1;2
RPD	relative percent deviation
RWIS	Reclaimed Water Infiltration Study
SAT	soil aquifer treatment
SF_6	sulfur hexafluoride
SFP	suspected false positives
SOP	standard operating procedure
TC	Thurston County
TCEP	Tris(2-carboxyethyl)phosphine

Acronyms and Abbreviations

TCPP	Tris (1-chloro-2-propyl) phosphate
TDCPP	Tris(1,3-dichloroisopropyl)phosphate
THMs	trihalomethanes
TKN	total Kjeldahl nitrogen
TOC	total organic carbon
TQu	Tertiary Unconsolidated and Undifferentiated Sediments
UCSB	University of California, Santa Barbara
UHP	ultra-high purity
VOC	volatile organic compounds
WQ	water quality
YSI	Yellow Springs Instruments
°C	degree(s) Celsius
µg	microgram(s)

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1.0 Introduction

This report documents the results of a tracer test and water quality monitoring effort conducted at the Hawks Prairie Reclaimed Water Ponds and Recharge Basins (Hawks Prairie property), a facility owned and operated by the LOTT Clean Water Alliance (LOTT). Field activities for this work occurred from January to October, 2018. This effort is part of LOTT's ongoing Reclaimed Water Infiltration Study (RWIS).

1.1 Background

LOTT provides services to treat and manage wastewater for the urban areas of Lacey, Olympia, and Tumwater in Thurston County, Washington (at the southern end of Puget Sound); see **Figure 1-1**. Since 2006, LOTT has also produced reclaimed water at the Budd Inlet Reclaimed Water Plant and the Martin Way Reclaimed Water Plant (MWRWP) for irrigation and other non-drinking water purposes. Some of the reclaimed water produced at the MWRWP is used to recharge (replenish) groundwater using rapid-infiltration basins on the LOTT Hawks Prairie property. The long-range plan for meeting future wastewater needs includes expanding reclaimed water production and developing additional groundwater recharge facilities.

LOTT is conducting the RWIS to provide local scientific data and community input to help policymakers make informed decisions about future reclaimed water treatment and use. Residual chemicals are the primary focus of the study; these include household chemicals, pesticides/herbicides, pharmaceuticals, personal care products, cooking products, and flame retardants. LOTT is evaluating which of these residual chemicals remain in reclaimed water after treatment, which exist in the local environment, how infiltrated reclaimed water interacts with soils and local groundwater, and what happens to the residual chemicals over time in the environment. LOTT and the wider community will use the findings of the study to make the most appropriate choices for reclaimed water management and protection of public health and the environment.

1.2 Purpose of Tracer Testing and Water Quality Monitoring

The purpose of this evaluation is to add to the current understanding of the effectiveness of soil aquifer treatment of reclaimed water, particularly with respect to nutrients and residual chemicals from water infiltrated at the Hawks Prairie property.

Tracer testing was conducted to determine reclaimed water travel times to downgradient monitoring wells, dominant flow directions, and velocities as it recharges the groundwater system and travels through the vadose zone and aquifer.

Groundwater quality monitoring is essential in assessing changes in chemical concentrations that occur over time as reclaimed water moves downgradient from the recharge basins. Changes in residual chemical concentrations result from biological degradation and sorption, as well as mixing and dilution.

The tracer test and water quality monitoring were carried out in accordance with the work plan, *Tracer Testing and Water Quality Monitoring of Treatment Effectiveness Work Plan (Task 2.1.3)* (HDR 2018a).

1.3 Report Contents

This document provides a comprehensive summary of the tracer test and water quality monitoring that occurred from January through October 2018. Section 2 outlines prior investigations performed by HDR for reference throughout the report. Section 3 describes the LOTT Hawks Prairie wetlands and reclaimed water recharge basins property. Section 4 includes a description of the background hydrogeology of the area. Section 5 provides a summary of the tracer delivery, sampling, and analytical methods. Section 6 details water quality monitoring procedures to assess changes in concentration of residual chemicals and nutrients as reclaimed water travels through the subsurface. Section 7 summarizes the process and results of HDR's data validation of laboratory water quality results. Sections 8 and 9 present the tracer testing and water quality monitoring results, while Section 10 provides an overall summary.

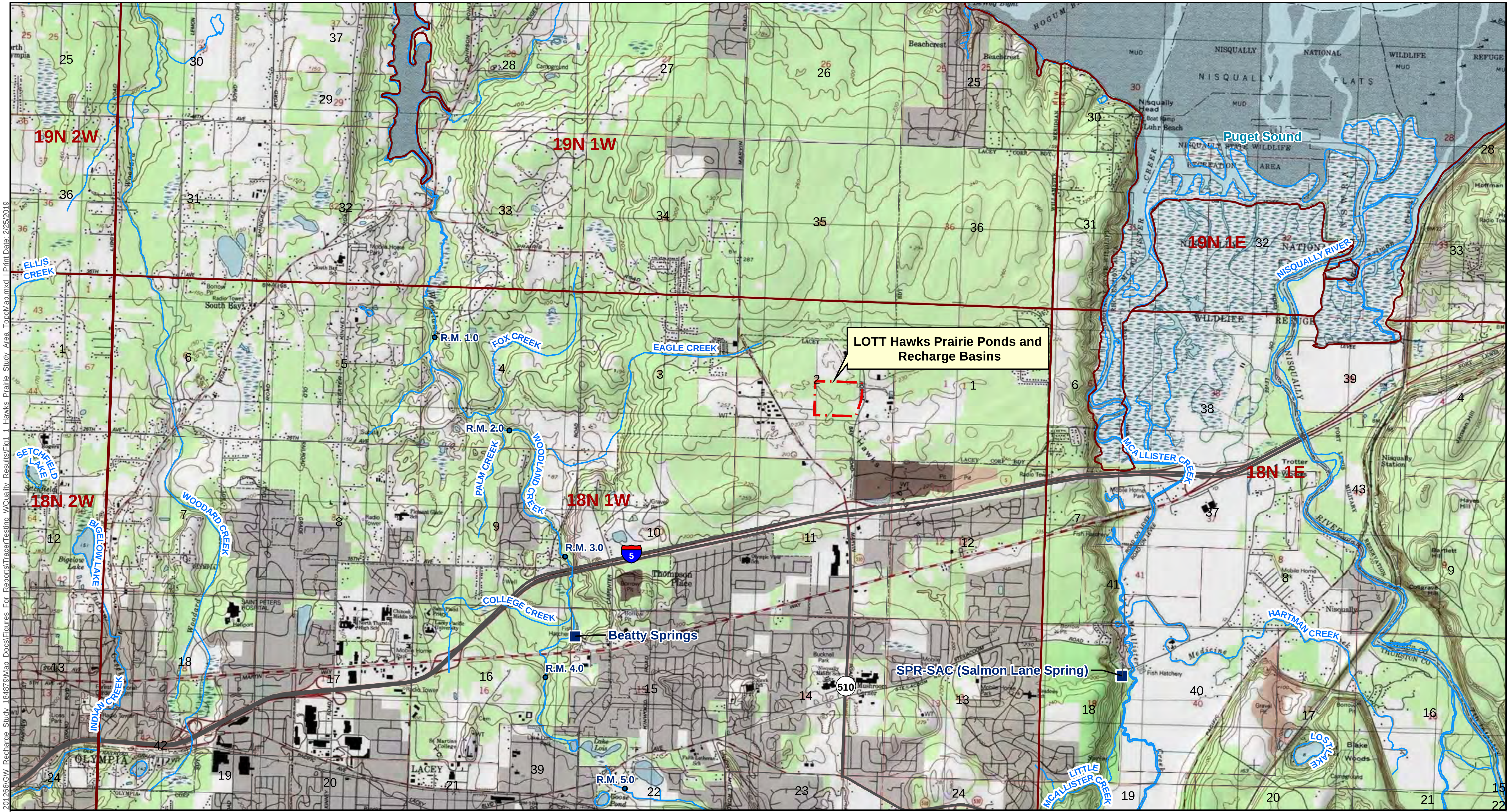

Figure 1-1
Topographic Map Hawks Prairie Area

Source: Bing Maps (2011), City of Bellevue (2013), WSDOT (2013).

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2.0 Prior Investigations

HDR previously prepared the following reports as part of the ongoing LOTT RWIS and they are referenced throughout this report:

- Scope of Services LOTT Clean Water Alliance Reclaimed Water Infiltration Study, Phase III – Study Implementation, HDR (2014a). This document describes the initial study scope.
- Reclaimed Water Infiltration Study, Startup Water Quality Monitoring Report Hawks Prairie Reclaimed Water Ponds and Recharge Basins, HDR (2014b). This report presents reclaimed water infiltration startup monitoring activities in 2014 including groundwater quality sampling and groundwater level monitoring before and during infiltration. Groundwater quality monitoring results were used for preliminary estimates of travel time and an initial assessment of soil aquifer treatment effectiveness.
- Woodland Creek Stream Flow Measurement and Ground Water Inflow Analysis, HDR (2015). This technical memorandum documents a stream survey of Woodland Creek, Eagle Creek, and Fox Creek to assess low-flow conditions and characterize groundwater inflow/outflow into these creeks.
- Groundwater Quality Characterization (Task 1.1), HDR (2017a). This report documents the groundwater quality sampling and analysis completed by HDR during 2015 with samples collected from residential, monitoring, and public supply wells and a spring in the Hawks Prairie and Tumwater areas. Samples were analyzed for nutrients, residual chemicals, metals, water quality indicator parameters, organic compounds, and other constituents of interest.
- Surface Water Quality Characterization (Task 1.2), HDR (2017b). This report documents the surface water quality characterization completed by HDR in the Woodland Creek and Deschutes River watersheds. The monitoring study quantified surface water quality, including laboratory analysis for residual chemicals and conventional surface water quality parameters, on a quarterly basis from August to December 2015, including summer low flow, a fall storm event, and two winter high flow events.
- Wastewater and Reclaimed Water Quality Characterization (Task 1.3), HDR (2017c). This report presents information on a quarterly sampling and laboratory analysis program to determine the residual chemicals present in LOTT’s wastewater and the quality of produced reclaimed water at the Budd Inlet Reclaimed Water Plant and MWRWP from November 2014 to October 2015.
- Work Plan: On-site Wells and Lysimeter Installation (Task 2.1.1.a) and Off-Site Monitoring Wells (Task 2.1.2.c) Hawks Prairie Area, HDR (2017d). This work plan describes the approach and methods for constructing on-site monitoring wells and lysimeters at the Hawks Prairie property and additional upgradient and downgradient monitoring wells off-site from the Hawks Prairie property. The work plan includes details on soil sampling and analysis methods, drilling procedures, and monitoring well and lysimeter construction and installation.

- Tracer Testing and Water Quality Monitoring of Treatment Effectiveness Work Plan (Task 2.1.3), HDR (2018a). This report describes the scope and method of performing tracer testing and water quality monitoring for the RWIS at the Hawks Prairie area.
- Hydrogeologic Characterization Report, HDR (2018b). This report describes the hydrogeologic investigation undertaken at the vicinity of the LOTT Hawks Prairie property, including collection of vadose zone soil samples and installation of six vadose zone borings and lysimeters to collect samples to characterize vadose zone pore-water quality, installation of two soil moisture/temperature probes, the drilling of 14 soil borings below the water table, collection of saturated zone soil samples and laboratory analysis of soil properties (grain size, mineralogy, organic carbon), and installation of 14 monitoring wells (10 wells were completed in the Shallow [Qva] Aquifer and 4 wells were completed in the Sea-Level [Qc] Aquifer). Depth to groundwater was measured in wells to determine groundwater elevations and horizontal and vertical groundwater gradients. Pumping tests and slug tests were performed and analyzed to estimate aquifer hydraulic properties.
- Draft Work Plan Groundwater Modeling Fate and Transport Assessment (Task 2.1.4), (HDR 2018c). This report describes the scope and groundwater model development process.

3.0 Description of LOTT Hawks Prairie Recharge Facility

The Hawks Prairie site covers 41 acres and includes five wetland ponds and eight groundwater recharge basins, totaling 5 and 8 acres, respectively. The wetland ponds are used for educational, recreational, and aesthetic purposes. They are between one and six feet deep and normally contain 10 to 20 million gallons (MG) when full. Wetland pond residence time is about 10 to 20 days, assuming 10 to 20 MG of capacity with a 1-million-gallon per day (mgd) inflow rate. Under typical operations, where the MWRWP is producing more water than is needed to support other uses (such as infiltration at the separate Woodland Creek Groundwater Recharge Facility) and maintenance of the ponds, water is piped from the MWRWP to the wetland ponds and then flows into the basins, as shown in **Figure 3-1**. Basins are operated in pairs, with two basins receiving reclaimed water at a time.

The groundwater recharge basins infiltrate reclaimed water to the aquifer. Each 1-acre basin is designed for a maximum recharge rate of 1 mgd. The basins are excavated into the subsurface and overlain by about 1 foot of imported sand.

The basins are designed to be operated using wetting-drying cycles to control algae growth and to aerate the top soil. A typical cycle consists of the following:

- 3 days of wetting
- 1 day of drying
- 8 days of non-operation

At least two times per year the basins are tilled to aerate the surface soils and to remove any vegetation that may be growing. No sediment removal has been necessary, primarily because of the very low amount of suspended solids in the reclaimed water influent. The basins are operated year round except during periods of maintenance at the MWRWP.

Reclaimed water recharge rates to all basins combined range from 0.02 to about 1.25 mgd. During the summer and early fall months, less reclaimed water is recharged on the Hawks Prairie property (an average of about 0.5 mgd opposed to approximately 1 mgd during the winter and spring) because it is also used for irrigation at the Hawks Prairie site, maintenance of the ponds, and for water rights mitigation for the Cities of Lacey and Olympia at the Woodland Creek Groundwater Recharge Facility. When the basins are operated in rotation, groundwater levels typically increase up to about 10 feet with up to 1 mgd of recharge.

Reclaimed water delivery to the basins is controlled by an adjustable computerized control system that records flow rates to each basin. Power is available on the site (120 volts [V]) and there are roads between and around the basins with good access. No potable water is available on site; however, a City of Lacey waterline abuts the property and potable water can be obtained from a fire hydrant by coordinating with the city. The recharge basins are gated and locked.

3.1 Basin Operation during Tracer Test and Water Quality Monitoring

During tracer testing and water quality monitoring reclaimed water application and basin operation deviated from typical operations described above. For the tracer test period from December 2017 to October 2018 reclaimed water bypassed the wetland ponds and was delivered only to Basins 4 and 5. This was done to exclude any influences on water quality that could be imparted by the wetlands and focus the study on the effects of infiltration and soil aquifer treatment. Reclaimed water application was alternated between the eastern and western halves of Basins 4 and 5 on an approximately monthly cycle by mechanically separating flow via installation of a berm separating the eastern and western halves and by alternatively plugging half the header orifices on each side of the berm. This was done to simulate the design recharge rate of 1 mgd per basin. **Table 3-1** describes the operation schedule of Basin 4 and 5, and **Figure 3-2** shows Basins 4 and 5 infiltrating reclaimed water during the tracer test.

Reclaimed water was delivered to Basins 4 and 5 on 291 out of 304 days from January 1 to October 31, 2018. **Figure 3-3** shows a hydrograph of reclaimed water delivery to the basins. Flow to the basins increased throughout January, plateaued in February, and then generally decreased after March, as more water was diverted for other purposes as described above. Monthly average, maximum, and minimum flow to the basins and number of days water was delivered to the basins are summarized in **Table 3-2.** Monthly average flow was greater than 0.85 mgd from January to May, then decreased to closer to 0.55 mgd from June to September. Reclaimed water flow ranged from a minimum of 0.02 mgd in October to a maximum of 1.25 mgd in February.

Table 3-1. Summary of Operations for Basins 4 and 5

Transfer Date		Basin 4		Basin 5	
		East	**West**	**East**	**West**
2017	11-Dec	×	✓	×	✓
	18-Dec	✓	×	✓	×
	22-Dec	×	✓	×	✓
2018	2-Jan	✓	×	✓	×
	8-Jan	×	✓	×	✓
	14-Jan	✓	×	✓	×
	15-Jan[a]	✓	✓	✓	×
	3-Feb	✓	×	✓	×
	27-Mar	×	✓	×	✓
	26-Apr	✓	×	✓	×
	10-May	×	✓	×	✓
	15-Jun	✓	×	✓	×
	12-Jul	×	✓	×	✓
	10-Aug	✓	×	✓	×
	12-Sep	×	✓	×	✓
	3-Oct	✓	✓	✓	✓

Notes:

[a] Both the East and West halves of Basin 4 were operating during tracer introduction.

“×” indicates that plugs were put in place on the specified date, restricting flow to the respective half of the basin.

Table 3-2. Summary of Reclaimed Water Inflow to Basins 4 and 5, January–October 2018

Month	Average Inflow mgd	Maximum Inflow mgd	Minimum Inflow mgd	Reclaimed Water "On" Number of Days per Month
January	0.85	1.17	0.31	31
February	1.15	1.25	1.06	28
March	0.99	1.18	0.83	31
April	0.88	1.14	0.47	29
May	0.91	1.12	0.58	31
June	0.63	0.85	0.27	29
July	0.65	0.83	0.46	31
August	0.44	0.66	0.22	25
September	0.47	0.54	0.36	30
October	0.26	0.51	0.02	26

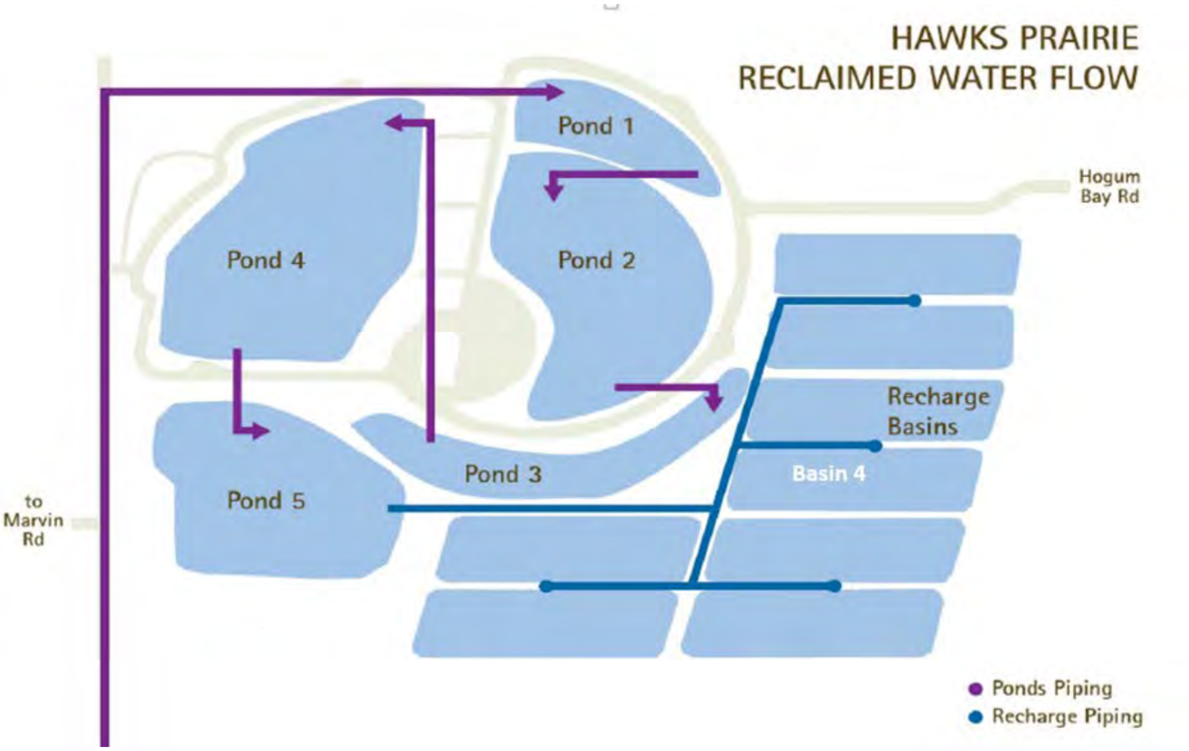

Figure 3-1. Layout of Wetland Ponds, Recharge Basins, and Reclaimed Water Flow Path

Figure 3-2. Infiltration at Basin 4 during the Tracer Test

Top: Basin 4 looking West on May 10, 2018.
Bottom Left: Basin 4 looking East on January 14, 2018.
Bottom Right: Basin 5 looking West on January 14, 2018.

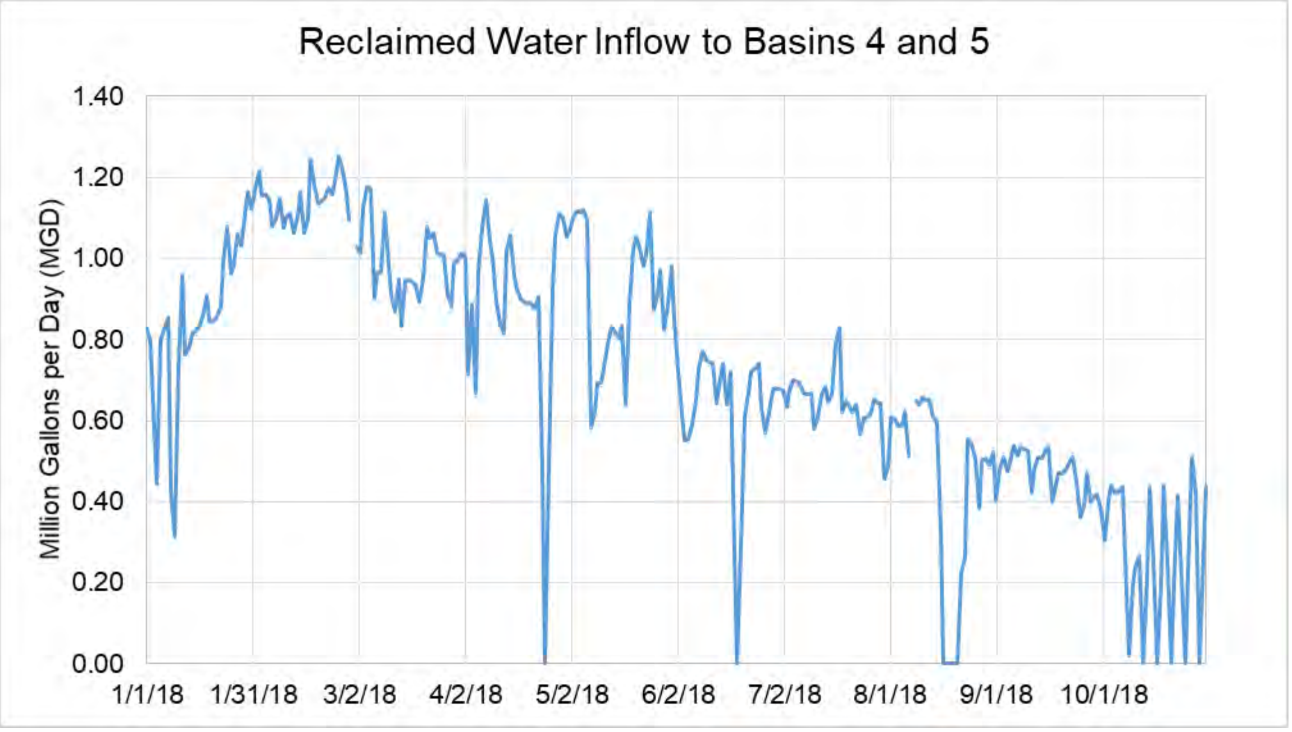

Figure 3-3. Reclaimed Water Inflow to Basins 4 and 5 from January to October 2018

4.0 Background Hydrogeology

This section provides a summary of the hydrogeology of the area including information gathered during the 2017/2018 field investigations and water quality monitoring.

The Hawks Prairie study area was heavily glaciated, resulting in a sequence of stratified sediments that are regionally correlated based on their water-bearing properties (Logan et al. 2003). The information below reflects previously completed hydrogeologic characterizations of the study area (HDR 2018b, 2018c, 2017a). Data sources include regional geologic and hydrogeologic reports, groundwater supply studies, and well installation and testing projects (Brown and Caldwell 2009, 2004; Drost et al. 1999, 1998; Golder 2011; Landau 2016; Logan et al. 2003; Northwest Land & Water 2008; Pacific Groundwater Group 2004, 1997; and Robinson Noble 2005, 2002, 2000). Previously created cross-sections by HDR that traverse the study area and show the hydrostratigraphic units of interest are included below. Well and cross-section locations are shown on **Figure 4-1**, while the cross-sections are displayed on **Figure 4-2** and **Figure 4-3**.

4.1 Hydrostratigraphic Units

The hydrostratigraphic units present in the Hawks Prairie study area are discussed below from top to bottom. Unit nomenclature differs between two sources of data. In the descriptions below the geologic formation name is presented first (abbreviations in parentheses are first from Drost et al. (1999) and second from Logan et al. (2003)) and the hydrostratigraphic unit name is presented second. For the purposes of this report, unit name abbreviations follow Drost et al. (1999).

<u>Late Vashon Sediments in Woodland Creek Valley (Qgof/Qgos).</u> Late Vashon sediments were deposited in the Woodland Creek valley during inter-glacial periods (Logan et al. 2003; Landau 2003). Sediments consist of sand/silt up to 100 feet thick or more in the middle reach of Woodland Creek valley (HDR 2018b). This unit forms an unconfined aquifer within the Woodland Creek valley.

<u>Alluvium and Vashon Recessional Gravel Outwash (Qvr, also known as Qgo), Vadose Zone (when dry) or Shallow (Qvr) Aquifer (when saturated)</u>. This unit is composed of alluvium and recessional glacial outwash sand and gravel. Throughout most areas the unit is unsaturated and forms the vadose zone and where saturated it forms part of the unconfined aquifer. Approximate thickness of the unit ranges from being absent (eroded) to more than 100 feet thick in places. This is the upper-most water-bearing unit in the Hawks Prairie study area.

<u>Vashon Till (Qvt, also known as Qgt), part of either the Vadose Zone (when dry) or the Shallow (Qva) Aquifer (when saturated).</u> Deposits of dense (compacted) unsorted silt, clay, sand, and gravel form a regional dense unit, which sometimes impedes the vertical flow of groundwater if the sediments above it are saturated. The till unit is absent throughout most of the LOTT Hawks Prairie property, but is present nearby to the south and north of the site. Approximate thickness of the unit ranges from being absent to more than 50 feet thick, with appearances at the surface and at varying depths.

<u>Vashon Advance Outwash (Qva, also known as Qga), Shallow (Qva) Aquifer.</u> The Vashon Advance Outwash is a regional aquifer composed of sand and gravel. This is the upper-most

water-bearing unit where Qvr is not saturated. The Qvr and Qva units are sometimes grouped together and called the Shallow (Qvr/Qva) Aquifer in previous studies. The depth to the bottom of the Shallow (Qva) Aquifer is generally less than 150 feet below ground surface (bgs), although it may be deeper in places. In the vicinity of the LOTT Hawks Prairie property the Shallow (Qva) Aquifer is generally unconfined, although in places the groundwater level may rise into the glacial till and become confined.

Kitsap Formation (Qf), Upper (Qf) Confining Unit. The Kitsap Formation is a low-permeability silt, sand, and clay formation that is a regional Upper (Qf) Confining Unit up to 150 feet thick between the Shallow (Qva) Aquifer and the Sea-Level (Qc) Aquifer. The top of the Kitsap formation was generally observed at depths of 110 feet to 160 feet in well logs in the study area. Significant thicknesses of fine sand beds have been observed in some locations, which may cause the confining unit to behave as a leaky confining unit. The Kitsap Formation appears to be absent near the east side of the Thurston County Landfill, as shown in HDR (2017a).

Pre-Vashon Coarse Deposits (Qc), Sea-Level (Qc) Aquifer. This thick (up to 150 feet) sequence of coarse, stratified sand and gravel forms a regional aquifer used in places for public supply wells. These aquifer deposits are often distinguishable in the field during drilling because of the reddish-orange color, whereas the overlying Kitsap Formation is black or dark gray in color. The aquifer is also sometimes called the Sea-Level (Qc) Aquifer in previous studies. The top of the Sea-Level (Qc) Aquifer was generally observed at depths of 190 to 260 feet bgs in well logs. The aquifer is almost always confined because groundwater levels are above the top of the overlying Kitsap Formation confining unit. The coarse-grained deposits are usually found in beds overlain and underlain by finer-grained sediments that act as confining units or low-permeability units within the aquifer. The coarse-grained sediments are often correlated to be at or below current Sea-Level elevation, but are not necessarily uniform in depth or extent.

Tertiary Unconsolidated and Undifferentiated Sediments (TQu). Layers of clay, silt, sand, and gravel of glacial and non-glacial origin above bedrock are characterized as Tertiary unconsolidated and undifferentiated sediments.

- Lower Confining (TQu) Unit: Below the Sea-Level (Qc) Aquifer there is a fine-grained unit known locally as the Lower Confining Unit. The fine sediments of the Lower Confining Unit generally appear 250 to 350 feet bgs.
- Deep (TQu) Aquifer: In some places, public supply wells have been completed in the coarse TQu sand and gravel units that form a deep confined aquifer called the Deep (TQu) Aquifer in previous studies. The top of the coarse sediments of the Deep Aquifer appeared between approximately 350 and 530 feet bgs in well logs.

4.2 Groundwater Levels and Flow Directions

Continuous groundwater levels were recorded using pressure transducers at monitoring wells located within the vicinity of the LOTT Hawks Prairie property throughout the monitoring period, January to October, 2018. The electronic recording pressure transducers are the HOBO model manufactured by Onset Instruments, Inc. and they were suspended in wells between 5 to 20 feet below the water table using braided nylon fishing line. Groundwater levels were adjusted to account for barometric pressure shifts which were measured on site using a pressure transducer exposed to atmospheric pressure. In addition, groundwater levels were measured before each sampling event using a water level indicator.

Table 4-1 and **Table 4-2** show the manually measured groundwater elevations in the Shallow (Qva) and Sea-Level (Qc) aquifers for late spring and early summer of 2018. **Figure 4-4** and **Figure 4-5** show the groundwater potentiometric elevations for the Shallow (Qva) Aquifer and Sea-Level (Qc) Aquifer, respectively. **Figure 4-6a** through **Figure 4-6o** present hydrographs showing groundwater levels monitored throughout the test period in LOTT monitoring wells and in City of Lacey monitoring well MW-11 and City of Lacey production well S29. Groundwater level measurements collected during water quality sampling events are reported in **Appendix A**.

4.2.1 Shallow (Qva) Aquifer Groundwater Levels and Flow Direction

Groundwater elevations in the Shallow (Qva) Aquifer are shown on **Figure 4-4**. Groundwater flows laterally from a groundwater divide located between the Nisqually River valley and the Woodland Creek valley. This causes groundwater to flow from a high point (approximately elevation 160 feet) north of the LOTT Hawks Prairie property either to the southwest or west toward Woodland Creek or to the east or southeast toward McAllister Creek. Groundwater in the immediate vicinity of the LOTT Hawks Prairie property flows southwest from an elevation of about 150 feet northeast of the property, to an elevation of about 95 feet southwest of the property. A hydraulic profile across the LOTT Hawks Prairie property is presented in **Figure 4-7.** Groundwater gradients flatten to the southwest as flows head west toward the middle reach of Woodland Creek and discharge to a spring/wetland complex. This change in groundwater gradient is likely due to the behavior of the Upper (Qf) Confining unit, composed of the lower-permeability Kitsap Formation silt/sand. The Qf dips down from the north to the southwest across the LOTT property and then flattens to the southwest where it transitions into the Woodland Creek alluvium.

East of the LOTT property, groundwater flows east or southeast, discharging to either McAllister Creek or the Nisqually River. Numerous springs emanate from the base of the east scarp of the Nisqually River valley.

Groundwater levels recorded in monitoring wells installed on and around the LOTT Hawks Prairie property completed in the Shallow (Qva) Aquifer are shown on hydrographs on **Figure 4-6a** through **Figure 4-6o**. The groundwater level data indicate approximately 4 to 20 feet of fluctuation in the Shallow (Qva) Aquifer, partially as a result of the increase in precipitation throughout the winter and partially because of LOTT recharge activities. Monitoring wells in the immediate vicinity to the LOTT recharge basins and MW-24 to the east of the basins display very similar hydrographs. Water levels in MW-13 did not begin dropping until mid-May; however, they showed a similar level of decline as wells nearer the recharge basins. Lacey MW-11 shows less water level change throughout the monitoring period, indicating that recharged water volumes have little to no impact on water levels at this monitoring well. Transducer data indicate that water levels dropped below the pressure transducer in MW-22 after June 28 and the monitoring well was observed to be dry during sampling events from July 10 to October 1.

4.2.2 Sea-Level (Qc) Aquifer Groundwater Levels and Flow Direction

Groundwater in the Sea-Level (Qc) Aquifer at the LOTT Hawks Prairie property flows from west to east, where it eventually discharges into the Nisqually River, as shown on **Figure 4-5**. Regional well logs to the north and west of the property indicate that groundwater there flows to the north, likely discharging into Puget Sound. A hydraulic profile across the LOTT property is shown in **Figure 4-8**.

Groundwater hydrographs presented on **Figure 4-6c** to **Figure 4-6m** for wells installed near the LOTT site and on **Figure 4-6o** for City of Lacey Well S29 indicate that groundwater levels in the Sea-Level (Qc) Aquifer have 7 to 14 feet of seasonal fluctuation. Groundwater levels increase throughout the winter and early spring, reaching a maximum in late spring and then declining throughout the summer and fall. The groundwater levels for the paired wells in the Shallow (Qva) Aquifer and Sea-Level (Qc) Aquifer show that the deeper aquifer is hydraulically influenced by recharge from the upper aquifer, and that groundwater levels in each aquifer fluctuate similarly.

4.3 Aquifer Hydraulic Properties

Aquifer hydraulic properties by hydrostratigraphic unit are discussed below. The hydraulic property values presented are the horizontal hydraulic conductivity values and, in units containing production wells, well yields. Hydraulic conductivity quantifies the ability of a porous medium to transmit water based on the size, shape, and interconnectedness of the material’s pores. Well yield refers to the maximum well pumping rate an aquifer can support. Differences in well yields between the Shallow and Sea-Level Aquifers are most likely due to differences in unit thicknesses and hydraulic conductivity.

Shallow (Qva) Aquifer. The Vashon Advance Outwash is a regional aquifer that is used for domestic and public water supply. Production well yields within the Hawks Prairie study area for the Shallow (Qva) Aquifer are between 170 and 275 gallons per minute (gpm) with rates reported up to 810 gpm on well logs (HDR 2018c). Estimates of median hydraulic conductivity are 180 feet per day (ft/d) reported by Drost et al. (1999). Pumping tests in the study area for water supply well projects and by HDR for this project indicates a geometric mean hydraulic conductivity of 56 ft/d and an upper hydraulic conductivity value of 235 ft/d (HDR 2018c). Grain-size analysis yielded similar results and most of the samples from the Shallow (Qva) Aquifer had hydraulic conductivity values between 100 and 363 ft/d (HDR 2018b).

Upper (Qf) Confining Unit. The Kitsap Formation is a low-permeability formation that is a regional confining unit. Because wells are not completed in the formation, there is no pumping test data to calculate hydraulic conductivity. Hydraulic conductivity estimates range from 0.05 to 62 ft/d with a median of 17 ft/d by Drost et al. (1999). Estimated hydraulic conductivity values from grain-size analysis of samples collected by HDR in 2017 using the Hazen Method found hydraulic conductivity values between 0.015 and 8 ft/d with a geometric mean value of 0.2 ft/d (HDR 2018b).

Sea-Level (Qc) Aquifer. This thick sequence forms a regional aquifer used in places for public supply wells. Well yields of up to 1,680 gpm have been reported on well logs and City of Lacey supply wells (S21, S22, S28) produce 1,000 gpm to 1,600 gpm (Ecology 2018, Carollo

Engineers 2013). Estimates of median hydraulic conductivity are 150 ft/d by Drost et al. (1999). The geometric mean of hydraulic conductivity values from pumping tests in water supply wells in the Hawks Prairie area is 87 ft/d (HDR 2018c).

Table 4-1. Groundwater Elevation Measurements, Shallow Aquifer, September 2017 and April–August 2018

Well Name	Top of Casing (ft)[a]	Screen Interval (ft bgs)	Date	Groundwater Elevation (ft)[a]	Date	Groundwater Elevation (ft)[a]
LOTT Hawks Prairie MW-1	219.46	87–97	6/14/2018	136.13		
LOTT Hawks Prairie MW-2	218.27	97–107	6/14/2018	136.90		
LOTT Hawks Prairie MW-3a	219.17	77–127	6/13/2018	131.85		
LOTT Hawks Prairie Mw-5	219.09	76–96	6/14/2018	135.18		
LOTT Hawks Prairie MW-6	218.97	83–103	6/14/2018	139.41		
LOTT Hawks Prairie MW-7	218.91	100–120	6/14/2018	137.65		
LOTT Hawks Prairie MW-8	218.70	105–125	6/14/2018	117.84		
LOTT Hawks Prairie MW-9	218.69	89–109	6/14/2018	127.92		
LOTT Hawks Prairie MW-11	228.00	150–160	6/15/2018	96.62		
LOTT Hawks Prairie MW-13	226.80	118.7–148.7	6/15/2018	108.57		
LOTT Hawks Prairie MW-15	219.20	75–95	6/12/2018	137.77		
LOTT Hawks Prairie MW-16	219.34	74.5–94.5	6/13/2018	137.09		
LOTT Hawks Prairie MW-20	219.22	120–150	6/12/2018	96.51		
LOTT Hawks Prairie MW-22	227.23	110–140	6/14/2018	93.71		
LOTT Hawks Prairie MW-24	204.90	65–90	6/14/2018	144.26		
LOTT Hawks Prairie MW-25	228.95	118–168	6/12/2018	96.73		
LOTT Hawks Prairie MW-26	233.18	75–105	6/11/2018	154.36		
LOTT Hawks Prairie MW-27	220.16	95–120	6/11/2018	122.85		
LOTT Hawks Prairie MW-28	224.85	130–170	6/12/2018	98.38		
Thurston Cty Landfill MW-1	220.58		6/13/2018	90.80	8/1/2018	87.41
Thurston Cty Landfill MW-9S[c]	253.24	130–145	4/23/2018	123.94	7/31/2018	121.54
Thurston Cty Landfill MW-10S	228.09	125–135	6/13/2018	124.13	7/31/2018	122.41
Thurston Cty Landfill MW-11[c]	225.07	90–105	4/27/2018	122.62	8/1/2018	118.97
Thurston Cty Landfill MW-12S[c]	220.18	158–168	4/24/2018	102.07	8/1/2018	97.23
Thurston Cty Landfill MW-13S[c]	213.97	110–120	4/23/2018	101.57	7/31/2018	101.27
Thurston Cty Landfill MW-14[c]	226.35	222.9[b]	4/24/2018	123.90	8/1/2018	123.01
Thurston Cty Landfill MW–15[c]	226.41	222.74[b]	4/24/2018	131.63	8/1/2018	128.03
Hogum Bay 1224[d]	251.34	139[b]	9/13/2017	151.42		
Lacey MW-11	232.12	119.3–129.3	6/15/2018	110.17		

Notes:

[a] Elevation datum is NAVD88 (ft); groundwater depths are manual measurements taken via water level indicators.

[b] Screened Interval is not available, total depth of the well is given.

[c] **Elevation data provided by Thurston County. June data were not available, the closest surrounding measurements are provided.**

[d] **Elevation data provided by the City of Lacey.**

Table 4-2. Groundwater Elevation Measurements, Sea-Level (Qc) Aquifer, April–August 2018

Well Name	Top of Casing (ft)[a]	Screen Interval (ft bgs)	Date	Groundwater Elevation (ft)[a]	Date	Groundwater Elevation (ft)
Lacey S29 (Betti)[d]	230.62	294–394	6/28/2018	83.92		
Thurston Cty Landfill MW-6R[c]	227.87	224.34[b]	4/24/2018	36.61	8/1/2018	34.08
Thurston Cty Landfill MW-9D[c]	252.53	248–258	4/23/2018	30.65	7/31/2018	28.33
Thurston Cty Landfill MW-10D[c]	227.51	253–258	4/23/2018	38.96	7/31/2018	36.36
Thurston Cty Landfill MW-12D[c]	220.18	238–248	4/24/2018	58.20	8/1/2018	53.34
Thurston Cty Landfill MW-13D[c]	214.04	218–228	4/23/2018	33.34	7/31/2018	31.03
LOTT Hawks Prairie MW-12	227.00	284.7–304.7	6/15/2018	93.61		
LOTT Hawks Prairie MW-14	218.04	310–330	6/12/2018	64.32		
LOTT Hawks Prairie MW-21	227.16	220–240	6/14/2018	92.71		
LOTT Hawks Prairie MW-23	204.54	259.8–289.8	6/14/2018	55.99		

Notes:

[a] Elevation datum is NAVD88 (ft); groundwater depths are manual measurements taken via water level indicators.

[b] Screened Interval is not available, total depth of the well is given.

[c] Elevation data provided by Thurston County. June data were not available, the closest surrounding measurements are provided.

[d] Elevation data provided by the City of Lacey.

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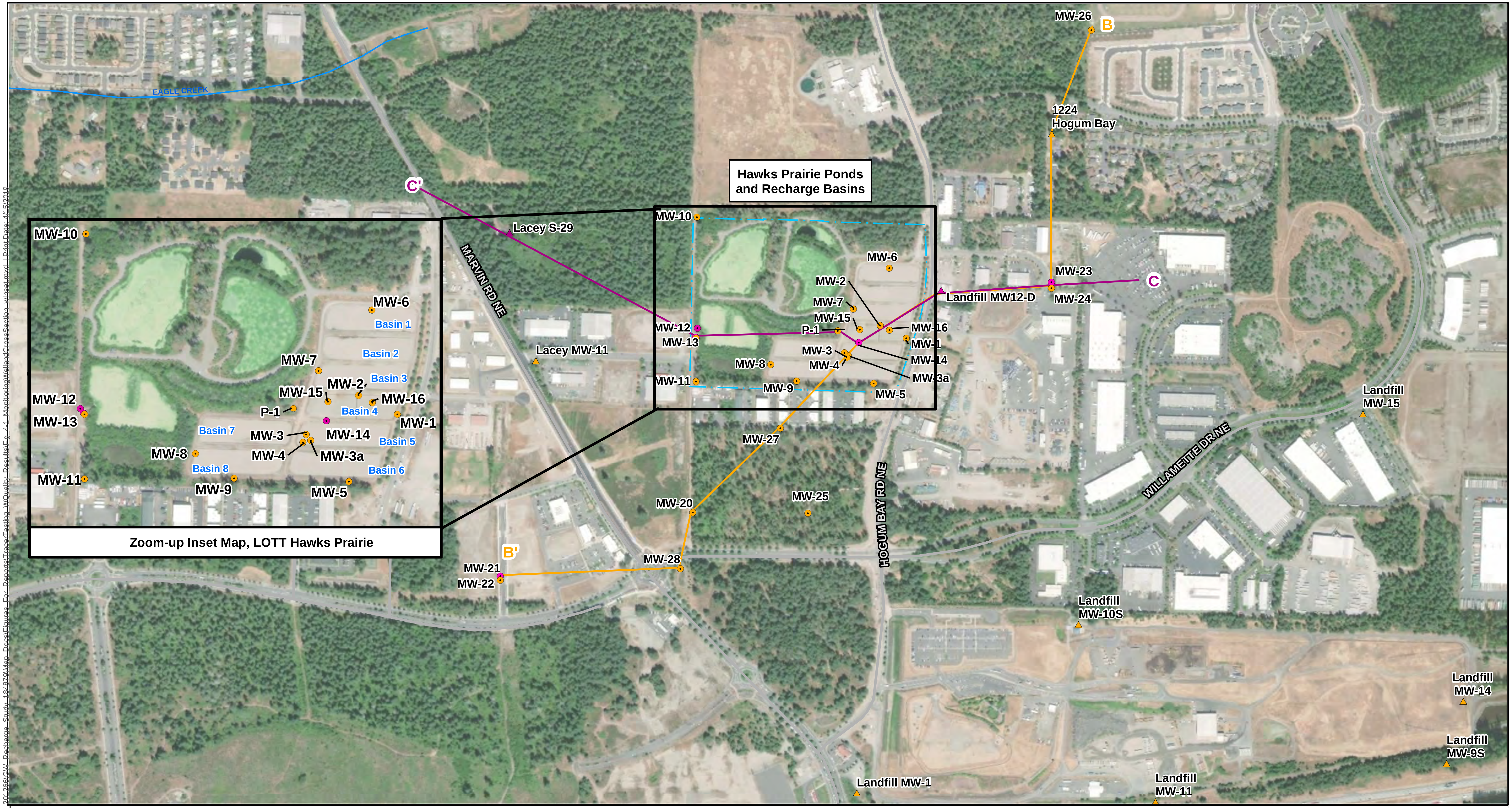


Figure 4-1. Well and Hydrogeologic Cross-Section Locations

Source: Bing Maps (2011), City of Lacey (2014), WSDOT (2013).

Path: G:\Projects\Washington\LOTT_CWA_201266\GW_Recharge_Study_184879\Map_Docs\Figures_For_Reports\TracerTesting_WQuality_Results\Fig_4-1_MonitioringWellandCrossSection_wInset.mxd | Print Date: 4/15/2019

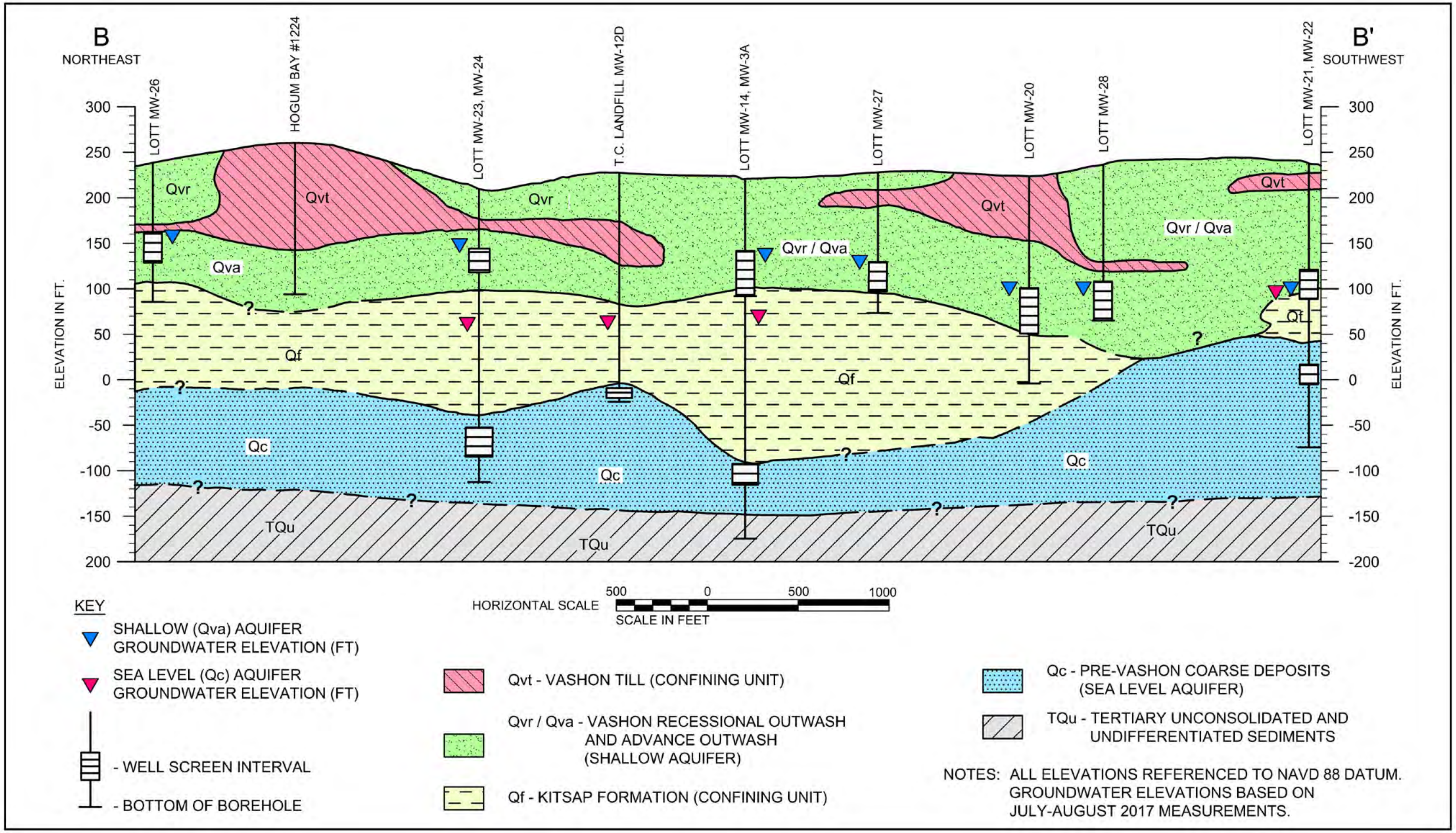


Figure 4-2. Cross-Section B-B’

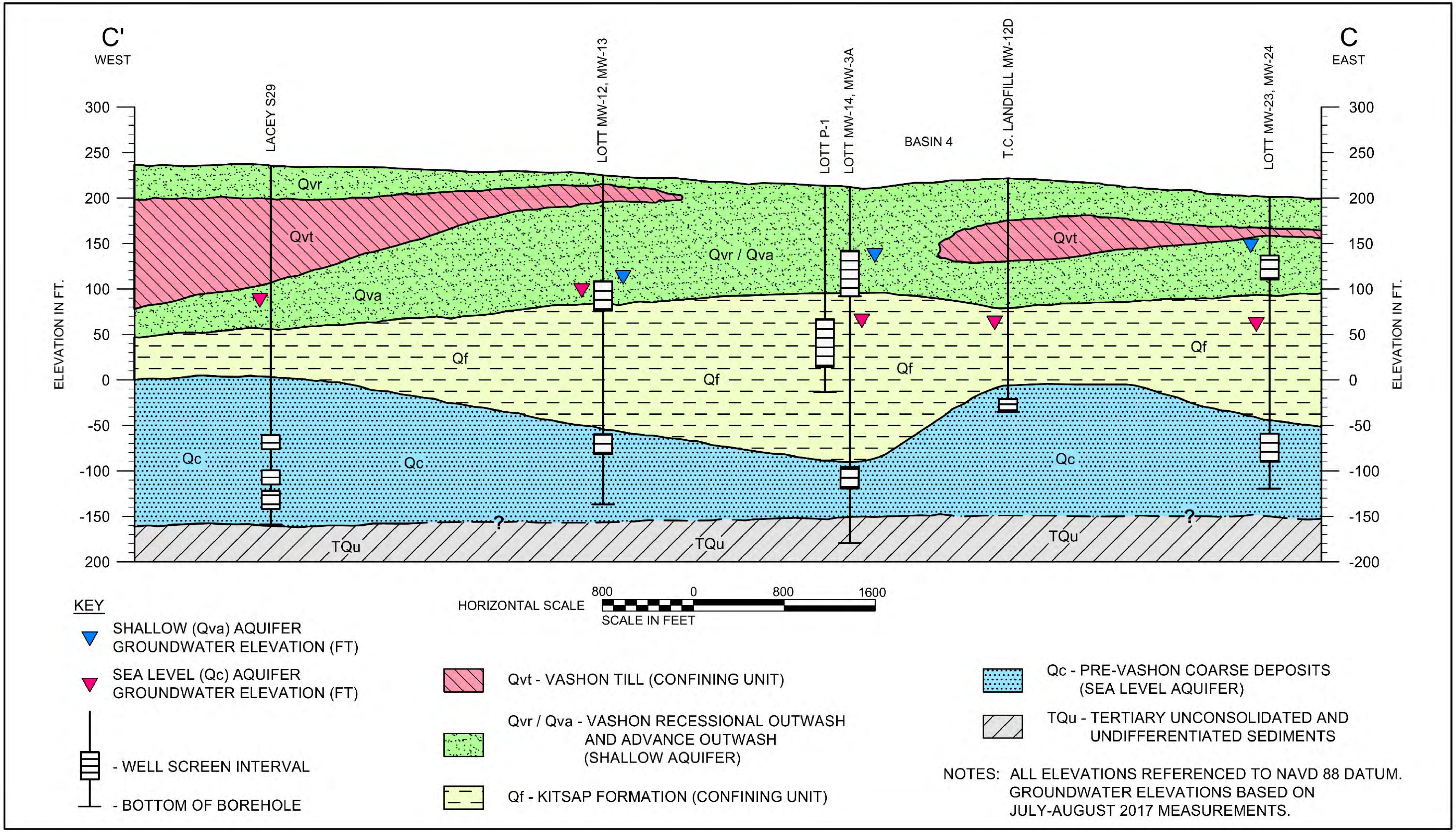
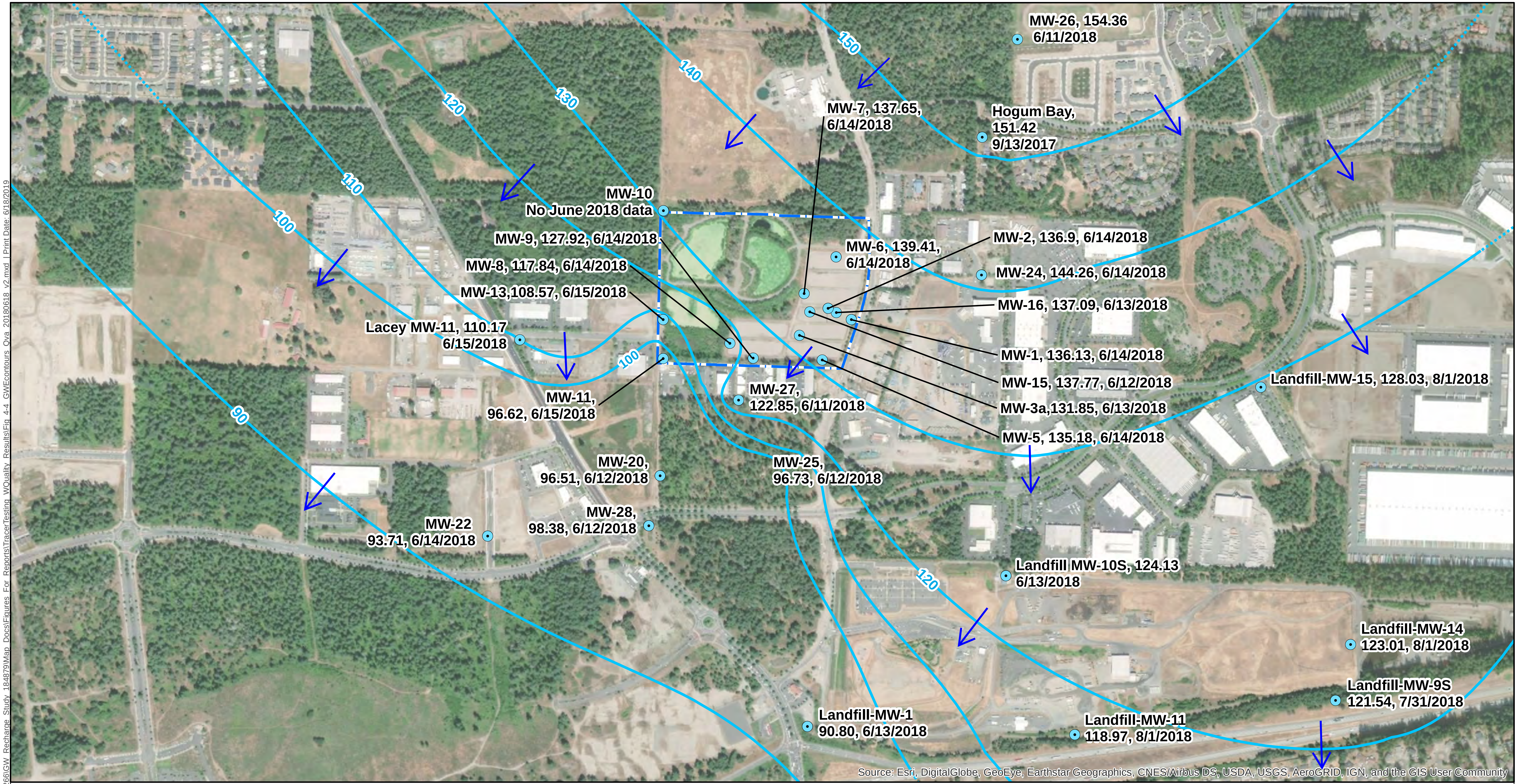


Figure 4-3. Cross Section C-C’



⌜⌟ LOTT Hawks Prairie Recharge Facility

— Streams

— Groundwater Potentiometric Elevation Contour (ft)
Dashed where data is limited and contours are inferred

Well Name
⊙ Groundwater Elevation (ft)
Groundwater Elevation Date

N

0 500 1,000
Feet

Figure 4-4. Groundwater Potentiometric Elevation Contours Shallow (Qva) Aquifer, June 2018

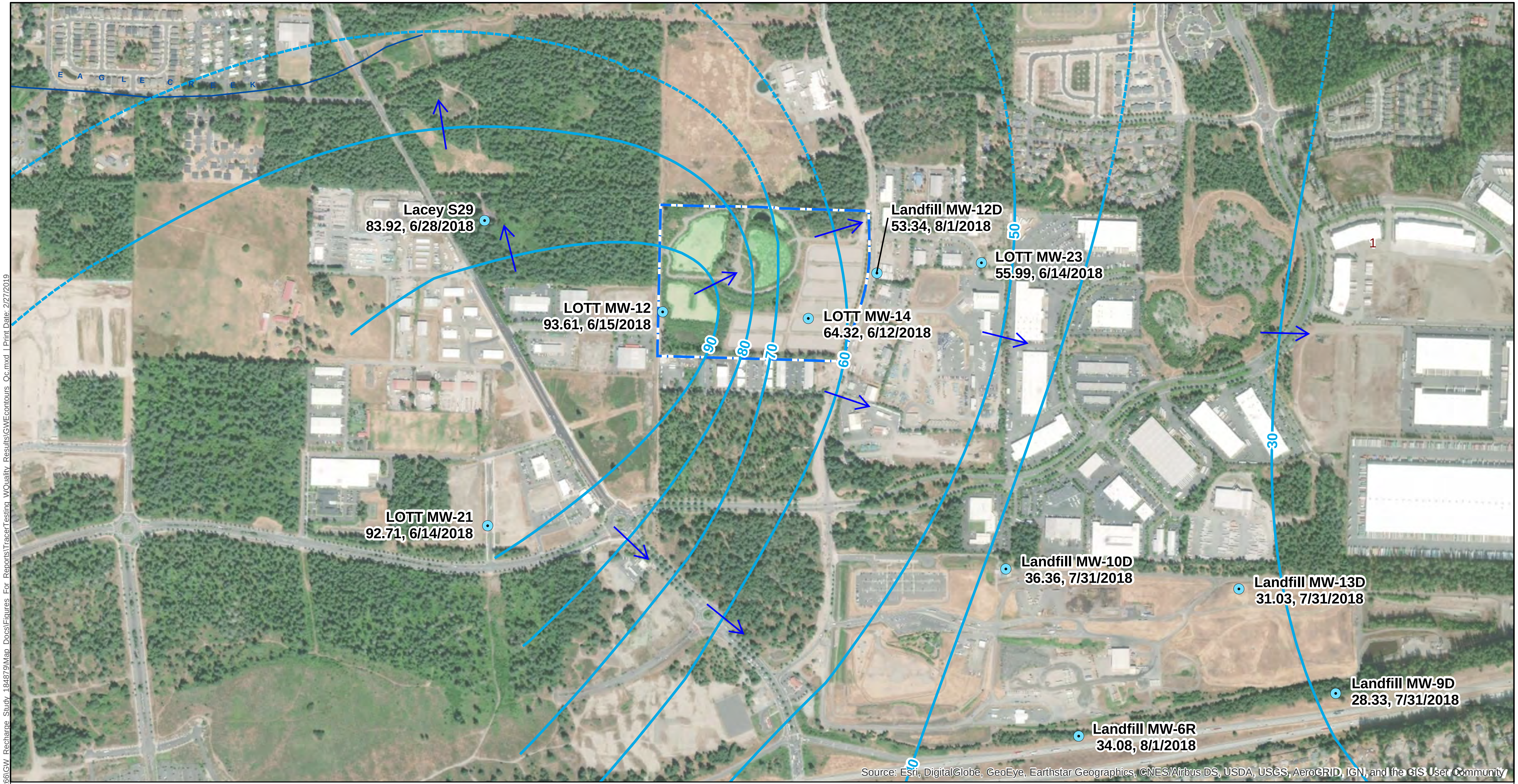
NOTE:
1. Vertical datum for groundwater elevations is NAVD 88.
2. Groundwater potentiometric elevation contours are based on June, 2018 water elevations and supplemental data.

Path: G:\Projects\Washington\LOTT CWA 201266\GW Recharge Study 184879\Map Docs\Figures For Reports\TracerTesting WQuality Results\Fig 4-4 GWEcontours Qva 20180618 v2.mxd | Print Date: 6/18/2019

LOTT Clean Water Alliance

HDR

Source: City of Lacey (2018), Ecology (2015), Esri (2018), Thurston Co Landfill (2018), WSDOT (2018).



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

⌜⌟ LOTT Hawks Prairie Recharge Facility

— Creek

— Groundwater Potentiometric Elevation Contours (ft)
Dashed where data is limited and contours are inferred

⊙ Well Name
Groundwater Elevation (ft)
Groundwater Elevation Date

N

0 500 1,000
Feet

Figure 4-5. Groundwater Potentiometric Elevation Contours Sea Level (Qc) Aquifer, June 2018

NOTE:
1. Vertical datum for groundwater elevations is NAVD 88.
2. Groundwater potentiometric elevation contours are based on June, 2018 water elevations and supplemental data.

Path: G:\Projects\Washington\LOTT_CWA_201266\GW_Recharge_Study_184879\Map_Docs\Figures_For_Reports\TracerTesting_WQuality_Results\GWEcontours_Qc.mxd | Print Date: 2/27/2019

Source: City of Lacey (2018), Ecology (2015), Esri (2018), Thurston Co Landfill (2018), WSDOT (2018).

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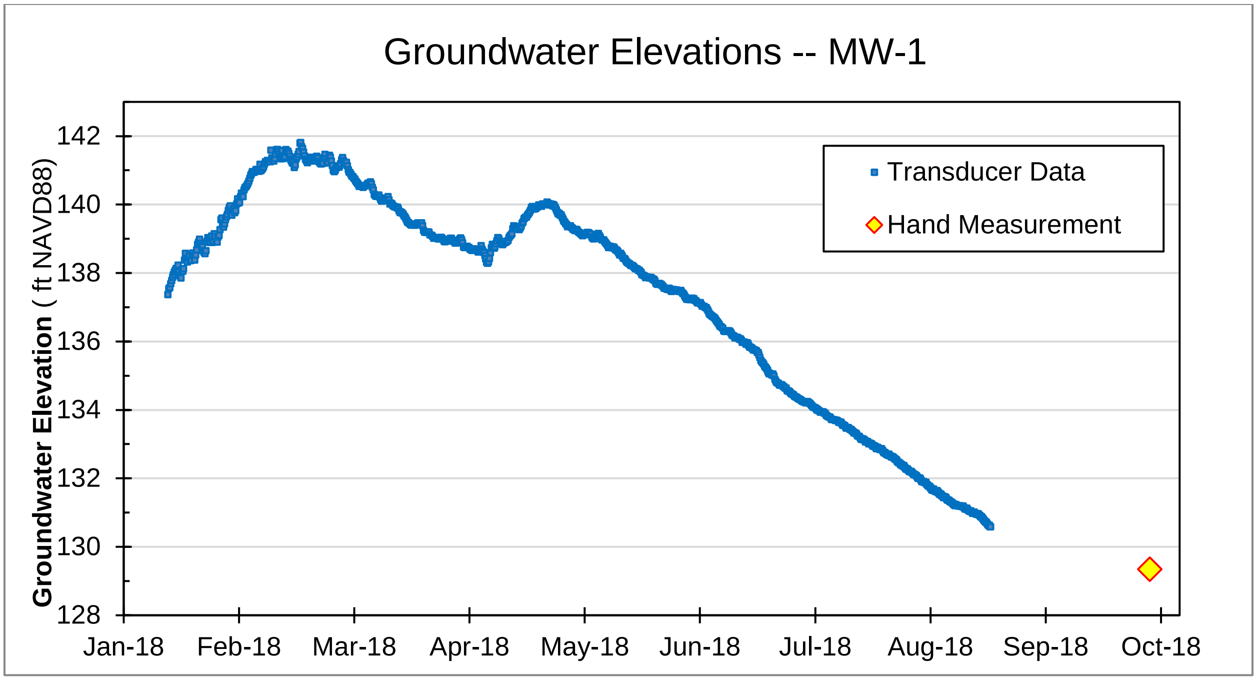


Note: Hand measurements included when transducer data not available

Figure 4-6a. Groundwater Elevations MW-1

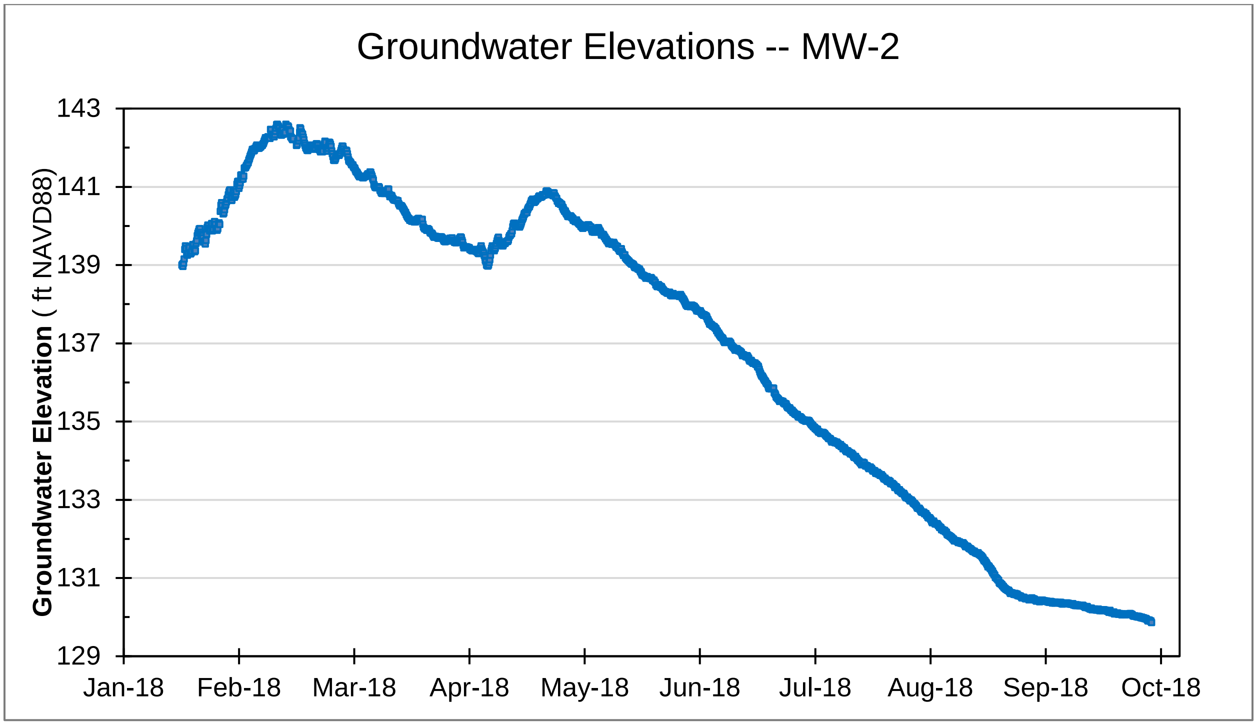


Figure 4-6b. Groundwater Elevations MW-2

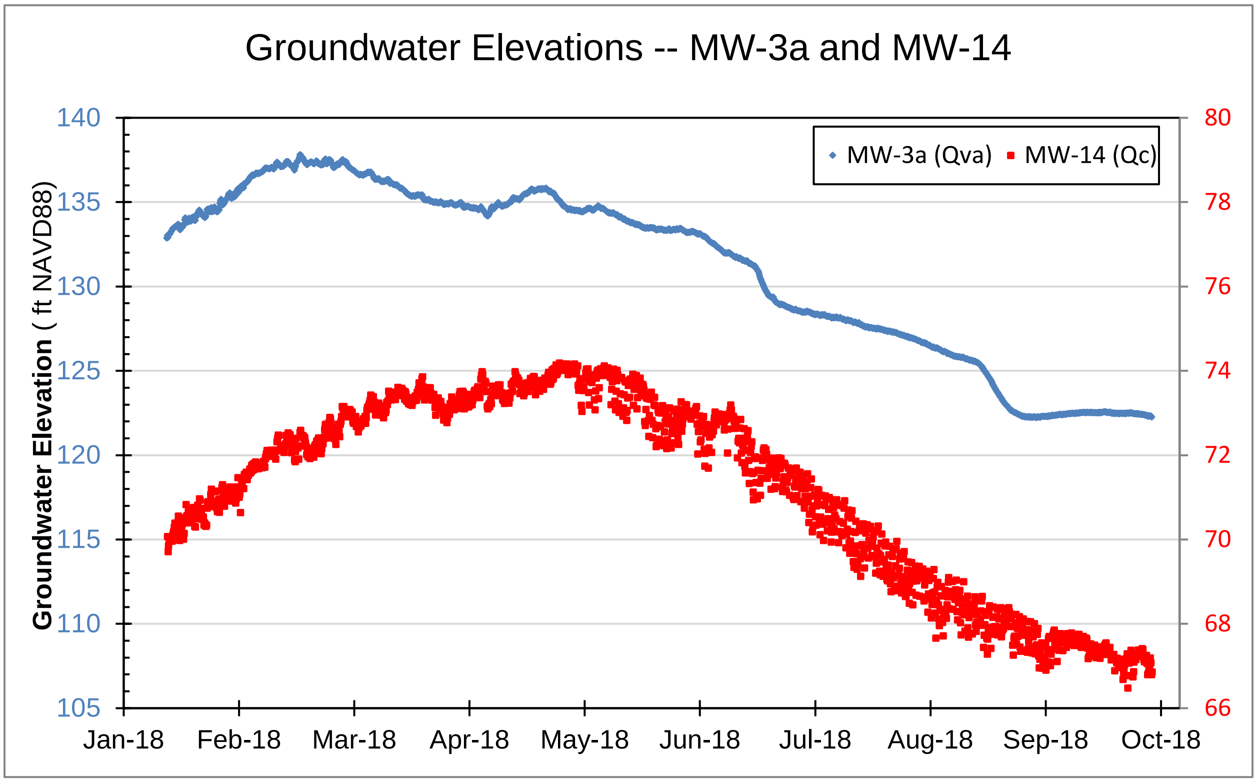


Figure 4-6c. Groundwater Elevations MW-3a and MW-14

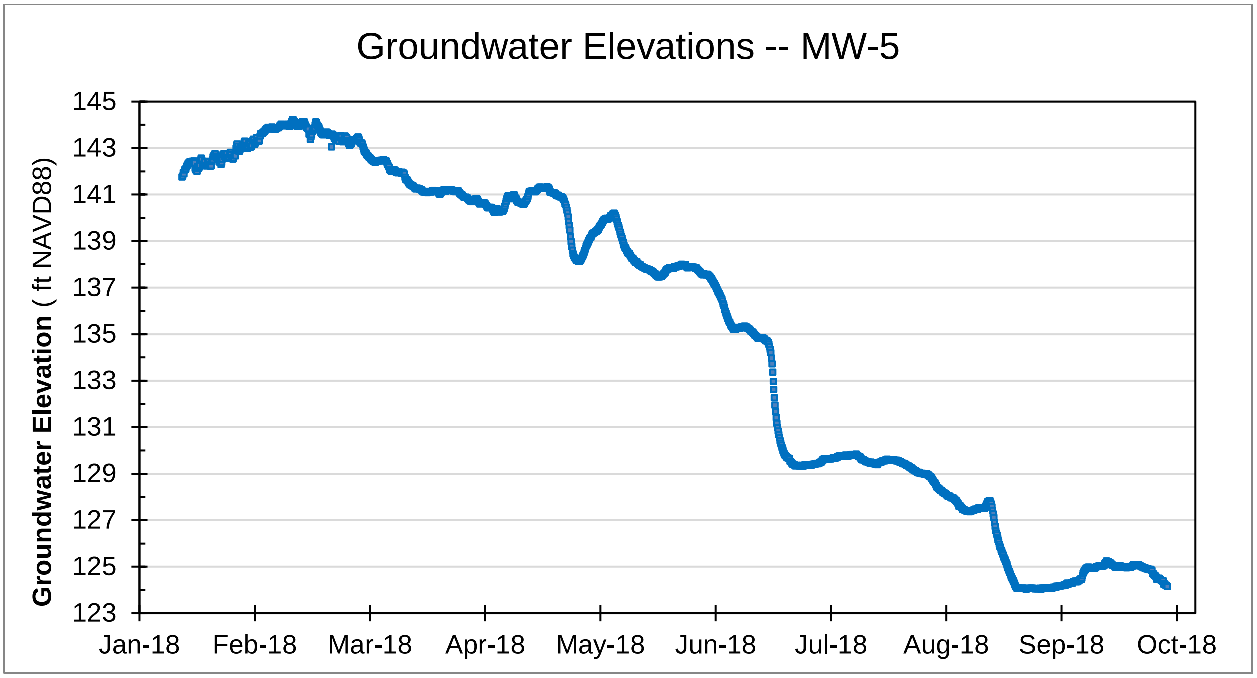


Figure 4-6d. Groundwater Elevations MW-5

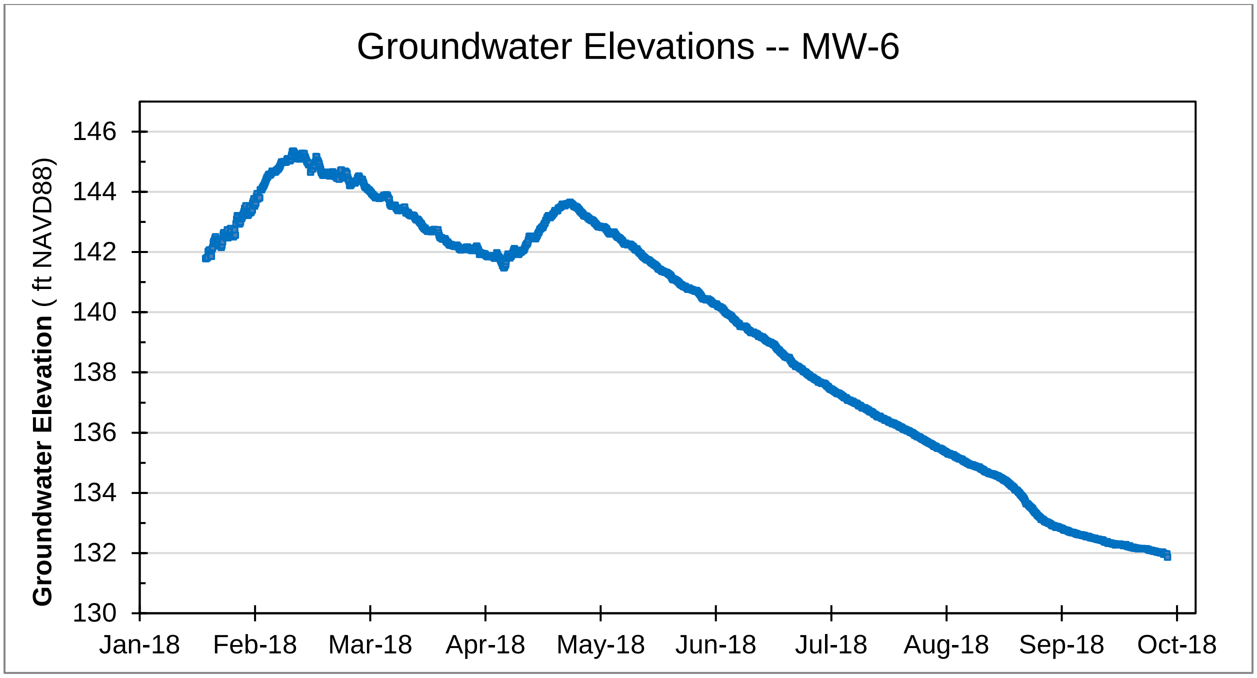


Figure 4-6e. Groundwater Elevations MW-6

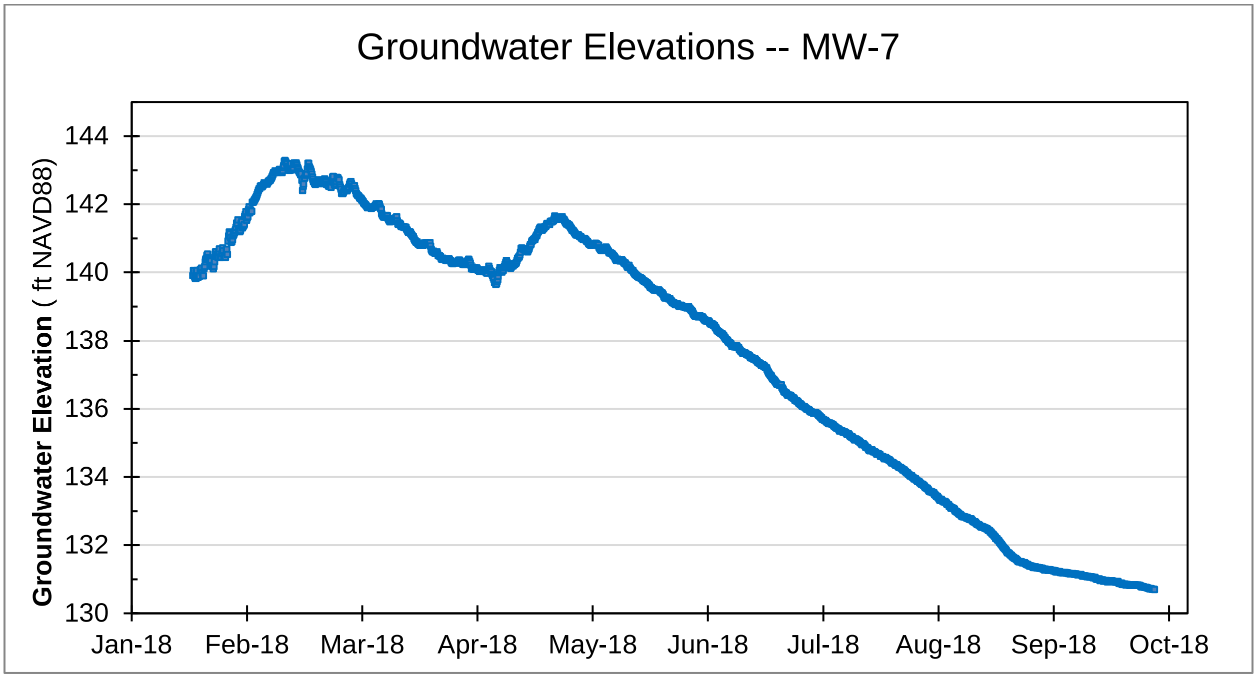


Figure 4-6f. Groundwater Elevations MW-7

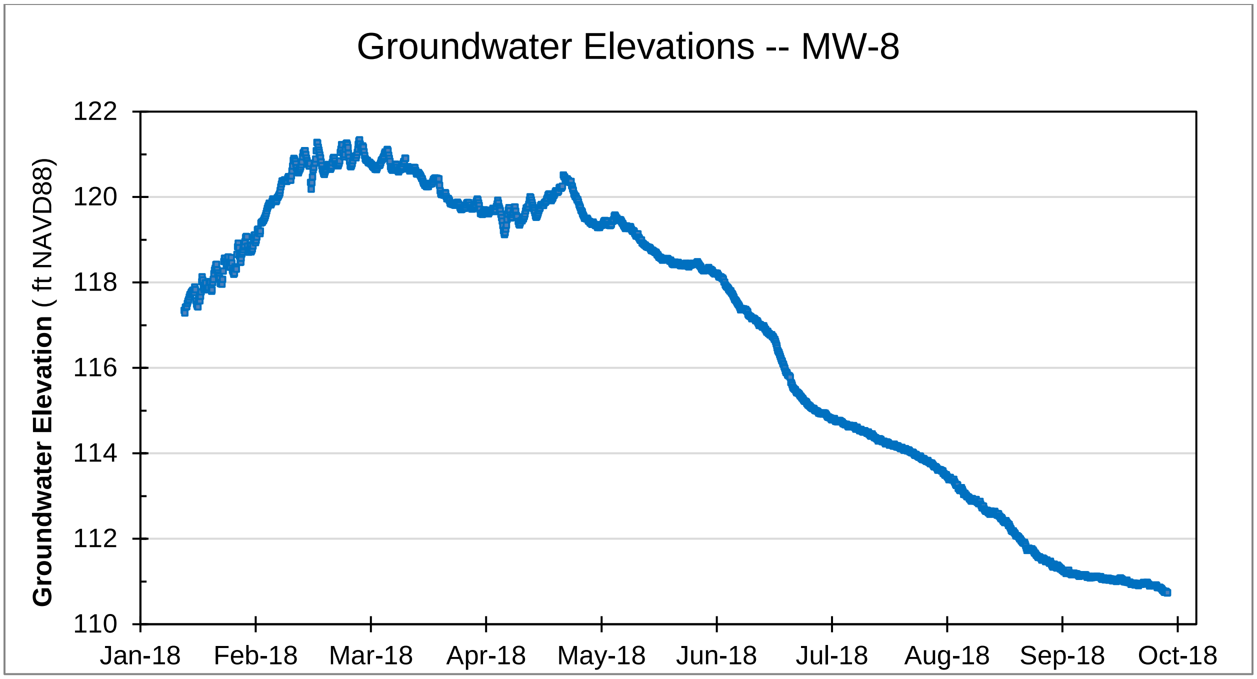


Figure 4-6g. Groundwater Elevations MW-8

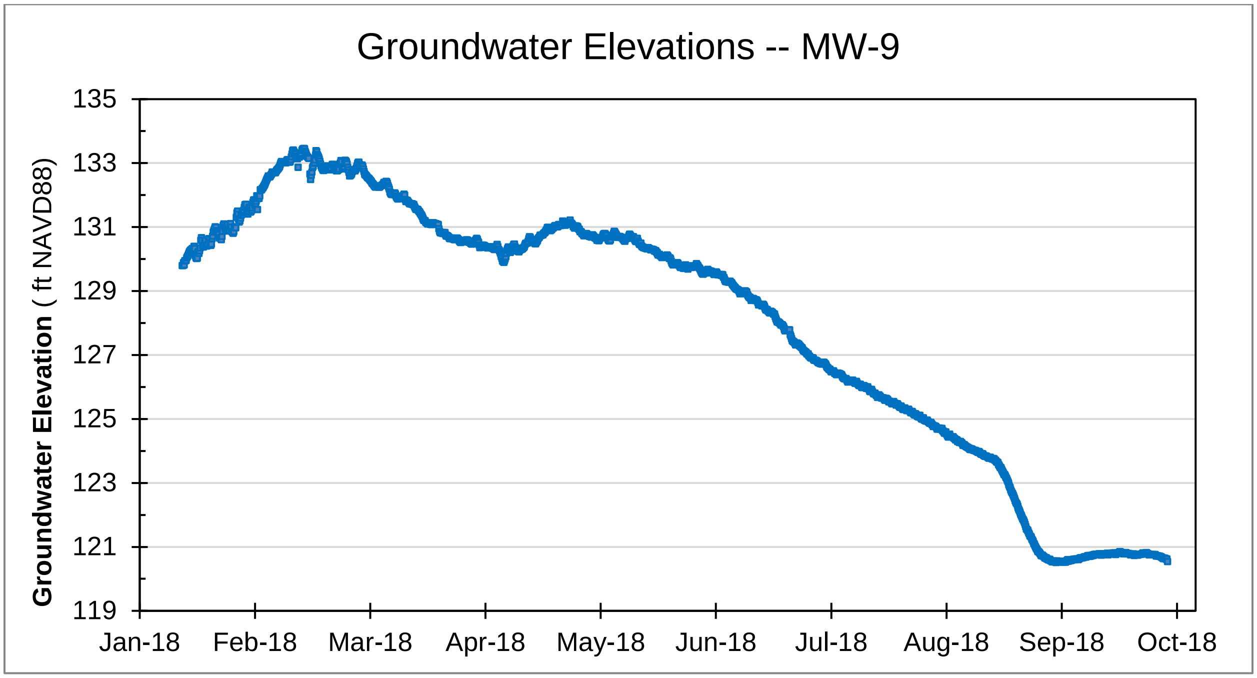
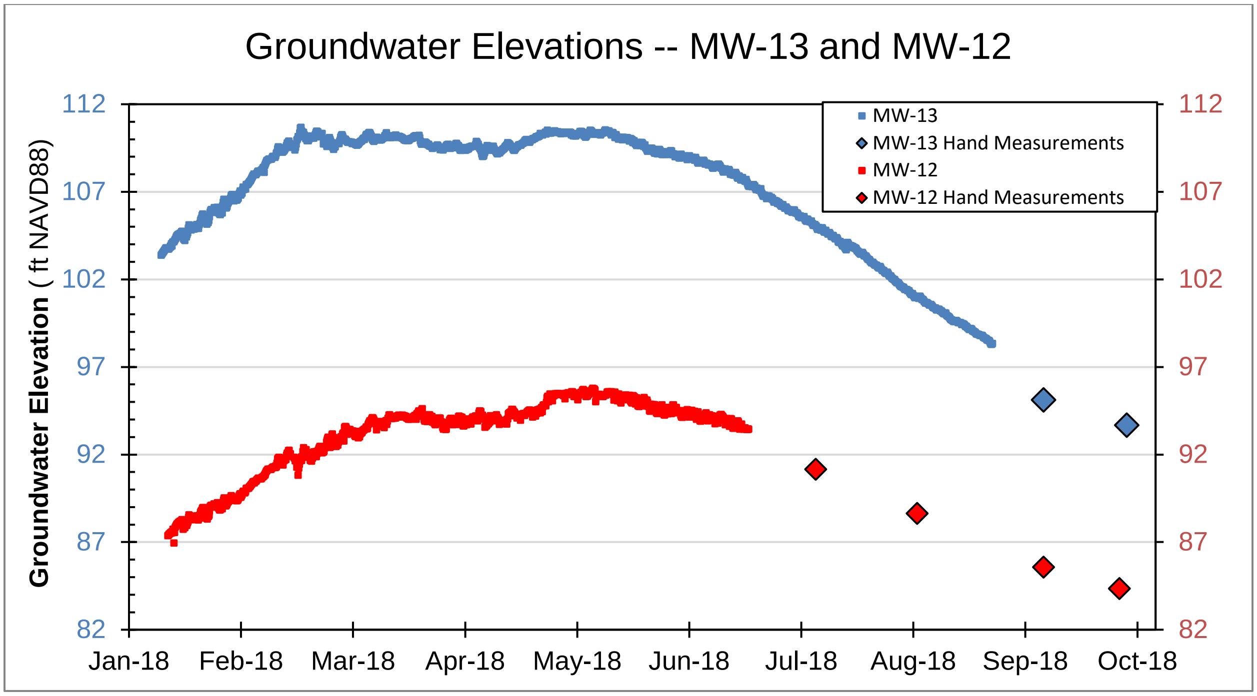


Figure 4-6h. Groundwater Elevations MW-9



Note: Hand measurements are included when transducer data is not available

Figure 4-6i. Groundwater Elevations MW-12 and MW-13

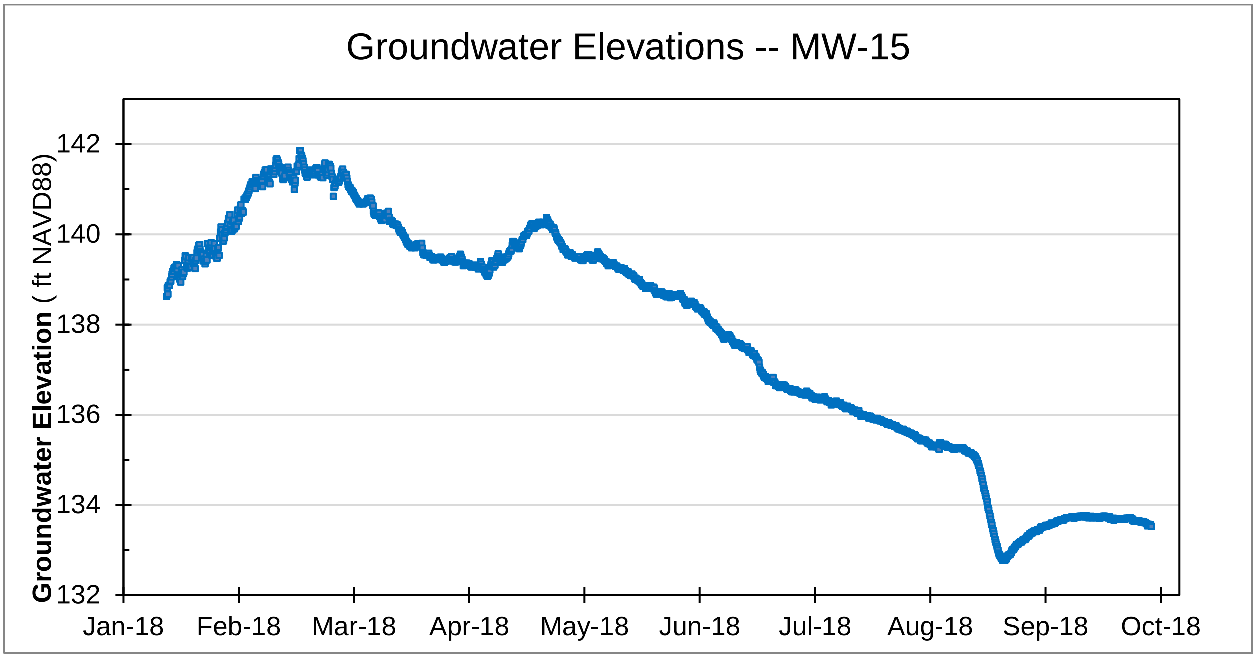


Figure 4-6j. Groundwater Elevations MW-15

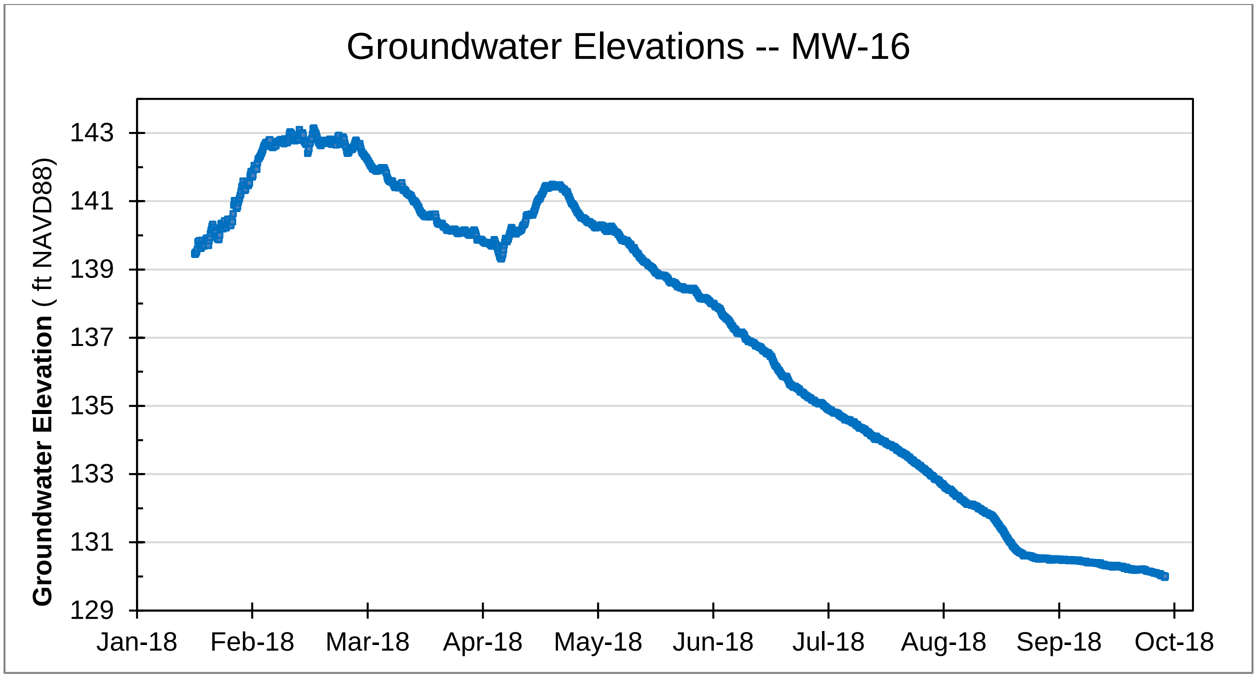
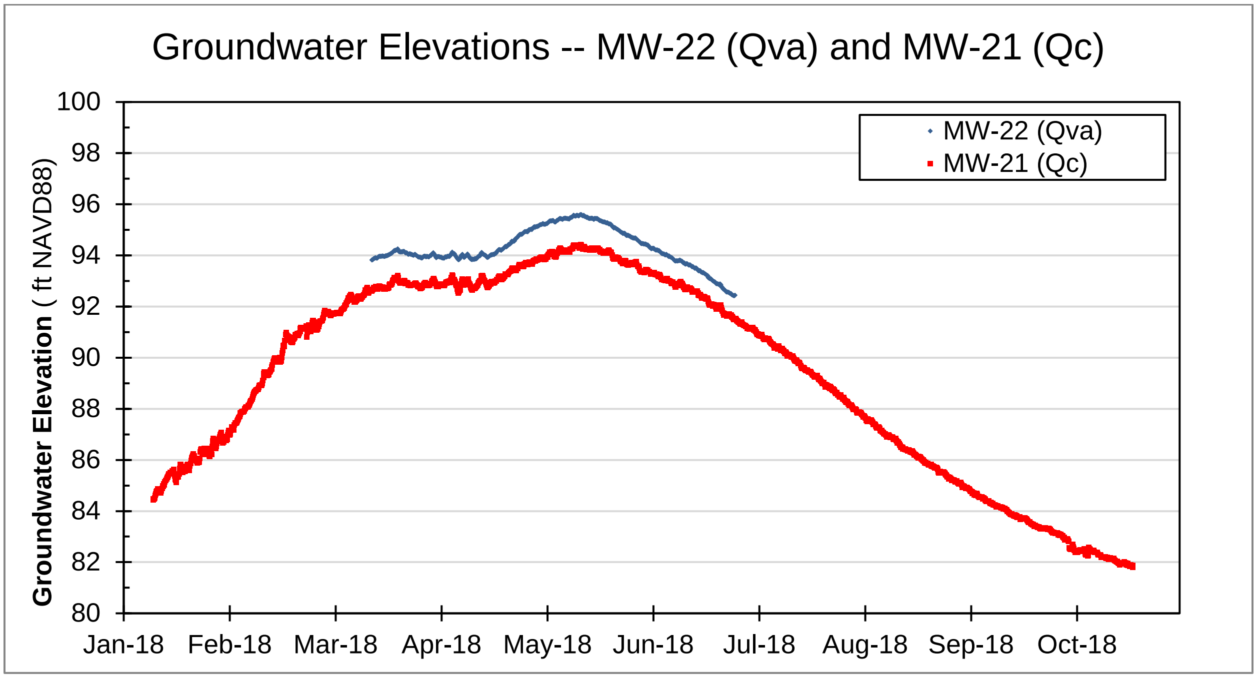


Figure 4-6k. Groundwater Elevations MW-16



Note: Water level was below MW-22 transducer January 9 – March 14 and June 28 – October 23

Figure 4-6l. Groundwater Elevations MW-21 and MW-22

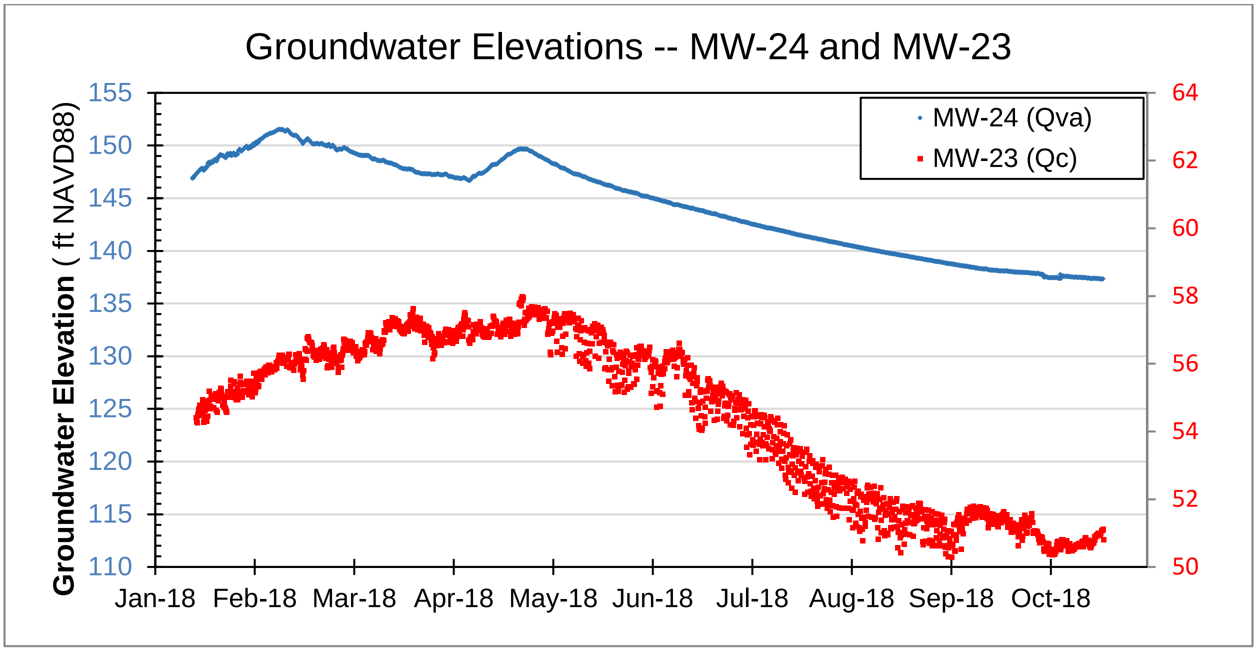


Figure 4-6m. Groundwater Elevations MW-23 and MW-24

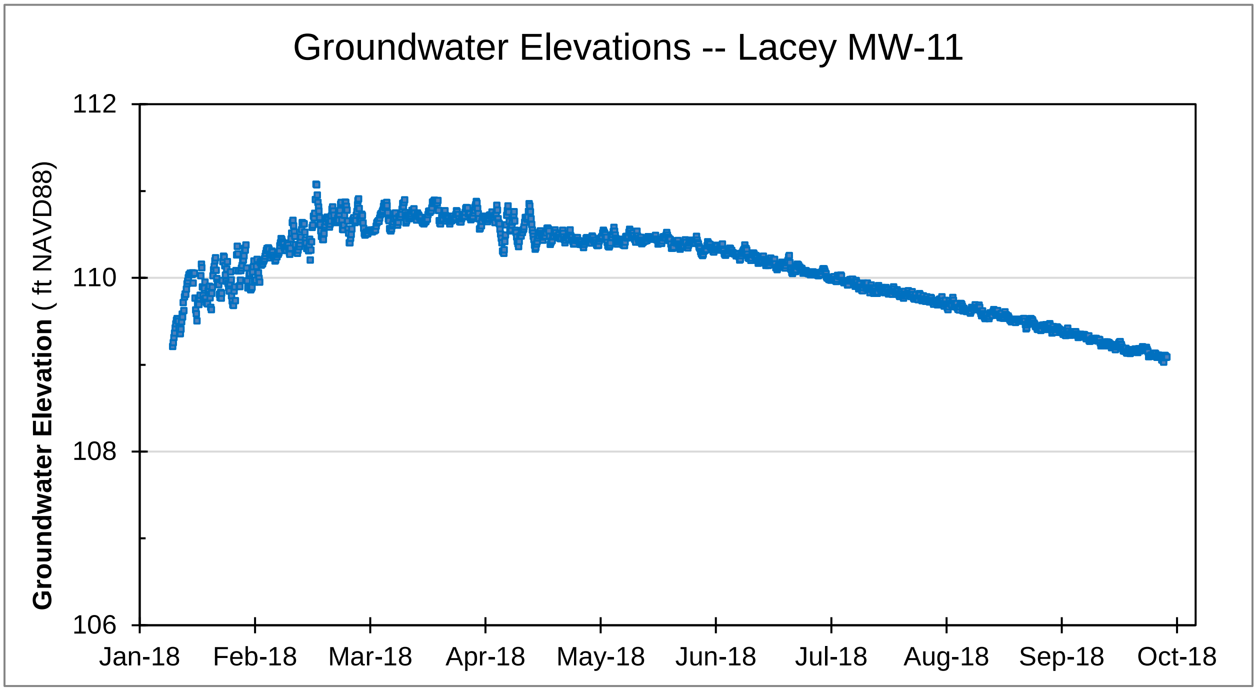
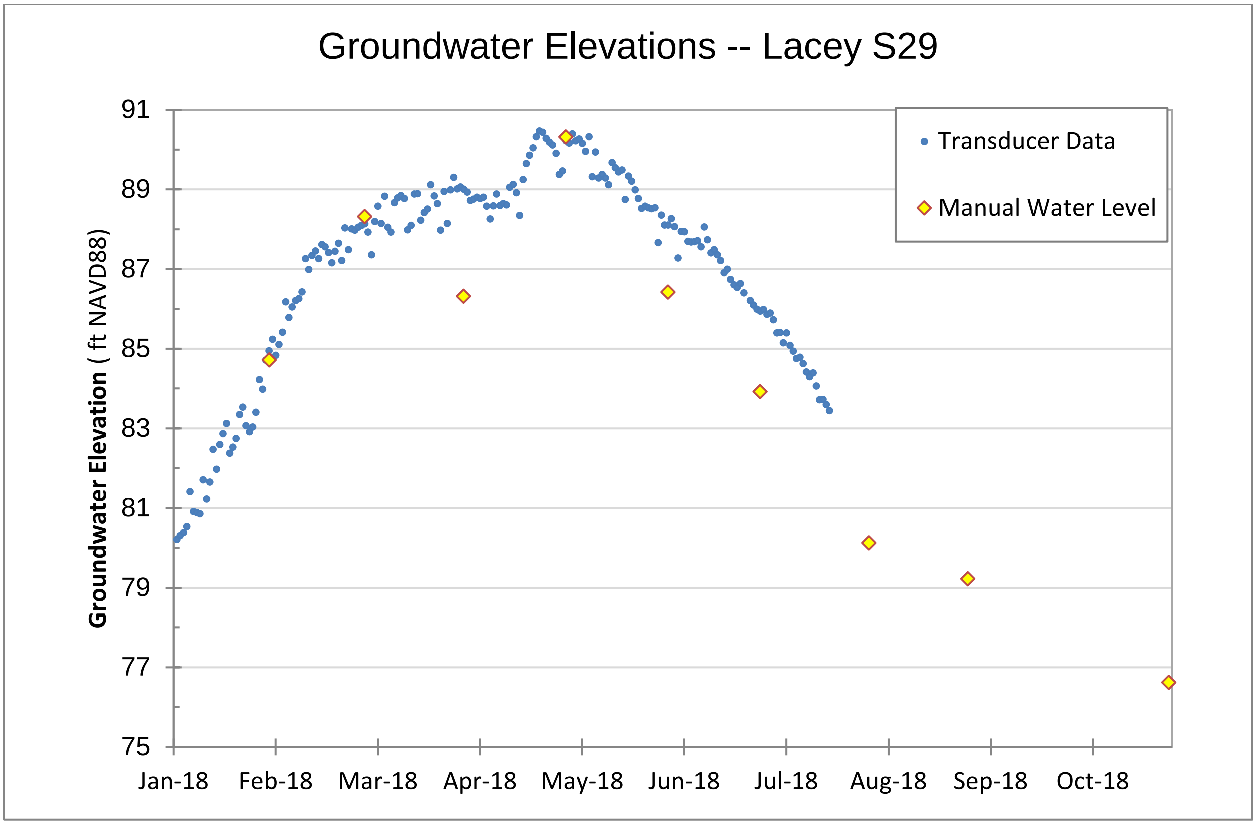


Figure 4-6n. Groundwater Elevations Lacey MW-11



Note. Transducer data show daily maximum water level (representing static conditions)

Figure 4-6o. Groundwater Elevations Lacey S29

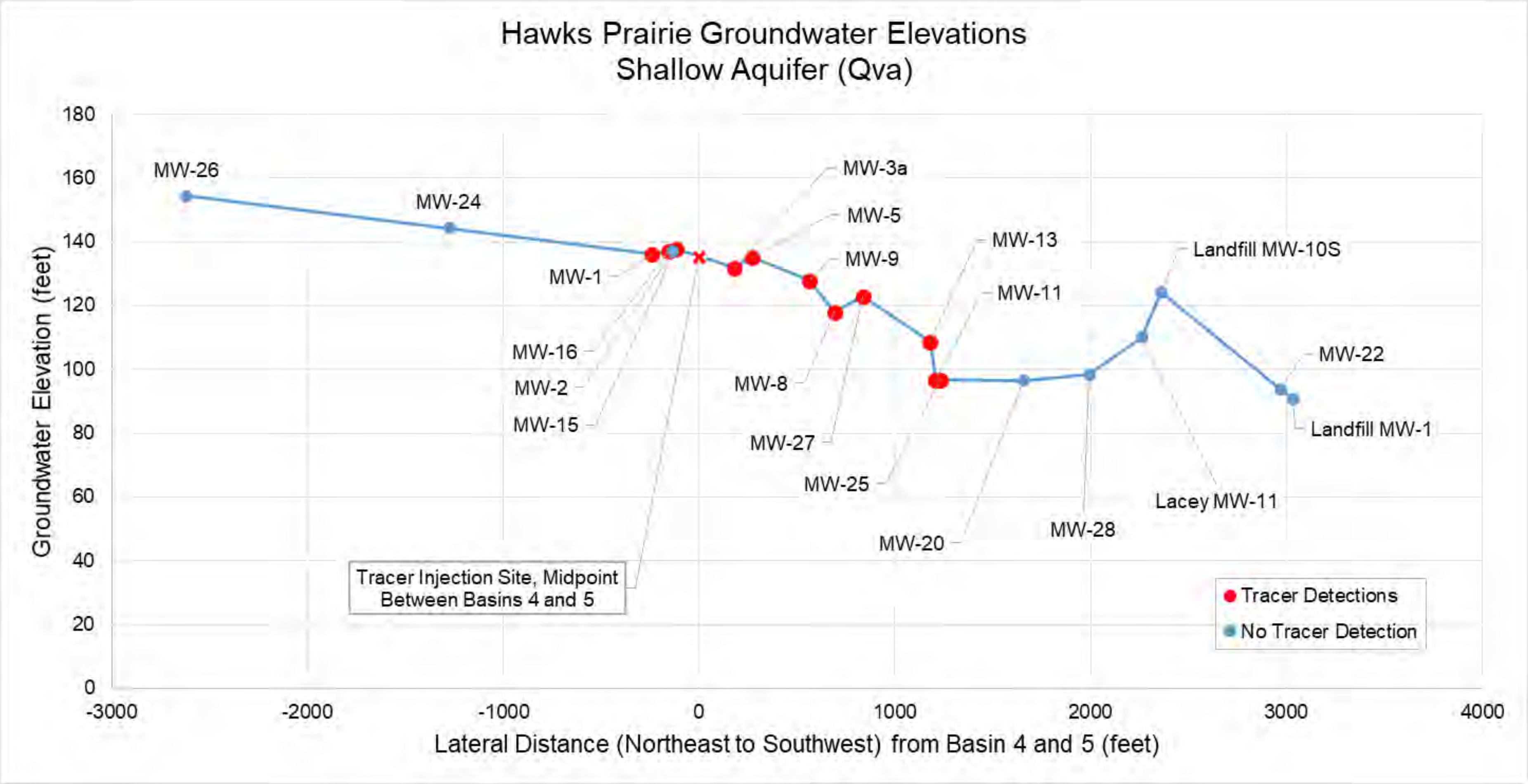


Figure 4-7. Hydraulic Profile Shallow Aquifer

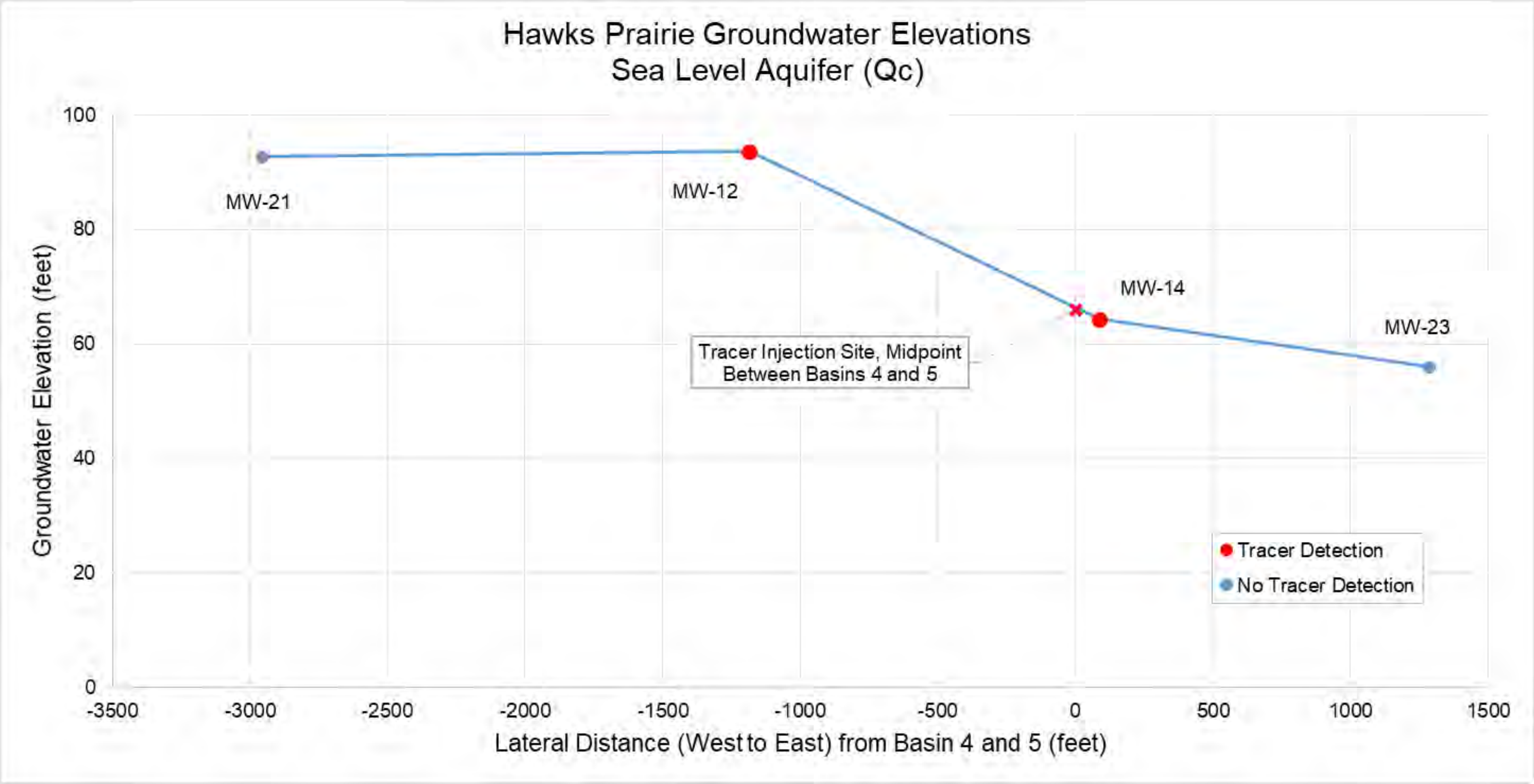


Figure 4-8. Hydraulic Profile Sea-Level (Qc) Aquifer

5.0 Tracer Delivery, Sampling, and Analytical Methods

Two conservative tracers, potassium bromide and SF_6, were used to measure travel time of reclaimed water flowing from Basins 4 and 5 through the vadose zone and groundwater. A conservative tracer is a constituent that moves through the subsurface along the downgradient flow paths at approximately the same rate of travel as groundwater. Two tracers were used to provide redundancy in the event that one of the tracers was not detected or a sample lost. Bromide and SF_6 tracers were delivered, sampled, and analyzed as per the work plan (HDR 2018a) and are summarized in this section.

Bromide is an ideal groundwater tracer because it is nontoxic, inexpensive, easy to detect in trace amounts, chemically stable, not retarded or sorbed in groundwater, and not present at high concentrations in the local groundwater being studied (Kass 1998; Davis et al. 1985).

SF_6 served as a second groundwater tracer; it is a non-reactive, inexpensive, low-toxicity gas that is easily detected at low concentrations (Lester and Greenberg 1950). Furthermore, it is present in native groundwater at extremely low concentrations (< 0.0001 pmol/L; 1 pmol = 10^{-12} mol). These properties make it an ideal tracer gas for groundwater. It has been successfully used as a tracer at multiple aquifer recharge projects (Avisar and Clark 2005; Clark et al. 2009, 2005, 2004; Gamlin et al. 2001; Wilson and Mackay 1996). SF_6 has also been used as a tracer in other experimental settings to evaluate the presence of trapped air, which forms because of the rising and lowering of the water table or by biogeochemical reactions that produce methane and other gases (e.g., Cirpka and Kitanidis 2001; Vulava et al. 2002).

5.1 Baseline Tracer Concentrations

Previous water quality characterization of reclaimed water over four quarterly sampling events from 2014 to 2015 found bromide concentrations ranging from 41 to 77 micrograms per liter (µg/L) (HDR 2017c). Background concentrations of bromide in groundwater observed in prior sampling of the Hawks Prairie property wells and regional residential wells range from 10 to 40 µg/L and average about 25 µg/L (HDR 2014b; 2017a; 2018b). Background sampling at wells monitored during the tracer test observed bromide concentrations from 7.1 to 69 µg/L (Appendix E).

Although SF_6 does not occur naturally in the environment, it is found in the atmosphere at very low partial pressures. In 2018, its partial pressure was about 9 pico atmospheres (patm) (NOAA 2019). Water in equilibrium with the atmosphere at 15°C should have a SF_6 concentration less than 0.001 pico moles per liter (pmol/L). Baseline sampling January 10 to 15, 2018, observed SF_6 concentration below the detection limit of 0.05 pmol/L in 9 of the 10 wells sampled. MW-8, the one well in which SF_6 was detected, had a concentration of 0.66 pmol/L. Four subsequent samples at MW-8 from January 18 to February 2 were less than 0.05 pmol/L.

5.2 Delivery of Bromide and SF_6 Tracers

The tracer test was conducted in Basins 4 and 5, which remained in operation throughout the duration of tracer testing. Reclaimed water delivery was alternated between the eastern and western halves of Basins 4 and 5 on an approximately monthly cycle (see **Table 3-1** for the operation schedule). Reclaimed water bypassed the wetland ponds and was delivered directly to the basins throughout the duration of the tracer test and water quality monitoring program.

The bromide and SF_6 tracers were prepared for delivery to the groundwater system on site. The potassium bromide was sourced from ICL Industrial Products. Potassium bromide was mixed in two 1,500-gallon aboveground polyethylene storage tanks filled with potable water in quantities outlined in the work plan (HDR 2018a) to achieve a concentration of approximately 25 mg/L bromide in the reclaimed water introduced to the basins. All potable water was provided from the City of Lacey potable water supply pipeline using an onsite fire hydrant, water meter, and reduced-pressure backflow assembly; the potable water was delivered by fire hose to the tanks. Mixing was conducted through physical agitation. Bromide tracer solution was introduced at Vault 5, shown in **Figure 5-1**. A total mass of 1,410 kilograms (kg) of bromide (2,100 kg of potassium bromide) was introduced from January 16 to February 3, 2018; the quantity of bromide introduced each day is presented in **Table 5-1**. There was a break in tracer introduction between January 26 and 29 as more potassium bromide was being delivered to the site. Bromide tracer concentration in reclaimed water was calculated from the mass of bromide used to make the tracer solution in the tanks and the reclaimed water flow volumes per day to the basins. The average calculated bromide concentration was 28.31 mg/L. Ten tracer-tagged reclaimed water samples were collected during the tracer introduction into the basins and had an average concentration of 28.28 mg/L of bromide with a range of 9.8 mg/L to 42.5 mg/L. The mass of bromide, volume of recharge, and calculated and laboratory measured bromide concentrations are detailed in **Table 5-1**.

The SF_6 was sourced from Praxair (a specialty gas vendor) and has a purity of over 99 percent. SF_6 was delivered and stored in high-pressure steel bottles (K-size cylinders), which weighed approximately 115 pounds. Because SF_6 condenses at a relatively low pressure (~300 psi) the cylinders contained liquid SF_6. This gas tracer was introduced using two methods: (1) delivery into the reclaimed water at Vault 5 and (2) directly into five monitoring wells around Basin 4. The reason for introducing SF_6 into both the basins and the monitoring wells was to provide redundancy.

The procedure for delivering the SF_6 into the basins was as follows. One-hundred-gallon nylon bags were collapsed prior to filling to remove air from the bags. Then, they were partially filled with SF_6 (about 20 gallons) followed by potable water (without allowing air to enter) and the SF_6 gas was allowed to diffuse into solution. A set of two bags (200 gallons total) was used to allow adequate time for SF_6 to diffuse into solution. The solution was delivered by gravity flow over an 8-hour period into reclaimed water Vault 5 using tubing with its end submerged in the reclaimed water to avoid aerating the sample during delivery. This was done twice per day (once in the morning and once in the evening) for most days.

SF_6 was introduced directly to the groundwater under Basins 4 and 5 through monitoring wells MW-1, MW-2, MW-7, MW-15, and MW-16. Injection into the monitoring wells began on February 7, 22 days after tracer introduction began at Vault 5, and continued until February 14. The same procedure using the nylon 100-gallon bags was followed when introducing tracers into the monitoring wells. Approximately 20 gallons of sulfur hexafluoride gas was injected into the bag and allowed to diffuse into 100 gallons of potable water. The bags were placed on stands, as shown in **Figure 5-2**, at the monitoring wells so the tracer solution could drain by gravity through tubing into the saturated portion of the well screen and out into the formation. The volume of SF_6 tagged water and the location of tracer introduction is presented in **Table 5-2.**

5.3 Groundwater and Reclaimed Water Sampling Schedule and Methods

This section describes the groundwater, vadose zone pore-water, and reclaimed water monitoring methods and frequency used during the tracer study. The purpose of monitoring is to determine when (and if) tracers arrive at each monitoring well, so that groundwater flow directions and velocity can be assessed. Samples of groundwater, vadose zone pore-water, and reclaimed water were collected in accordance with the sampling protocol laid out in the work plan (HDR 2018a).

Monitoring of tracers and water quality was conducted through a groundwater monitoring well network shown in **Figure 5-3**. In addition to the aquifer monitoring wells, Basin 4 was equipped with two sets of vadose zone monitoring and sampling instrumentation. One set of stainless steel suction lysimeters and one set of vadose zone monitoring tools (soil moisture, temperature, conductivity, and oxygen) were installed in the east half and west half of Basin 4, as shown in **Figure 5-4**. A description of the groundwater monitoring wells and lysimeters installed for the project is presented in the hydrogeologic characterization report (HDR, 2018b).

5.3.1 Monitoring Well Sampling Pump Installation

Groundwater monitoring wells were equipped with dedicated sampling pumps. Sampling pumps consisted of either newly purchased PFAS-free bladder pumps by Geotech Environmental, Inc., or existing Grundfos Redi-Flo2® submersible pumps, depending on whether the well would be used only for tracer monitoring or also for water quality monitoring (see Section 6 for a description of water quality monitoring). Bladder pumps were installed in new monitoring wells that would be tested for tracers (bromide and SF_6), and also in wells that would be tested for the full suite of groundwater quality parameters (Section 6). Submersible pumps included existing LOTT-owned submersible pumps in some onsite wells, and submersible pumps in wells owned by Thurston County Landfill. Submersible pumps, which contain stainless steel and Teflon parts that could potentially result in a false-positive laboratory detection, were used in certain wells that would be tested only for tracer chemicals. Bladder pumps were equipped with polyethylene bladders and tubing to avoid potential interference with laboratory analyses. The following list describes the type of pump used in each monitoring well:

- Bladder pump-equipped wells (20): MW-3A, MW-5, MW-8, MW-9, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16, MW-20, MW-21, MW-22, MW-23, MW-24, MW-25, MW-26, MW-27, MW-28, and Lacey MW-11
- Submersible pump-equipped wells (6): MW-1, MW-2, MW-6, MW-7, TC Landfill MW-1, and TC Landfill MW-10S

For wells with a static water level above the well screen, the pump intake was placed at mid-screen. For wells with a static water level below the top of the well screen, the pump intake was set near the bottom of the well screen.

5.3.2 Monitoring Well Groundwater Sample Collection Methods

Groundwater sampling procedures followed those described in the work plan, Tracer Testing and Water Quality Monitoring of Treatment Effectiveness Work Plan (Task 2.1.3) (HDR 2018a). Monitoring well sampling began with laying out clean plastic sheeting around the well, unlocking the well, and measuring the depth to water with an electronic water level indicator. The well condition and depth to water reading were recorded on a sampling log form. Monitoring wells equipped with bladder pumps were sampled using a portable air compressor and Geotech BP Controller, both of which were run by a gasoline-powered generator. Monitoring wells equipped with submersible pumps were sampled using a Redi-Flo2®-compatible controller run by a gasoline-powered generator. Each well was purged prior to sample collection to ensure that non-stagnant water was collected. Stabilization parameters including pH, temperature, conductivity, dissolved oxygen (DO), and oxidation-reduction potential (ORP) were recorded using a YSI Professional Plus water quality instrument equipped with a flow-through cell. The well was purged at a relatively low rate (e.g., 500 milliliters per minute) and the water was discharged to the ground surface near the well. After the first 1.5 gallons was purged, indicator parameters were collected every 3 to 5 minutes until parameters stabilized in accordance with the work plan (HDR 2018a).

Once the indicator parameters stabilized, the flow-through cell was disconnected and the sample was collected directly from the pump discharge line. Sample containers for bromide tracer analysis were placed on ice in a cooler, and samples for SF_6 tracer analysis were collected in pre-weighed 10 mL Vacutainers™ and placed in a cooler without ice.

Static water levels fluctuated during the tracer study because of seasonal changes in rainfall, which affected the sampling of some monitoring wells as shown in **Figure 4-6a** through **Figure 4-6o**. In MW-5, the static water level fell to near the top of the pump in September and October 2018, and the well was purged at a slower rate (100 milliliters per minute) during these monitoring events because of slow recharge. In MW-22, the static water level declined below the pump after the June 2018 monitoring event, and precluded the collection of samples during the July, August, September, and October 2018 monitoring events. Similarly, MW-27 could not be sampled during the September and October 2018 sampling events because of the static water level falling below the pump.

5.3.3 Lysimeter Vadose Zone Pore-water Sample Collection Methods

Lysimeter sampling procedures followed those described in the work plan, Tracer Testing and Water Quality Monitoring of Treatment Effectiveness Work Plan (Task 2.1.3) (HDR 2018a). Lysimeters sampled are located in the east and west halves of Basin 4 at depths of 10, 25, and 50 feet as shown in **Figure 5-4**. Lysimeter sampling began with laying out clean plastic sheeting; unlocking the protective casing; and withdrawing the polyethylene tubing that is stored within the casing. The tubing allows operation of the lysimeters from the surface and consists of a black suction/pressure tube, a clear sample receiving tube, and a green priming tube. Lysimeters were purged dry at the beginning of each sampling event to remove any stagnant water from the lysimeter body. Purging was achieved by pressurizing the system through the black tubing using a bicycle pump until water no longer flowed from the clear sample receiving tube. Suction was then applied by connecting the black tubing to a vacuum pump, and the lysimeter was left to refill. Fill times varied significantly over the course of the tracer study. Initially, in January 2018, fill times were a few hours or less. Later, in the dryer summer months, the required fill time was 8 to 12 hours depending on the individual lysimeter.

Prior to sample collection the vacuum pump was disconnected from the black tube, and a bicycle pump once again was connected to pressurize the lysimeter and push water out the clear sample receiving tube. Sample containers were filled directly from the clear tube. Sample containers for bromide tracer analysis were placed on ice in a cooler (SF_6 tracer samples were not collected from lysimeters because of expected loss into soil air). One set of field parameters (pH, temperature, conductivity, DO, and ORP) was collected for informational purposes, and recorded on a sampling log form. No flow-through cell was used when collecting field parameters at lysimeters; instead, the sample water was placed in a cup and the water quality probes were inserted into the cup. After the sample containers were filled the lysimeter was emptied so that no “old” water remained in the lysimeter body, and fresh vacuum was then applied if sampling was going to occur again that day or the next. Lysimeters were not purged on a daily basis during collection of monthly and quarterly water quality samples, because these sampling events extended over multiple days due to slow fill rates.

5.3.4 Reclaimed Water Sample Collection Methods

Samples of reclaimed water were collected directly from an outlet hole in the perforated black plastic pipe in Basin 4. The outlet hole exhibiting the highest flow was selected for sampling. Sample containers were filled by holding the container under the water flow, without allowing the water to touch the outside of the black discharge pipe. One set of field parameters (pH, temperature, conductivity, DO, and ORP) was collected for informational purposes, and recorded on a sampling log form. No flow-through cell was used when collecting field parameters from reclaimed water; instead, the water quality probe was inserted directly into an outlet hole in the black plastic discharge pipe and allowed to equilibrate prior to taking the readings. Sample containers for bromide tracer analysis were placed on ice in a cooler (SF_6 tracer samples were not collected from reclaimed water).

5.3.5 Sample Packing and Shipping

Bromide samples were packed into coolers with ice and shipped for next-day delivery to Eurofins Eaton Analytical (EEA) in Monrovia, California, for analysis. Sulfur hexafluoride samples were packed into a cardboard shipping box without ice and shipped for ground delivery to the University of California, Santa Barbara for analysis. Chain-of-custody forms were filled out and placed in a sealed plastic baggie inside each sample cooler or box.

5.3.6 Tracer Monitoring Frequency

Prior to introducing tracer chemicals into Basins 4 and 5, monitoring wells located near Basins 4 and 5, lysimeters, and reclaimed water were sampled to assess background concentrations of bromide and sulfur hexafluoride. Most background samples were collected from January 10 to January 17, 2018. Some monitoring wells located farther away from Basins 4 and 5, including MW-25, Landfill-MW-1, and Landfill-MW-10S, were sampled for background at later dates. MW-22, which was dry when the tracer test commenced, was sampled for the first time on March 14, 2018.

Subsequent to the introduction of tracer chemicals at Basins 4 and 5 on January 16, 2018, tracer monitoring was performed in general accordance with the sampling frequency described in the work plan (HDR 2018a). The monitoring frequency was updated after the third week of the tracer study to adapt the monitoring program to what the early tracer test results were showing. The final tracer testing groundwater monitoring frequency is shown in **Table 5-3**. Reclaimed water was sampled at Basin 4 from January 16 to February 3, 2018, while tracer chemicals were being fed into the reclaimed water discharge.

5.4 Laboratory Analytical Methods

The following section details the laboratory analytical methods used on samples analyzed for the reclaimed water tracers bromide and SF_6.

5.4.1 Bromide

Bromide analyses were completed by EEA using the EPA inorganic anion method 300.0, determining bromide concentrations by ion chromatography (Pfaff 1993). Bromide samples were collected in 60 mL poly bottles containing 0.6 mL of ethylene diamine (EDA) preservative, allowing for a maximum hold time of 28 days. EEA conducted the following quality assurance and quality control (QA/QC) tests for bromide:

- Laboratory Control Sample Recoveries
- Method Blank
- Minimum Reporting Limit Check
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries and Relative Percent Differences
- Surrogate Recoveries

Analytical results were provided to HDR electronically in both PDF reports and electronic data deliverable spreadsheets. HDR conducted data validation on the laboratory analytical reports as described in Section 7.

5.4.2 SF_6

SF_6 analyses were conducted by staff working under the direction of Dr. Jordan F. Clark at the University of California, Santa Barbara. The laboratory analytical method was developed by Clark (2004) and borrows from the Wanninkhof and Ledwell (1991) headspace method. The general process is as follows:

1. Weigh each Vacutainer™ prior to filling with UHP nitrogen to create a headspace pressure of approximately one atmosphere
2. Invert containers 10 times to equilibrate
3. Pass equilibrated headspace through a desiccant column filled with magnesium perchlorate

4. Send sample to a gas chromatograph (GC) equipped with an electron capture detector (ECD)
5. Separate SF_6 gas using a molecular sieve 5A column held at room temperature

A number of QA/QC steps were taken to improve the accuracy of SF_6 results. To avoid autocorrelation, which may arise due to trends in the machine, local atmosphere at time of sampling, or laboratory air, samples were measured in a random order. The air within the laboratory was monitored before, after, and throughout sampling (every five to eight samples) to ensure that ambient SF_6 remained below a certain value (10 patm). If laboratory air exceeded this value, no samples were measured until the laboratory air had a chance to return to the mean atmospheric value. Standard samples, which were purchased and certified by Scott-Marrin, Inc. (Riverside, California) with known SF_6 partial pressures were measured before, after, and throughout sampling events (every five to eight samples) to check the accuracy of the GC detector. In addition, four replicates were created and two replicates were measured for every sample. If the two replicates did not agree within a certain threshold, the third and fourth samples were measured. Two different thresholds were set to incorporate drift in machine response over time (±24 percent difference before June 21, 2018, and ±10 percent difference after June 21, 2018). The first threshold (±24 percent reflects long-term error in the machine while the later threshold (±10 percent) represents daily error, or the typical variation between at least 10 standards. The averages of all agreeing measurements were reported. If none of the measurements agreed, they were designated as inconsistent and reported as suspected false positives (SFP). Overall, 6 percent of all SF_6 samples were found to be inconsistent (22 of 374 total samples). Inconsistent results are presented in **Appendix E**.

5.5 Tracer Detection Methods

No single concentration threshold for bromide or SF_6 was used in determining tracer detections. Instead, two criteria were considered in evaluating the presence of tracers and the validity of using the associated data to describe travel characteristics of reclaimed water. The two criteria were:

1. **Detection of both bromide and SF_6 above observed baseline concentrations.** Baseline bromide ranged from 10 to 77 µg/L while SF_6 generally remained below 0.05 pmol/L, or non-detect.
2. **Presentation of a breakthrough curve or multiple elevated detections.** Since baseline monitoring was not robust enough to determine concentration thresholds for tracer detections, display of a breakthrough curve or multiple detections at each monitoring well was used to determine the presence of tracers, opposed to a single elevated detection.

These criteria were used in determining tracer detections. A single elevated concentration of either bromide or SF_6 is not enough to confirm tracer breakthrough, as a lone value could be explained by natural variation, field error, or laboratory error. The ideal signal of tracer tagged reclaimed water is observation of a typical breakthrough curve, showing a distinct rise in concentration from background concentrations to a peak, and then the tailing off of concentrations. However, if elevated concentrations of bromide and SF_6 occur relatively simultaneously, this is also a good indicator to the presence of tracer tagged reclaimed water.

Both of the above criteria were met in all monitoring wells where tracer was deemed present, with the exception of MW-11, where a bromide breakthrough curve presented and SF_6 remained below 0.05 pmol/L.

Table 5-1. Bromide Tracer Introduction Log

Date	Mass of Bromide Introduced (kg)	Volume of Recharge into Basins 4 and 5 (mgd)	Calculated Daily Concentration of Bromide flowing into Recharge Basins 4 and 5 (µg/L)	Laboratory Measured Concentrations of Br Flowing Into Recharge Basins 4 and 5 (µg/L)
1/16/2018	0.0	0.83	-	-
1/17/2018	31.7	0.86	9,741	23,500
1/18/2018	186.5	0.91	54,162	Not sampled
1/19/2018	53.9	0.85	16,839	42,500
1/20/2018	144.3	0.84	45,179	Not sampled
1/22/2018	134.3	0.88	40,299	35,000
1/23/2018	0.0	1.00	-	32,000
1/24/2018	156.7	1.08	38,384	Not sampled
1/26/2018	40.9	0.98	11,016	31,000
1/29/2018	201.4	1.11	47,782	26,000
1/30/2018	100.7	1.17	22,827	9,800
1/31/2018	83.9	1.12	19,744	30,000
2/1/2018	83.9	1.17	18,885	29,000
2/2/2018	77.7	1.22	16,879	24,000
2/3/2018	115.0	1.15	26,330	Not sampled
Average concentration (µg/L)			28,313	28,280

Note: Only SF_6 was introduced on day one of the tracer test (1/16/2016).

Table 5-2. SF$_6$ Tracer Introduction Log

Date	Water Volume (gallon)	Mixing Ratio	Location				
SF$_6$ Added to Recharge Basins							
1/16/2018	200	20 ga SF$_6$/100 ga water	Vault 5				
1/17/2018	400	20 ga SF$_6$/100 ga water	Vault 5				
1/18/2018	200	20 ga SF$_6$/100 ga water	Vault 5				
1/19/2018	400	20 ga SF$_6$/100 ga water	Vault 5				
1/20/2018	200	20 ga SF$_6$/100 ga water	Vault 5				
1/22/2018	200	20 ga SF$_6$/100 ga water	Vault 5				
1/23/2018	400	20 ga SF$_6$/100 ga water	Vault 5				
1/24/2018	400	20 ga SF$_6$/100 ga water	Vault 5				
1/25/2018	400	20 ga SF$_6$/100 ga water	Vault 5				
1/26/2018	400	20 ga SF$_6$/100 ga water	Vault 5				
1/29/2018	400	20 ga SF$_6$/100 ga water	Vault 5				
1/30/2018	400	20 ga SF$_6$/100 ga water	Vault 5				
1/31/2018	400	20 ga SF$_6$/100 ga water	Vault 5				
2/1/2018	400	20 ga SF$_6$/100 ga water	Vault 5				
2/2/2018	400	20 ga SF$_6$/100 ga water	Vault 5				
SF6 Added to Monitoring Wells							
2/7/2018	200 each well	15 ga SF$_6$/150 ga water	MW-1	MW-2	MW-7	MW-15	MW-16
2/8/2018	200 each well	15 ga SF$_6$/150 ga water	MW-1	MW-2	MW-7	MW-15	MW-16
2/9/2018	200 each well	15 ga SF$_6$/150 ga water	MW-1	MW-2	MW-7	MW-15	MW-16
2/12/2018	200 each well	15 ga SF$_6$/150 ga water	MW-1	MW-2	MW-7	MW-15	MW-16
2/13/2018	200 each well	15 ga SF$_6$/150 ga water	MW-1	MW-2	MW-7	MW-15	MW-16
2/14/2018	300 each well	15 ga SF$_6$/150 ga water	MW-1	MW-2	MW-7	MW-15	MW-16

Table 5-3. Tracer Testing Groundwater Monitoring Frequency

Flow Direction and Travel Distance (feet)	Monitoring Wells and Lysimeters Within Travel Distance (feet)	Tracer Monitoring Frequency												
		Background (Jan 10-17)	**Week 1 (Jan 16-20)**	**Week 2 (Jan 21-27)**	**Week 3 (Jan 28-Feb 3)**	**Week 4 (Feb 4-10)**	**Week 5 (Feb 11-17)**	**Month 2 (Feb 18-March 10)**	**Month 3 (March 11-31)**	**Month 4 (April 9-26)**	**Month 5 (May 7-10)**	**Month 6 (June 11-15)**	**3rd Quarter (July 9-12, Aug 6-10, Sept 10-13)**	**4th Quarter (Oct 1-4)**
Shallow (Qva) Aquifer														
Upgradient	MW-26	Once	None	None	None	None	None	None	None	None	Monthly	Monthly	July only	None
Cross-Gradient	MW-24	Once	1 per week	1 per week	1 per week	1 per week	1 per week	1 per week	2 per month	2 per month	Monthly	Monthly	Monthly	Monthly
At Basin 4	East and west lysimeters 10, 25, and 50 ft depth	Once	Daily[a]	Daily[a]	Every other day[a]	2 per week[a]	2 per week[a]	1 per week[a]	2 per month	2 per month	Monthly	Monthly	Monthly	Monthly
At Basin 4	MW-1, 2, 15, 16	Once	Every other day	Every other day	Every other day	Every other day	2 per week	1 per week[b]	2 per month[b]	2 per month[b]	Monthly[b]	Monthly[b]	Monthly[b]	Monthly[b]
Downgradient: 250 ft	MW-3A, 5	Once	Every other day	Every other day	Every other day	2 per week	2 per week	1 per week	2 per month	2 per month	Monthly	Monthly	Monthly	Monthly
Downgradient: 500 ft	MW-6, 7, 8, 9	Once	Every other day	Every other day	Every other day	Every other day	2 per week	1 per week[b]	2 per month[b]	2 per month[b]	Monthly[b]	Monthly[b]	Monthly[b]	Monthly[b]
Downgradient: 1,000 ft	MW-11, 13, 27	Once	1 per week	1 per week	1 per week	1 per week	1 per week	1 per week	2 per month	2 per month	Monthly	Monthly	Monthly	Monthly
Downgradient: 1,500 ft	MW-20, 25	Once	None	1 per week	1 per week	1 per week	1 per week	1 per week	2 per month	2 per month	Monthly	Monthly	Monthly	Monthly
Downgradient: 2,000 ft	MW-28	Once	None	None	None	None	None	1 per week	2 per month	2 per month	Monthly	Monthly	Monthly	Monthly
Downgradient: 2,500 ft	Lacey MW-11, Landfill MW-10S	Once	None	None	None	None	None	1 per week	2 per month	2 per month	Monthly	Monthly	Monthly	Monthly
Downgradient: 3,500 ft	MW-22, Landfill MW-1	Once	None	None	None	None	None	1 per week	2 per month	2 per month	Monthly	Monthly	Monthly	Monthly
Sea-Level (Qc) Aquifer														
At Basins	MW-14	Once	1 per week	1 per week	1 per week	1 per week	1 per week	1 per week	2 per month	2 per month	Monthly	Monthly	Monthly	Monthly
Upgradient	MW-12	Once	1 per week	None	1 per week	1 per week	1 per week	1 per week	2 per month	2 per month	Monthly	Monthly	Monthly	Monthly
Downgradient	MW-23	Once	1 per week	None	None	1 per week	1 per week	1 per week	2 per month	2 per month	Monthly	Monthly	Monthly	Monthly
Upgradient	MW-21	Once	1 per week	None	None	None	None	1 per week	2 per month	2 per month	Monthly	Monthly	Monthly	Monthly

Notes:

[a] Lysimeters were only sampled for bromide, not sulfur hexafluoride.

[b] MW-1, MW-2, MW-6, and MW-7 were not monitored after Week 7.

Refer to Appendix E for detailed sample dates (and corresponding tracer results).

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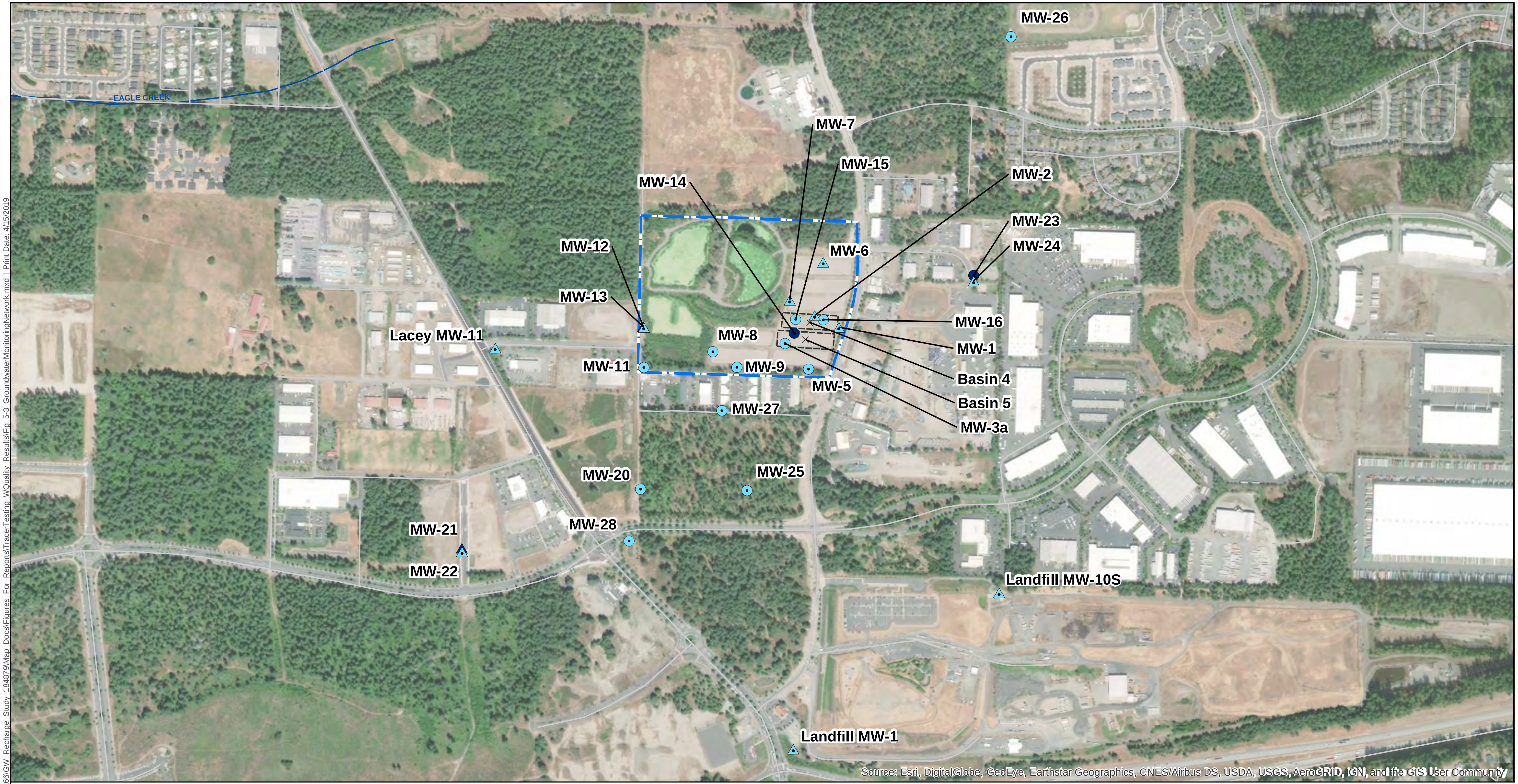
Figure 5-1. Delivery of Bromide (top; tanks) and SF_6 (bottom; bags) Tracers 1/17/2018

Figure 5-2. Delivery of SF_6 Directly into MW-15 (foreground) and MW-7 (upper left)



Shallow (Qva) Aquifer Monitoring Network
- △ Tracer Data Only
- ○ Tracer and Water Quality Data

Sea Level (Qc) Aquifer Monitoring Network
- ▲ Tracer Data Only
- ● Tracer and Water Quality Data
- ⬚ LOTT Hawks Prairie Recharge Facility
- — Roads
- — Creek

N
0 500 1,000
Feet

Figure 5-3. Groundwater Monitoring Network

LOTT Clean Water Alliance

HDR

Source: City of Lacey (2018), Ecology (2015), Esri (2018), Thurston Co Landfill (2018), WSDOT (2018).

Path: G:\Projects\Washington\LOTT_CWA_201266\GW_Recharge_Study_184879\Map_Docs\Figures_For_Reports\TracerTesting_WQuality_Results\Fig_5-3_GroundwaterMonitoringNetwork.mxd | Print Date: 4/15/2019

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Figure 5-4. Location of Basin 4 Lysimeters and Soil Instruments

Source: Bing Maps (2011), City of Lacey (2014), WSDOT (2013).

Path: G:\Projects\Washington\LOTT CWA 201266\GW Recharge Study 184879\Map Docs\Figures For Reports\TracerTesting WQuality Results\Fig 5-4 TestBasin4 Lysimeters.mxd | Print Date: 2/27/2019

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6.0 Groundwater and Vadose Zone Water Quality Monitoring

This section describes the groundwater and vadose zone water quality monitoring that was performed in conjunction with the tracer study from January through October 2018. The purpose of the water quality monitoring is to determine the effectiveness of soil aquifer treatment in attenuating residual chemicals, and to assess the concentrations of nutrients, total organic carbon (TOC), and other constituents as residual chemicals travel through the vadose zone and groundwater. Water samples were collected from groundwater monitoring wells, vadose zone lysimeters, and the reclaimed water discharge in Basin 4 and analyzed for chemical constituents. Vadose zone soil monitoring instruments installed in Basin 4 were also monitored, as described in this section.

6.1 Sample Collection Methodology

Samples collected for water quality analysis included groundwater, vadose zone pore-water, and reclaimed water samples. Water quality samples were collected in accordance with the sampling protocol laid out in the work plan (HDR 2018a). Equipment and sample collection methods used for water quality monitoring were the same as those outlined for tracer monitoring in Sections 5.3.1 through 5.3.5, except as described below:

- Sample preservation: Many laboratory analyses required chemical preservatives, some of which were provided in the sample container by the laboratory and some of which were added to the containers in the field prior to filling. (Laboratory analytical methods are described in Section 6.3.)
- Field filtering: Some analytes, including metals, total phosphorus, and orthophosphate required field filtering. This was achieved by connecting a disposable 0.45-micrometer filter by Geotech Environmental, Inc. to the sample tubing and filling the sample container from the outlet side of the filter.[1] The filter was thrown away after a sample was collected.
- Lysimeter sampling: Because of the sample volume required for water quality monitoring, collection of vadose zone pore-water samples from lysimeters required multiple rounds of sampling and refilling over multiple days. For analytes with short hold times, the sample was shipped on the day of collection.
- Field duplicate: A field duplicate sample was collected for Reclaimed Water 1 during each water quality monitoring event. The duplicate was collected at the same time as the “Reclaimed Water 1” sample and named “Reclaimed Water 1-Duplicate.”
- Packing and shipping: All samples were placed in coolers with ice. Chain-of-custody forms were filled out and placed in a plastic baggie inside each cooler. Samples for total coliform analysis were hand-delivered daily to the LOTT laboratory in Olympia, Washington, to meet

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[1] Note: after determining in the field that no settleable solids existed in the lysimeter groundwater samples and reclaimed water samples, it was decided that these samples would not be field-filtered. Groundwater samples from monitoring wells were field-filtered.

the analytical holding time. Samples for the remaining water quality analyses were shipped via overnight delivery to EEA.

Water quality monitoring locations included lysimeters and monitoring wells in Basin 4, upgradient and downgradient monitoring wells screened in both the Shallow (Qva) Aquifer and Sea-Level (Qc) Aquifer, and reclaimed water at Basin 4. A list of monitoring locations and sample identifiers are shown in **Table 6-1**.

6.2 Sample Collection Frequency

Water quality monitoring was conducted on a quarterly basis for residual chemicals and other reclaimed water parameters of interest, and monthly (during non-quarter events) for indicator parameters. Parameters and laboratory analytical methods are described below in Section 6.3. The first quarterly monitoring event served as a background monitoring event, conducted on January 10–17, 2018. Monitoring events were conducted on the dates shown in **Table 6-2**.

6.3 Laboratory Analytical Methods

The water quality sample parameters tested for during quarterly and monthly (non-quarterly) monitoring events are identified in **Table 6-3**. Laboratory analytical methods, sample containers, and holding times are shown in **Table 6-4**. Samples for total coliform analysis were analyzed upon receipt by the LOTT laboratory in Olympia, Washington. LOTT used the Colilert system for analysis and followed prescribed quality control procedures for that method. The remaining analyses were performed by EEA, where a standard 2-week turnaround time was requested for the laboratory analyses. EEA conducted the following QA/QC tests for the water quality parameters:

- Laboratory Control Sample Recoveries
- Method Blank
- Minimum Reporting Limit Check
- MS/MSD Recoveries and Relative Percent Differences
- Surrogate Recoveries

Analytical results were provided to HDR in both electronic PDF reports and electronic data deliverable spreadsheets. HDR conducted data validation on the reports, as described in Section 7.

6.4 Vadose Zone Soil Instrument Monitoring Methods

Soil moisture, conductivity, temperature, and oxygen instruments were installed in the vadose zone under Basin 4 in 2017, as described in HDR (2018b). Three depths (10 feet, 25 feet, and 50 feet) were monitored in both the east half and west half of Basin 4. Soil moisture, conductivity, and temperature instruments contain data loggers that were programmed to collect and store readings every six hours from January 19 to October 23, 2018. These instruments were downloaded to a field laptop computer in February, April, July, and October. Soil oxygen was directly measured in the field during monitoring events using a handheld multimeter set to read in millivolts (mV).

The collected data are presented and discussed in **Appendix F**. The soil moisture, conductivity, and partial pressure data obtained from these instruments were deemed unusable for analysis, likely due to installation issues which compromised the quality of the data. Soil temperature data are discussed in comparison to observed reclaimed water temperature in **Section 9-1.**

Table 6-1. Water Quality Monitoring Locations and Sampled IDs

Sample ID	Location Description	Sample Source
MW-26	Upgradient	Groundwater; Shallow (Qva) Aquifer
MW-15 (Jan–Mar only)[a]	West ½ Basin 4	Groundwater; Shallow (Qva) Aquifer
MW-16	East ½ Basin 4	Groundwater; Shallow (Qva) Aquifer
MW-3A	Downgradient, on site	Groundwater; Shallow (Qva) Aquifer
MW-5	Downgradient, on site	Groundwater; Shallow (Qva) Aquifer
MW-8	Downgradient, on site	Groundwater; Shallow (Qva) Aquifer
MW-9	Downgradient, on site	Groundwater; Shallow (Qva) Aquifer
MW-11 (Jan–Mar only)[a]	Downgradient, on site	Groundwater; Shallow (Qva) Aquifer
MW-14	Downgradient, on site	Groundwater; Sea-Level (Qc) Aquifer
MW-20	Downgradient, off site	Groundwater; Shallow (Qva) Aquifer
MW-23 (Apr–Oct only)[a]	Downgradient, off site	Groundwater; Sea-Level (Qc) Aquifer
MW-25	Downgradient, off site	Groundwater; Shallow (Qva) Aquifer
MW-27	Downgradient, off site	Groundwater; Shallow (Qva) Aquifer
MW-28 (Apr–Oct only)[a]	Downgradient, off site	Groundwater; Shallow (Qva) Aquifer
West B4 Lysimeter 10 ft	West ½ Basin 4	Vadose Zone pore-water
West B4 Lysimeter 25 ft	West ½ Basin 4	Vadose Zone pore-water
West B4 Lysimeter 50 ft	West ½ Basin 4	Vadose Zone pore-water
East B4 Lysimeter 10 ft	East ½ Basin 4	Vadose Zone pore-water
East B4 Lysimeter 25 ft	East ½ Basin 4	Vadose Zone pore-water
East B4 Lysimeter 50 ft	East ½ Basin 4	Vadose Zone pore-water
Reclaimed Water 1	Basin 4	Reclaimed water
Reclaimed Water 1-Duplicate	Basin 4	Reclaimed water
Reclaimed Water 2	Basin 4	Reclaimed water

Notes:

[a] On March 16, 2018, LOTT and HDR decided to stop monitoring water quality at MW-11 and MW-15, and to begin monitoring water quality at MW-23 and MW-28 instead. This decision was made based on an examination of the laboratory data gathered to date, and a desire to obtain water quality data from different areas.

Table 6-2. Water Quality Monitoring Schedule

Monitoring Event Dates (2018)	Quarterly Monitoring Event	Monthly Monitoring Event
January 10–17	✓[a]	
February 12–16		✓
March 12–16		✓
April 9–13	✓	
May 7–11		✓
June 11–15	✓	
July 9–13		✓
August 6–10	✓	
September 10–14		✓
October 1–5		✓

Notes:

[a] Background monitoring event.

Table 6-3. Water Quality Monitoring Parameters

Parameter	Method	Quarterly Monitoring Parameter	Monthly Monitoring Parameter
Residual Chemicals, including metformin and thiabendazole	EEA's PPCP LC/MS/MS Method	✓	
Trihalomethanes/VOCs	EPA 524.2	✓	
HAA5	SM 6251B	✓	
PFOS/PFOA + Other PFCs	EEA's MWH-PFC Method	✓	
NDMA	EPA 521	✓	
1,4-Dioxane	EPA 522	✓	
TKN, ammonia	EPA 300.0, 351.1, 351.2	✓	✓
Nitrate, nitrite	EPA 300.0, 353.2	✓	✓
Total phosphorous	EPA 365.1, 365.2	✓	
Orthophosphate	SM4500P-E	✓	✓
Total organic carbon	SM 5310C	✓	✓
Biodegradable organic carbon	Allgeier 1996	✓	✓[a]
Total coliform	SM 9223	✓	
Metals (Ag, As, Ca, Cd, Cr, Cu, Fe, Hg, K, Pb, Mg, Mn, Na, Pb, Ni, Se, Si, Zn)[b]	EPA 200 series	✓	
Sulfate	EPA 300.0	✓	
Chloride	EPA 300.0	✓	✓
Total dissolved solids	SM2540C	✓	
Total alkalinity	SM2320B	✓	

Notes:

[a] Only reclaimed water samples were analyzed for biodegradable organic carbon during monthly monitoring events.

[b] Potassium (K) was added to the analyte list beginning with the April 2018 quarterly monitoring event, to assess cation/anion balance.

Table 6-4. Water Quality Analytical Methods, Sample Containers, and Holding Times

Parameter	Method	Sample Containers and Preservatives	Field Filtration	Hold Time Extraction	Hold Time Analysis
Residual Chemicals, including metformin and thiabendazole	EEA's PPCP LC/MS/MS Method	2 x 40 mL amber glass vial – sodium omadine and ascorbic acid	No	-	28 days
Trihalomethanes/VOCs	EPA 524.2	3 x 40 mL amber glass vials – ascorbic acid - add HCL in field	No	-	14 days
HAA5	SM 6251B	3 x 40 mL amber glass vials – ammonium chloride	No	14 days	14 days
PFOS/PFOA + Other PFCs	EEA's MWH-PFC Method	1 x 250 mL poly – Trizma buffer	No	14 days	14 days
NDMA	EPA 521	3 x 500 mL amber glass – sodium thiosulfate	No	14 days	28 days
1,4-Dioxane	EPA 522	3 x 125 mL amber glass – sulfite and bisulfite	No	28 days	28 days
TKN, ammonia	EPA 300.0, 351.1, 351.2	1 x 250 mL poly – H_2SO_4	No	-	28 days
Nitrate, nitrite	EPA 300.0, 353.2	1 x 125 mL poly – no preservative	No	-	48 hours
Total phosphorous	EPA 365.1, 365.2	1 x 125 mL poly – H_2SO_4	Yes	-	28 days
Orthophosphate	SM4500P-E	1 x 250 mL poly – no preservative	Yes	-	48 hours
Total organic carbon	SM 5310C	1 x 125 mL amber glass –H_2SO_4	No	-	28 days
Biodegradable organic carbon	Allgeier 1996	2 x 250 mL amber glass – sodium thiosulfate	No	48 hours	NA
Total coliform	SM 9223	1 x 100 mL poly – sodium thiosulfate	No	-	24 hours
Metals (Ag, As, Ca, Cd, Cr, Cu, Fe, Hg, K, Pb, Mg, Mn, Na, Pb, Ni, Se, Si, Zn)	EPA 200 series	1 x 250 mL poly – HNO_3	Yes	-	6 months
Sulfate	EPA 300.0	1 x 125 mL poly – no preservative	No	-	28 days
Chloride	EPA 300.0	1 x 125 mL poly – no preservative	No	-	28 days
Total dissolved solids	SM2540C	1 x 500 mL poly – no preservative	No	-	7 days
Total Alkalinity	SM2320B	1 x 250 mL poly- no preservative	No	-	14 days

7.0 Data Validation

In order to ensure the accuracy, quality, and completeness of water quality laboratory results, HDR conducted data validation analyses for all monthly and quarterly sampling events upon completion of EAA's laboratory analysis. As described in Section 6.3, laboratory analytical results were provided to HDR in both electronic PDF reports and electronic data deliverable spreadsheets.

Data validation verifies the appropriate QA/QC procedures are followed and the data package is consistent and complete—including all necessary documentation from both the laboratory and field. Any data falling outside of the QA/QC criteria are flagged based on qualifiers outlined by the EPA (2017a, 2017b). Verification and validation steps addressed in data validation include:

- Sampling Procedures
- Holding Times
- Quantitation Limits
- Surrogate Recoveries
- MS/MSD Recoveries and Relative Percent Differences
- Laboratory Control Sample Recoveries
- Method Blank
- Laboratory and Field Replicate and Duplicate Relative Percent Differences

A tabular summary of all results, including qualifiers, is presented in **Appendix B**. Data validation reports documenting the review process are included in **Appendix C**, and complete laboratory reports are included in **Appendix D**.

The laboratory QA/QC and data validation/verification steps with the most significant impacts to the data, resulting in the most data qualifications, are summarized as follows:

1. **Surrogate Recoveries.** Surrogates are organic compounds that are similar in chemical composition, extraction, and chromatography to certain analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analysis. Several samples fell outside of QC limits in the April and June sampling events. The corresponding results were qualified as estimates and are described in more detail in **Appendix C**.
2. **Matrix Spike/Matrix Spike Duplicate Recovery.** Another means by which to examine matrix effects is to spike samples with known concentrations of analytes and compare percent recoveries to statistical control limits. Most recoveries were within statistical control limits; however, many sampling events included a small number of results that were qualified based on this criterion, as described in **Appendix C**.
3. **Laboratory Control Sample Recovery.** Laboratory Control Samples (LCS) are samples of known concentration that are carried through the extraction and analysis process. The percent recovery is the percentage of the theoretical concentration, and has statistical

control limits indicating that the analytical process is "in control." Some residual chemicals for a small number of samples had results that were outside the quality control limits. These results were flagged as estimates and are described in more detail in **Appendix C**.

4. **Method Blank.** The method blank results indicate any possible contamination exposure during the sample handling, digestion, or extraction process and analysis. In most instances, compounds were not detected at or above the method reporting limits. Every sampling event, however, includes a number of results qualified based on this criterion—described in more detail in **Appendix C**.
5. **Field Replicates.** In order to assess field precision, a duplicate sample was collected for Reclaimed Water 1 (Reclaimed Water 1-Duplicate). Original and duplicate sample values with an RPD exceeding 20 percent were qualified as estimates. While most results were within these limits, several sampling events included results flagged based on this criterion. Refer to **Appendix C** for more detail on the field replicate process and qualified results.

8.0 Tracer Testing Results

The purpose of the tracer test was to better understand the travel times to monitor wells, and thus the travel velocity in different directions, and to delineate the dominant downgradient flow paths of reclaimed water infiltrated at the Hawks Prairie. This work builds upon previous field observations during startup monitoring in 2014 to estimate time of travel to nearby monitoring wells (HDR 2014b).

Both bromide and SF_6 tracers were added to reclaimed water from January 16 to February 3, 2018 (day 0 – 18). Additionally, SF_6 was added directly to groundwater through monitoring wells near Basins 4 and 5 from February 7 to February 14 (day 22 – 29). The tracer test concluded on October 4, 2018 (day 261). Tables of measured tracer concentrations may be found in **Appendix E**.

8.1 Observed Tracer Detections and Reclaimed Water Flow Paths

Tracer detections were determined based on the criteria described in Section 5.5, where both bromide and SF_6 must be measured above baseline concentrations and a breakthrough curve, or multiple elevated detections, must be observed within the tracer testing period. These criteria were met in all monitoring wells where tracer was deemed present, with the exception of MW-11, where a bromide breakthrough curve presented yet SF_6 concentrations remained below 0.05 pmol/L. SF_6 was not sampled for in lysimeters as the collection procedure involved application of a vacuum, which would cause SF_6 to come out of solution.

Bromide tracer was detected in monitoring wells screened in the Shallow (Qva) Aquifer to the west, southwest, and south of Basins 4 and 5 where tracers were introduced as shown in **Figure 8-1**. **Figure 8-2** shows tracer detections in the Sea-Level (Qc) Aquifer at MW-12 and MW-14 on the LOTT Hawks Prairie property. Breakthrough curves showing tracer concentration through time are presented in **Figure 8-3a** through **Figure** 8-3**p**.

8.1.1 Vadose Zone

Bromide tracer was detected in all six lysimeters installed within Basin 4. Breakthrough curves for the East and West Basin 4 lysimeters are shown in **Figure 8-3a** and **8-3b**. Each lysimeter displays a double peaked bromide breakthrough curve, which is likely an artifact of the break in bromide tracer introduction on January 27 and 28.

There are significant differences between the breakthrough curves at the East and West Basin 4 lyimeters, suggesting heterogeneity of the hydraulic conductivity within the unsaturated zone beneath Basin 4, which results in different travel time behavior. At the western lysimeters, tracer detections follow predicted behavior, with high bromide concentrations that decrease and disperse with depth. The 25 and 50 foot eastern lysimeters show delayed arrivals of the bromide tracer and more dispersion as can be seen in the greater spreading of the breakthrough curves. In addition, the tracer tagged reclaimed water arrives at the 50 foot lysimeter before the 25 foot lysimeter. These results indicate that there may be finer sediments with lower vertical hydraulic conductivity below the eastern half of Basin 4, or variable saturation conditions that delays the vertical flow of reclaimed water. Soil samples collected during lysimeter installation showed clay fractions ranging from 1.5 to 7.4 percent and silt fractions ranging from 4.6 to 18.5 percent under the east half of Basin 4, however the samples collected under the west half of Basin 4 show similar ranges with clay fractions between 1.1 and 5.1 and silt fractions ranging from 4.7 to 10.4 percent (HDR 2018b). However, these are small diameter boreholes that may not represent the overall hydrogeologic conditions under the entire area of the basin.

The maximum bromide concentration observed was 24,000 µg/L and occurred in the 10-foot lysimeter in the east side of Basin 4; this is about 85 percent of the average bromide concentration in reclaimed water tagged with potassium bromide. The 10-foot western lysimeter observed a maximum relative concentration of 67 percent. The relative concentration, $\frac{C}{C_0}$, is the ratio of observed concentration at monitoring wells to average bromide concentration in the tracer tagged reclaimed water. By the 50-foot lysimeters relative concentrations decreased to 39 to 40 percent the introduced concentration.

Overall, the lysimeter data suggest a dominant vertical flow component beneath the western half of Basin 4. The eastern half displays less vertical connection suggesting lateral flow may dominate.

8.1.2 Shallow (Qva) Aquifer

Tracer detections in the Shallow Aquifer are consistent with previous conceptualizations of the dominant flow path, based on the groundwater level gradient, that groundwater flows from the north across the LOTT property to the west or southwest. Upon conclusion of the tracer test on October 4, 2018, non-detects, possible, and positive detections were as follows:

- **No tracer detections:** MW-2, MW-6, MW-7, MW-20, MW-22, MW-23, MW-24, MW-26, MW-28, and Landfill MW-10S.
- **Possible detections:** Lacey MW-11 and Landfill MW-1.
- **Positive bromide detections:** MW-1, MW-3a, MW-5, MW-8, MW-9, MW-11, MW-13, MW-15, MW-16, and in offsite monitoring wells: MW-25 and MW-27.
- **Positive SF_6 detections:** MW-5, MW-8, MW-9, MW-13, MW-15, MW-16, and in offsite monitoring wells: MW-25 and MW-27.

Monitoring wells in the apparent flow path to the west or southwest without tracer detections include MW-20, MW-22 and MW-28. For these downgradient wells, the lack of detections cannot indicate whether they experience a longer travel time than the duration of tracer test sampling (i.e., approximately eight months), if the initial quantity of tracer introduced was insufficient to produce detectable concentrations at these wells, or if they are not within Basin 4 and 5's flow path. At MW-22 the water level dropped below the screened interval of the well and it was unable to be sampled after June 14, so if tracer tagged reclaimed water arrived after then it was unable to be observed. No detections were observed at MW-6, MW-7, MW-24, or MW-26; groundwater elevations indicate that these wells are upgradient or cross-gradient of Basins 4 and 5. Neither tracer was detected at MW-2; however, sampling was discontinued after February 21 at this well (and other upgradient or cross-gradient wells; MW-1, MW-6, and MW-7), so as to reallocate sampling resources to other wells for which continued sampling data was deemed more valuable.

Lacey MW-11 and Landfill MW-1 do not meet the tracer detection criteria described in Section 5.5 and are considered possible detections. As shown in **Figure 8-3h** observed bromide concentrations at Lacey MW-11 rose from a background concentration of 56 µg/L to a maximum of 83 µg/L, dipped back down to the initially observed concentration, recovered back to 80 µg/L, and then declined. Groundwater elevation contours suggest that there could be a flow path from the recharge basins to Lacey MW-11, though it is difficult to discern. The observed concentrations may be a very muted breakthrough caused by dispersion or Lacey MW-11 being on the edge of the flow path. A single elevated SF_6 concentration, of 3.88 pmol/L, was observed which is not enough to corroborate a clear signal of tracer tagged reclaimed water at Lacey MW-11. It is for these reasons Lacey MW-11 is classified as a possible detection. The first sampled concentration of bromide at Landfill MW-1 was 150 µg/L on day 44. Observed bromide concentration increased to 180 µg/L at the next sampling event; after this bromide concentrations hovered around 110 µg/L as shown in **Figure 8-3n**. The consistent observation of bromide around 110 µg/L at Landfill MW-1 suggests this well has a high background concentration of bromide compared to the area average around 25 µg/L. Therefore, it is unclear whether the two higher bromide concentrations observed are caused by the arrival of tracer tagged reclaimed water at the well, or some natural variation in bromide concentrations within groundwater sampled at the well, or a fluctuation of bromide concentrations from a possible source giving rise to the high background bromide concentrations. No elevated SF_6 samples were observed at Landfill MW-1. For Lacey MW-11 and Landfill MW-1 clear breakthrough curves might have been observed if a higher tracer concentration was introduced at the recharge basins and the sampling schedule was more frequent. The observed tracer response at these wells is not strong enough to calculate travel times.

Breakthrough curves showing tracer concentration through time at shallow monitoring wells with detections are presented in **Figure 8-3c** through **Figure 8-3n**. **Figure 8-4** summarizes the relative concentration through time for all wells in the Shallow Aquifer; the maximum relative concentration is presented in **Table 8-2**. **Figure 8-5** is a zoomed in version of **Figure 8-4**, showing the low end of the bromide concentration scale and more detail during the later stages of the tracer test. Typical breakthrough curves, showing the rise in concentration to a peak, and then the trailing tail are observed at MW-8, MW-9, MW-15, MW-16, and MW-27.

Some observed breakthrough curves showed multiple peaks in concentration, possibly reflecting how the tracers were introduced. MW-3a and MW-13 display typical bromide breakthrough curves yet double-peaked SF_6 breakthrough curves. Multiple peaks in SF_6 concentration could be a reflection of the two SF_6 introduction methods. The breakthrough curves at MW-5 show two defined peaks for both bromide and SF_6 tracer, displaying a similar shape to the lysimeters in the west half of Basin 4 and the 10 foot lysimeter in the east half of Basin 4. This suggests that the double peaks are likely a reflection of the break in tracer introduction on January 27 and 28. The similarity in timing and concentration observed at MW-5 and the lysimeters shows a strong hydrologic connection between Basin 4 and MW-5.

Multiple concentration peaks for both tracers may indicate multiple preferential flow paths to a monitoring well. Two peaks were observed for both bromide and SF_6 tracer at MW-25. Given the distance of the monitoring well from the basins and the lag time between the peaks, the two peaks suggest two preferential flow paths to the well, rather than a reflection of the break in tracer introduction as observed at MW-5. MW-11 appears to display a similar trend to MW-25 of multiple bromide peaks; however concentrations were still increasing at the conclusion of sampling so any subsequent peaks were not observed.

Significantly higher SF_6 concentrations were observed at MW-8 and MW-27 than all other wells, with maximum concentrations of 12,800 pmol/L and 11,900 pmol/L respectively, other wells showed maximum SF_6 concentrations around 3,000 pmol/L. The high concentrations at MW-8 and MW-27 indicate these wells have a high degree of hydraulic connectivity to a well or multiple wells where SF_6 was introduced directly to the shallow aquifer (MW-1, MW-2, MW-7, MW-15, and MW-16). SF_6 concentrations remained relatively high at MW-13 indicating this high degree of hydraulic connectivity continues west of MW-8.

Observed concentrations of tracer decrease moving away from the recharge basins. **Figure 8-6** shows the slug of bromide tracer moving southward through MW-3a, MW-27, and MW-25 with time. **Figure 8-7** shows bromide concentrations to the west at wells MW-3a, MW-8, and MW-13. The farthest detections that clearly define the tracer transport extent in the Shallow Aquifer occur at MW-25 (1,231 feet to the southwest of Basins 4 and 5) and MW-13 and MW-11 (1,181 and 1,208 feet to the west, respectively). Maximum relative concentration at these wells ranged from one to three percent of introduced bromide concentration in tracer tagged reclaimed water.

Results from the tracer test indicate that reclaimed water travels within the vadose zone and Shallow (Qva) Aquifer via multiple flow paths. The number of flow paths speak to the heterogeneity of the subsurface at and around the Hawks Prairie facility.

The observed dominant flow direction of reclaimed water is to the southwest of Basins 4 and 5. This is based on the existing monitoring network and the measured tracer concentrations and quicker travel times observed at MW-5, MW-8, MW-9, MW-13, MW-27 and MW-25.

8.1.3 Sea-Level (Qc) Aquifer

Bromide and SF_6 tracers were observed in monitoring wells screened in the Sea-Level (Qc) Aquifer. These detections show the existence of flow paths from the recharge basins to the Sea-Level Aquifer based on travel times within the duration of the tracer test.

Tracer detections for wells screened in the Sea-Level Aquifer are unable to reveal discrete flow paths, but do provide travel times to discrete points (monitoring wells). Groundwater levels (**Figure** 8-2) suggest that the dominant flow path within the Sea-Level Aquifer is from the west to the east from reclaimed water infiltration basins, however tracer detections were not observed along this flow path. Instead, tracer detections indicate that transport within the time period of the tracer test is chiefly within the Shallow Aquifer and that the Kitsap Formation is a leaky confining unit or semi-confining unit. This is based on delayed tracer detection in several Sea-Level Aquifer monitoring wells. Upon conclusion of the tracer test on October 4, 2018, non-detects and positive detections were as follows:

- **No tracer detections:** MW-21 and MW-23.
- **Positive bromide and SF_6 detections:** MW-12 and MW-14

The detection of tracer at MW-12 and MW-14 confirms that some reclaimed water leaks though the Kitsap Formation into the Sea-Level Aquifer. Breakthrough curves showing tracer concentration through time at MW-12 and MW-14 are presented in **Figure 8-3o** and **Figure 8-3p.**

MW-12 appears to be upgradient of the recharge basins based on water levels in the Sea-Level Aquifer. Tracer observations at MW-12 show that reclaimed water travels downgradient through the overlying Shallow Aquifer and a small portion goes on to pass through Kitsap Formation to reach the Sea Level Aquifer. Therefore, the Sea-Level Aquifer may receive some reclaimed water in areas underlying the downgradient flowpath in the Shallow Aquifer depending on the hydraulic properties and thickness of the Kitsap Formation.

Figure 8-8 and **Figure 8-9** show the relative concentrations of bromide at the paired monitoring wells in the Shallow and Sea-Level Aquifers MW-12 and MW-13, and MW-3a and MW-14. The similarity in the rise and fall of concentration at paired wells MW-13/MW-12 as can be seen in Figure 8-8 suggests some connection between the aquifers in the vicinity of the paired wells. However, the concentrations observed at MW 12 in the Sea-Level Aquifer are almost an order of magnitude less than those observed at MW-13, showing that the reclaimed water reaching the Sea-Level Aquifer is significantly diluted by native groundwater or disperses through the Kitsap Formation. Only one elevated bromide concentration was observed at MW-14, but it is supported by two SF_6 detections as seen in **Figure 8-3p. Figure 8-9** shows the relative concentrations at the paired monitoring wells MW-3a/MW-14. The difference in peak concentration was even greater between MW-14/MW-3a, with a ratio of 0.03, compared to a ratio of 0.13 at MW-12/MW-13. The maximum bromide concentration in the Sea-Level Aquifer relative to the maximum bromide concentration in the shallow aquifer, in conjunction with the extended period of tracer detection, suggests greater connection between the Shallow and Sea-Level aquifer within the vicinity of MW-12 and MW-13 compared to MW-3a and MW-14 underneath the basins. This may be due to a combination of differences in hydraulic properties of the Kitsap Formation and a difference in thickness of the Kitsap Formation (about 183 feet near MW-3a/MW-14 compared to 135 feet at MW-13/MW-12 based on depth of bottom of well screen in the Shallow Aquifer to top of screen in the Sea-Level Aquifer). The peak relative concentration of bromide (ratio of concentration in a sampled monitoring well, compared to the concentration in reclaimed water) is less than one percent at MW-12 and MW-14 **(Table 8-2).**

MW-21 and MW-23, both located offsite to the southwest and east, respectively, did not observe tracer detections. Groundwater levels in the Sea-Level Aquifer indicate that MW-21 is upgradient from the recharge basins. However, MW-21 may be in the downgradient flow path of the Shallow Aquifer based on groundwater elevations. The observed water levels at MW-23 indicate it is a downgradient well within the Sea-Level Aquifer’s eastern flow path. Non-detections at these wells may be the result of: 1) the monitoring well is not in the downgradient flow path 2) the time of travel is longer than the duration of the tracer test, 3) the amount of tracer chemicals introduced was insufficient to produce a detectable concentration, or 4) the sampling schedule did not align with the occurrence of detectable tracer concentrations at the monitoring well.

Tracer testing results demonstrate the presence of flow paths from the recharge basins to the Sea-Level Aquifer. Tracer detections indicate that transport is chiefly within the Shallow Aquifer; based on detections in the upgradient Sea-Level Aquifer monitor well MW-12.

8.2 Observed Travel Times and Reclaimed Water Velocities

Observed time of first arrival, time of peak concentration, calculated reclaimed water velocity, and maximum relative concentration are presented in **Table 8-1** for lysimeters and **Table 8-2** for monitoring wells, and summarized in **Table 8-3**.

Reclaimed water velocity was calculated using the distance between the midpoint of Basins 4 and 5 to the monitoring well of interest and the time of observed peak bromide concentration for wells in the Shallow (Qva) Aquifer. For wells screened in the Sea-Level Aquifer (MW-12 and MW-14), the distance used was the lateral distance plus the vertical distance as approximated from the difference between the well screen elevation in the Shallow Aquifer and the well screen elevation in the Sea-Level Aquifer. The reclaimed water velocity calculations represent the reclaimed water velocity along the entire flowpath, from the point of infiltration to the point of sample collection; they do not describe transport velocity solely within the Shallow or Sea-Level Aquifer.

8.2.1 Vadose Zone

Bromide tracer was first detected in the 10-foot lysimeters on the west and east side of Basin 4 one day after the tracer tagged water was introduced to the basins. Reclaimed water moved more quickly under the west half of Basin 4, both with respect to time of first arrival, and time of peak concentration. Peak concentrations were observed in the lysimeters between 6 and 41 days, resulting in travel time velocities between 0.6 to 2.5 feet per day, with an average velocity of 1.7 feet per day. The depth to groundwater underneath Basin 4 was about 80.5 feet as observed in MW-15 and MW-16 on January 15th. Assuming a constant velocity of 1.7 feet per day would result in a travel time of 47 days to travel the 80.5 feet to the water table.

The lysimeters' breakthrough curves in **Figure 8-3a** and **Figure 8-3b** show that within 100 days of tracer introduction the tracer slug had passed through the top 50 feet of the vadose zone, with most of the tracer passing through in 50 days.

8.2.2 Shallow (Qva) Aquifer

Observed first arrival and time of peak concentration of bromide at monitoring wells near Basins 4 and 5 indicates some reclaimed water preferentially flows away from the point of introduction laterally through the vadose zone rather than solely vertically down to the groundwater table. MW-5 was the first monitoring well with a bromide tracer detection, occurring 2 days after tracer introduction began. This detection occurred before bromide was observed in the 25- and 50-foot lysimeters, MW-15, MW-16, or MW-3a—all of which are screened under the infiltration basins. Peak concentration at MW-5 was observed 8 days after tracer introduction began, which occurred before peak concentration was observed in either of the 50-foot lysimeters. The bromide peak concentration at MW-5 of 18,000 µg/L was also greater than either peak concentration measured at the lysimeters at 25 or 50 feet, MW-3a, MW-15, and MW-16. The earlier first arrival, earlier time of peak concentration, and magnitude of peak concentration observed at MW-5 all indicate the existence of a lateral preferential flow path from the ground surface under the basins through the vadose zone to the south rather than a dominant vertical downward flow to the shallow aquifer directly beneath the basins.

The prevalence of lateral flow through the vadose zone is further supported by comparing MW-8 and MW-9, located to west and southwest of the basins, to MW-3a which is screened under Basin 5. The first observed bromide tracer in MW-3a occurred after 7 days with the peak concentration occurring after 27 days. This agrees with results from the startup monitoring where water quality changes due to infiltration of reclaimed water at MW-3a were observed after 15 days (HDR 2014b). Tracer was first observed in MW-8 after 9 days with a peak concentration occurring in 30 days. This agrees with results from the startup monitoring where changes in conductivity, chloride, and TDS were observed 30 days after infiltration began (HDR 2014b). The arrival of tracer was seen at MW-9 in 6 days with the peak concentration occurring after 27 days. During startup monitoring temperature changes were observed after 14 days (HDR 2014b). Bromide tracer was observed at MW-9 before MW-3a, despite MW-9's location farther away from the basins. This observation further supports that reclaimed water flows laterally through the vadose zone.

MW-15 and MW-16 appear to receive less recharge from reclaimed water applied to Basins 4 and 5 than the nearby downgradient wells MW-3a, MW-5, MW-8, and MW-9. Bromide concentrations observed in MW-15 and MW-16 were less than in nearby wells throughout sampling, and the time of peak concentration was delayed. Specifically, it appears that there is a barrier impeding flow from the ground surface to the screened interval of MW-15, where high bromide concentrations were observed for a relatively short period of time compared to MW-16 and only one sample observed a bromide concentration above 300 µg/l. SF_6 concentrations at MW-15 and MW-16 are not representative of transport through the vadose zone because SF_6 was introduced directly into the groundwater at these wells.

Based on time of peak bromide concentration observed at the monitoring wells MW-3a, MW-5, MW-8, MW-9, typical travel times through the vadose zone appear to be about 30 days or less. This is a shorter time of travel than that predicted by the lysimeters of 47 days and MW-16 and MW-15 which observed first arrivals after 10 and 69 days and peak concentrations after 37 and 83 days. The slower reclaimed water velocities predicted by the lysimeters could be caused by a poor connection to the surrounding formation, or the importance of preferential pathways in the flow regime from the top of the basins to the groundwater table. Since travel time to the nearby monitoring wells was less than what was predicted by observations at the lysimeters and wells screened directly below the basin, there does not appear to be a representative way to distinguish travel time solely in the vadose zone to calculate travel times or reclaimed water velocities only in the saturated portion of the Shallow Aquifer.

The farthest wells with clear detections, MW-11, MW-13 and MW-25, all at about 1,200 feet, and had travel times from 37 to 177 days. Two peak concentrations are observed at MW-25; reclaimed water velocities are calculated for both peaks as they are interpreted to indicate two preferential flow paths. The first peak bromide concentration occurred 37 days after initial tracer introduction, with a second peak occurring at 111 days. Two elevated SF_6 concentrations of approximately 2 pmol/L were observed at 29 and 83 days after tracer introduction. By mid-August, or about 204 days into the tracer test, bromide concentrations decreased below 50 µg/L; indicating the main slug of tracer had passed by MW-25 by that time.

At the conclusion of the test, MW-13 still had elevated tracer concentrations showing that tracer was still moving through the less permeable sediments in the flow path. MW-11 had the latest time of first arrival of 113 days and time of peak concentration of 177 days. This significant delay suggests low permeability sediments in the flow paths from the recharge basins to MW-11. Bromide concentrations appeared to still be increasing at MW-11 when sampling was concluded, so the first observed peak concentration at day 177 was used to calculate reclaimed water velocity.

Reclaimed water velocity generally appears to increase with distance from the recharge basins as shown in **Figure 8-10**. The lower apparent reclaimed water velocities observed in monitoring wells nearest the basins: MW-15, MW-16, and MW-3a are due to the travel time through the vadose zone; unsaturated flow is slower than saturated flow through the same media. However, travel times through the unsaturated zone as measured in the lysimeters is greater than the overall travel time to monitor wells through the unsaturated zone and Shallow Aquifer. Velocities observed in these nearby wells range from 2 to 10 feet per day. The farthest away downgradient wells, MW-11 and MW-25, display the fastest and one of the slowest observed reclaimed water velocities. Given that these two wells have a similar groundwater gradient (as shown in **Figure 4-7**) the range of observed velocities indicates subsurface heterogeneity; as tracer moves down different flow paths it encounters sediments of differing hydraulic conductivity. **Figure 8-1** shows high reclaimed water velocities to the south-southwest of the basins at MW-5, MW-9, MW-8, MW-27, and MW-25 indicating more permeable sediments in this area, which is within the observed dominant flow path.

The calculated reclaimed water velocities of 3 to 43 ft/d in the Shallow (Qva) Aquifer agree with previous findings. Startup monitoring observed reclaimed water velocities between 13 and 42 ft/d (HDR 2014b). Estimates of the groundwater velocity using the Darcy equation approximated velocities of 1 to 23 ft/d in a previous characterization (HDR 2018b).

8.2.3 Sea-Level (Qc) Aquifer

During the duration of the tracer test two of four sampled monitoring wells screened in the Sea-Level Aquifer displayed bromide and SF_6 detections – MW-12 and MW-14. As discussed previously these tracer detections demonstrate flow paths to the Sea-Level Aquifer, but with dominant flow within the Shallow aquifer and then moving through the Kitsap Formation. The arrival of tracers at MW-12 and MW-14 depends on the properties of the overlying Shallow Aquifer and Kitsap Formation, rather than the hydraulic characteristics of the Sea-Level Aquifer. Travel times and velocities described in **Table 8-2** and **Figure 8-2** for wells screened within the Sea-Level Aquifer summarizes transport of reclaimed water from the point of introduction at Basins 4 and 5 to where it was sampled at MW-12 and MW-14.

The time of bromide first arrival observed at monitoring wells MW-12 and MW-14 in the Sea-Level aquifer is delayed compared to the paired wells in the shallow aquifer. The first arrival at MW-14 occurs on day 36, 29 days after the first arrival at MW-3a in the shallow aquifer. The first arrival at MW-12 occurs on day 55, 33 days after the first arrival at MW-13 in the shallow aquifer. The travel times for these two sets of paired wells is summarized in **Table 8-4.** The observed delay in time of first arrival indicates it takes at least 29 days for reclaimed water to travel through the Kitsap formation near the Hawks Prairie facility. The vertical difference between the bottom of the screened interval at MW-3a and the top of the screened interval at MW-14 is 183 feet, divided by the difference of 29 days in time of first arrival between MW-3a and MW-14 results in a velocity of 6.3 feet per day through the Kitsap Formation. This estimation assumes a straight vertical flow path, which is not likely. This velocity represents the fastest observed flow path and is not representative of hydraulic properties typical of the Kitsap Formation, though it likely indicates a low effective porosity facilitating relatively fast travel times.

8.3 Comparison of Results from the Two Tracers

These results have focused on the analysis of bromide tracer concentrations with respect to travel time and reclaimed water velocity. This is because SF_6 appears to be retarded in transport and due to the second period of tracer introduction directly into the Shallow Aquifer.

SF_6 appeared to be slowed in transport with both time of first arrival and time of maximum concentration occurring after bromide in all monitoring wells except MW-25, MW-12, and MW-14. Previous work has shown that gas transport is often slowed (retarded) in the presence of trapped air because of partitioning between the air and liquid phases (e.g., Vulava et al. 2002).

SF_6 had an extended time of introduction as it was injected directly into the groundwater underneath the recharge basins for an additional period of 7 days at MW-1, MW-2, MW-7, MW-15, and MW-16. The extended period of tracer introduction may have led to a delay in peak concentration which would have shown a slowed transport velocity as compared to bromide. This tagged groundwater was observed to follow some different flow paths than the tracer tagged reclaimed water introduced at the ground surface in Basins 4 and 5 as seen in the high SF_6 concentrations at MW-8 and MW-27, compared to the preferential flow path from the basin surface to MW-5.

In general, tracer behavior as shown in the breakthrough curves shows similar behavior for bromide and SF_6, including both bromide and SF_6 showing two peaks at MW-5. However, the high concentrations of bromide are not mirrored in the observed SF_6 concentrations, this may be because of SF_6 coming out of solution as it flows through the vadose zone, or because MW-5 does not receive as much flow from where SF_6 was introduced directly into the aquifer. The primary deviance in tracer behavior is seen at MW-11 where bromide was detected, but SF_6 was not, and at MW-3a where SF_6 displayed significantly retarded transport. At MW-14 and MW-25, one tracer had multiple detections and the other tracer had a single detection. The use of two tracers enabled flow path delineation, including confirming that detections in the Sea-Level Aquifer were not outliers or suspected false positive samples. However, SF_6 was proven to not be a reliable tracer to determine travel times to monitoring wells from the basins.

Table 8-1. Summary of 2018 Tracer Testing Results in the Unsaturated Zone, LOTT RWIS

Lysimeters and Unsaturated Zone												
Well ID	**Aquifer**	**Vertical Distance from Top Basin to Vadose Zone Depth (feet)**	**Tracer Detections During Test**		**Time of First Arrival (days)**		**Time of Peak Concentration (days)**		**Travel Time Velocity (Peak Concentration) (ft/d)**		**Max Observed Concentration (µg/L)**	**Max Relative Concentration[a]**
			Bromide	SF_6	Bromide	SF_6	Bromide	SF_6	Bromide	SF_6	Bromide	Bromide
West B4 Lysimeter, 10 ft	Unsaturated Zone	10	Yes	--	1	--	7	--	1.4	--	19,000	0.67
West B4 Lysimeter, 25 ft	Unsaturated Zone	25	Yes	--	3	--	10	--	2.5	--	16,000	0.57
West B4 Lysimeter, 50 ft	Unsaturated Zone	50	Yes	--	3	--	23	--	2.2	--	13,000	0.46
East B4 Lysimeter, 10 ft	Unsaturated Zone	10	Yes	--	1	--	6	--	1.7	--	24,000	0.85
East B4 Lysimeter, 25 ft	Unsaturated Zone	25	Yes	--	30	--	41	--	0.6	--	3,600	0.13
East B4 Lysimeter, 50 ft	Unsaturated Zone	50	Yes	--	13	--	30	--	1.7	--	11,000	0.39

Notes:

-- = Not sampled.

[a]. Relative concentrations (C/Co) are calculated by dividing the observed concentration by the average introduced concentration of 28.28 mg/L in reclaimed water

Time of first arrival (days) from start of tracer delivery into Basin 4 and 5 on January 16, 2018.

Table 8-2. Summary of 2018 Tracer Testing Results in the Groundwater Aquifers, LOTT RWIS

Shallow (Qva) Aquifer and Sea-Level (Qc) Aquifer															
Well ID	Aquifer	Vadose Zone Depth (feet)	Lateral Distance from Center Between Basin 4 and 5 (feet)	Upper Confined Unit Depth (feet)	Total Travel Time Distance (feet)	Tracer Detections During Test		Time of First Arrival (days)		Time of Peak Concentration (days)		Travel Time Velocity (Peak Concentration) (ft/d)		Max Observed Concentration (µg/L)	Max Relative Concentration[a]
						Bromide	SF_6	Bromide	SF_6	Bromide	SF_6	Bromide	SF_6	Bromide	Bromide
MW-1	Shallow Aquifer (Qva)	75	241	NA	316	Yes	NA[a]	15	NA[a]	NA	NA[a]	NA	NA[a]		
MW-2	Shallow Aquifer (Qva)	75	136	NA	211	No	NA[a]	ND	NA[a]	ND	NA[a]	ND	NA[a]		
MW-3a	Shallow Aquifer (Qva)	75	183	NA	258	Yes	No	7	36	27	112	10	2	6,200	0.219
MW-5 **Peak 1**	Shallow Aquifer (Qva)	75	271	NA	346	Yes	Yes	2	6	8	21	43		18,000	0.636
MW-5 **Peak 2**										19[b]	30	18	14,000	14,000	0.495
MW-6	Shallow Aquifer (Qva)	75	522	NA	597	No	No	ND	ND	ND	ND	ND	ND		
MW-7	Shallow Aquifer (Qva)	75	260	NA	335	No	NA[a]	ND	NA[a]	ND	NA[a]	ND	NA[a]		
MW-8	Shallow Aquifer (Qva)	75	692	NA	767	Yes	Yes	9	21	30	36	26	21	4,200	0.149
MW-9	Shallow Aquifer (Qva)	75	564	NA	639	Yes	Yes	6	10	27	36	24	18	4,900	0.173
MW-11	Shallow Aquifer (Qva)	75	1,208	NA	1,283	Yes	No	113	ND	177	ND	7	ND	480	0.017
Lacey MW-11	Shallow Aquifer (Qva)	75	2,264	NA	2,339	Yes	Yes	PD	SD	PD	SD	PD	SD		
MW-13	Shallow Aquifer (Qva)	75	1,181	NA	1,256	Yes	Yes	22	16	63[b]	70	20[b]	18	870	0.031
MW-15	Shallow Aquifer (Qva)	75	119	NA	194	Yes	Yes[a]	69	41[a]	83	NA[a]	2	NA[a]	1,700	0.060
MW-16	Shallow Aquifer (Qva)	75	154	NA	229	Yes	Yes[a]	10	17[a]	37	NA[a]	6	NA[a]	2,100	0.074
MW-20	Shallow Aquifer (Qva)	75	1,659	NA	1,734	No	No	ND	ND	ND	ND	ND	ND		
MW-22	Shallow Aquifer (Qva)	75	2,969	NA	3,044	No	No	ND	ND	ND	ND	ND	ND		
MW-24	Shallow Aquifer (Qva)	75	1,274	NA	1,349	No	No	ND	ND	ND	ND	ND	ND		

Shallow (Qva) Aquifer and Sea-Level (Qc) Aquifer

Well ID		Aquifer	Vadose Zone Depth (feet)	Lateral Distance from Center Between Basin 4 and 5 (feet)	Upper Confined Unit Depth (feet)	Total Travel Time Distance (feet)	Tracer Detections During Test		Time of First Arrival (days)		Time of Peak Concentration (days)		Travel Time Velocity (Peak Concentration) (ft/d)		Max Observed Concentration (µg/L)	Max Relative Concentration[a]
							Bromide	SF_6	Bromide	SF_6	Bromide	SF_6	Bromide	SF_6	Bromide	Bromide
MW-25	**Peak 1**	Shallow Aquifer (Qva)	75	1,231	NA	1,306	Yes	SD	28	29	37	29	35	45	310	0.011
	Peak 2										111	83	12	16	160	0.006
MW-26		Shallow Aquifer (Qva)	75	2,616	NA	2,691	No	No	ND	ND	ND	ND	ND	ND		
MW-27		Shallow Aquifer (Qva)	75	838	NA	913	Yes	Yes	14	20	32^b	39^b	29^b	23^b	1,500	0.053
MW-28		Shallow Aquifer (Qva)	75	1,992	NA	2,067	No	No	ND	ND	ND	ND	ND	ND		
Landfill MW-1		Shallow Aquifer (Qva)	75	3,036	NA	3,111	Yes	No	PD	ND	PD	ND	PD	ND		
Landfill MW-10S		Shallow Aquifer (Qva)	75	2,360	NA	2,435	No	No	ND	ND	ND	ND	ND	ND		
MW-12		Sea-Level Aquifer (Qc)	75	1,185	150	1,410	Yes	Yes	55	29	70	113	20	12	110	0.004
MW-14		Sea-Level Aquifer (Qc)	75	87	200	362	SD	Yes	36	28	36	36	10	10	190	0.007
MW-21		Sea-Level Aquifer (Qc)	75	2,956	50	3,081	No	No	ND	ND	ND	ND	ND	ND		
MW-23		Sea-Level Aquifer (Qc)	75	1,286	150	1,511	No	No	ND	ND	ND	ND	ND	ND		

Notes:
ND = Non-detect above baseline, or inconsistent detections.
NA = Not applicable
SD = Single detection
PD = Potential Detection
Time of first arrival (days) from start of tracer delivery into Basin 4 and 5 on January 16, 2018.

[a] SF_6 was introduced to groundwater at MW-1, MW-2, MW-7, MW-15, and MW-16 from day 22 to 29, SF_6 detection and time of first arrival are included only if occurring before February 7 (day 22).

[b] Observed peak bromide concentrations occurred during two events, therefore the midpoint between events was used as the time of peak bromide concentration.

[c] Relative concentrations (C/Co) are calculated by dividing the observed concentration by the average introduced concentration of 28.28 mg/L in reclaimed water

Table 8-3. Summary of Calculated Reclaimed Water Velocities

Velocities (ft/d)	Shallow Aquifer Wells (Qva)		Sea-Level Aquifer Wells (Qc)	
	Bromide	SF_6	Bromide	SF_6
Minimum	2	2	10	10
Average	19	16	15	11
Maximum	43	45	20	12

Table 8-4. Summary of Differences in Bromide Tracer Detections between Paired Wells in the Shallow and Sea-Level Aquifers

Monitoring Well		Screened Aquifer	Time of First Arrival (days)	Time of Peak Concentration (days)	Peak Bromide Concentration (µg/L)	Ratio of Peak Concentration - $\left(\frac{C_{Sea\ Level\ Aquifer}}{C_{Shallow\ Aquifer}}\right)$
Pair 1	**MW-3a**	Qva	7	27	6220	0.03
	MW-14	Qc	36	36	190	
Pair 2	**MW-13**	Qva	22	63	870	0.13
	MW-12	Qc	55	70	110	

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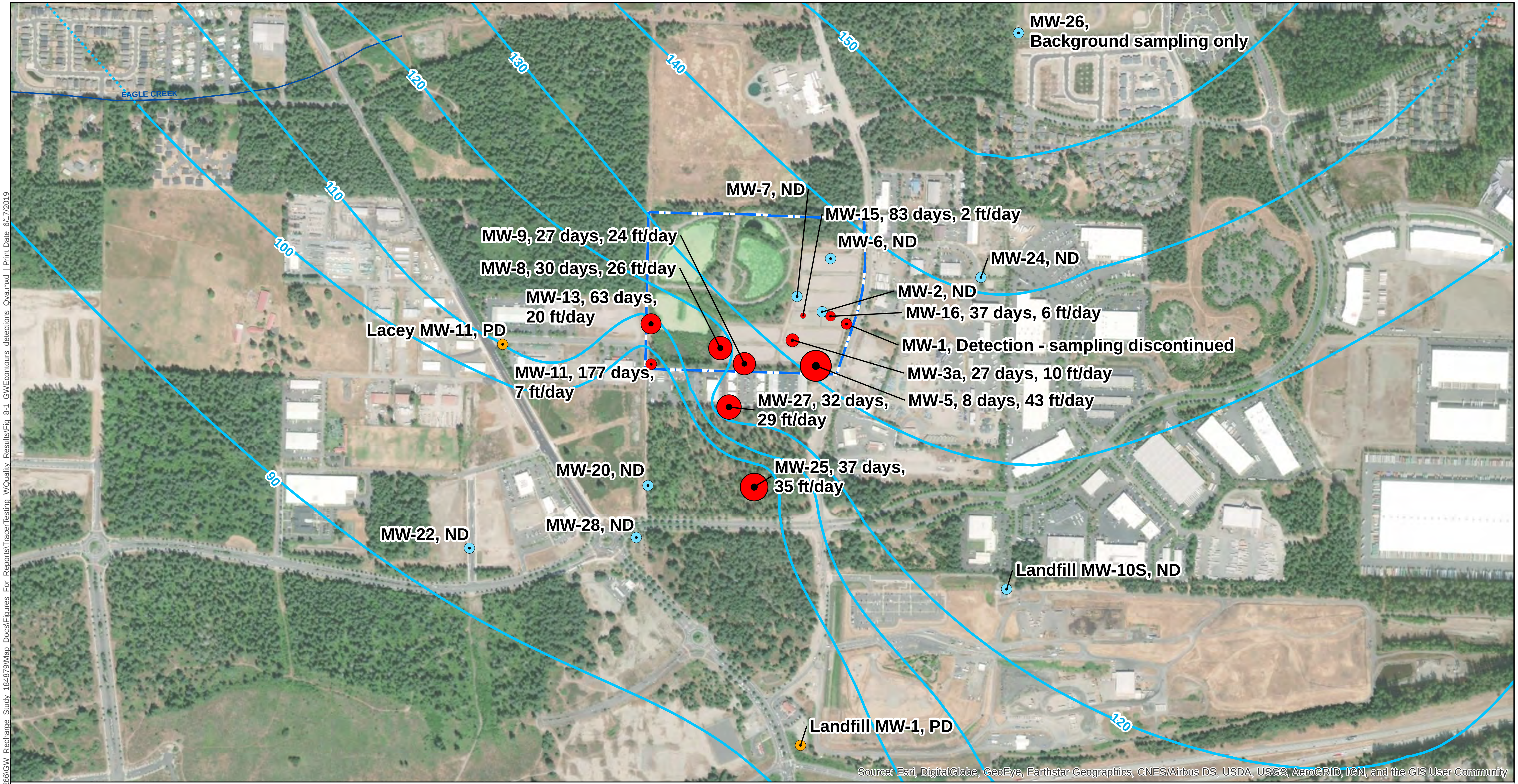


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

● Tracer Detection (symbol size proportional to groundwater velocity)

● No Tracer Detection (ND)

● Possible Tracer Detection (PD)

⬚ LOTT Hawks Prairie Recharge Facility

— Streams

— Groundwater Potentiometric Elevation Contours (ft)
Dashed where data is limited and contours are inferred

Tracer Monitoring Network

⊙ Well Name
Time of Peak Bromide Concentration (days after tracer introduction)
Groundwater Velocity (ft/day)
ND: Non-Detect

NOTE:

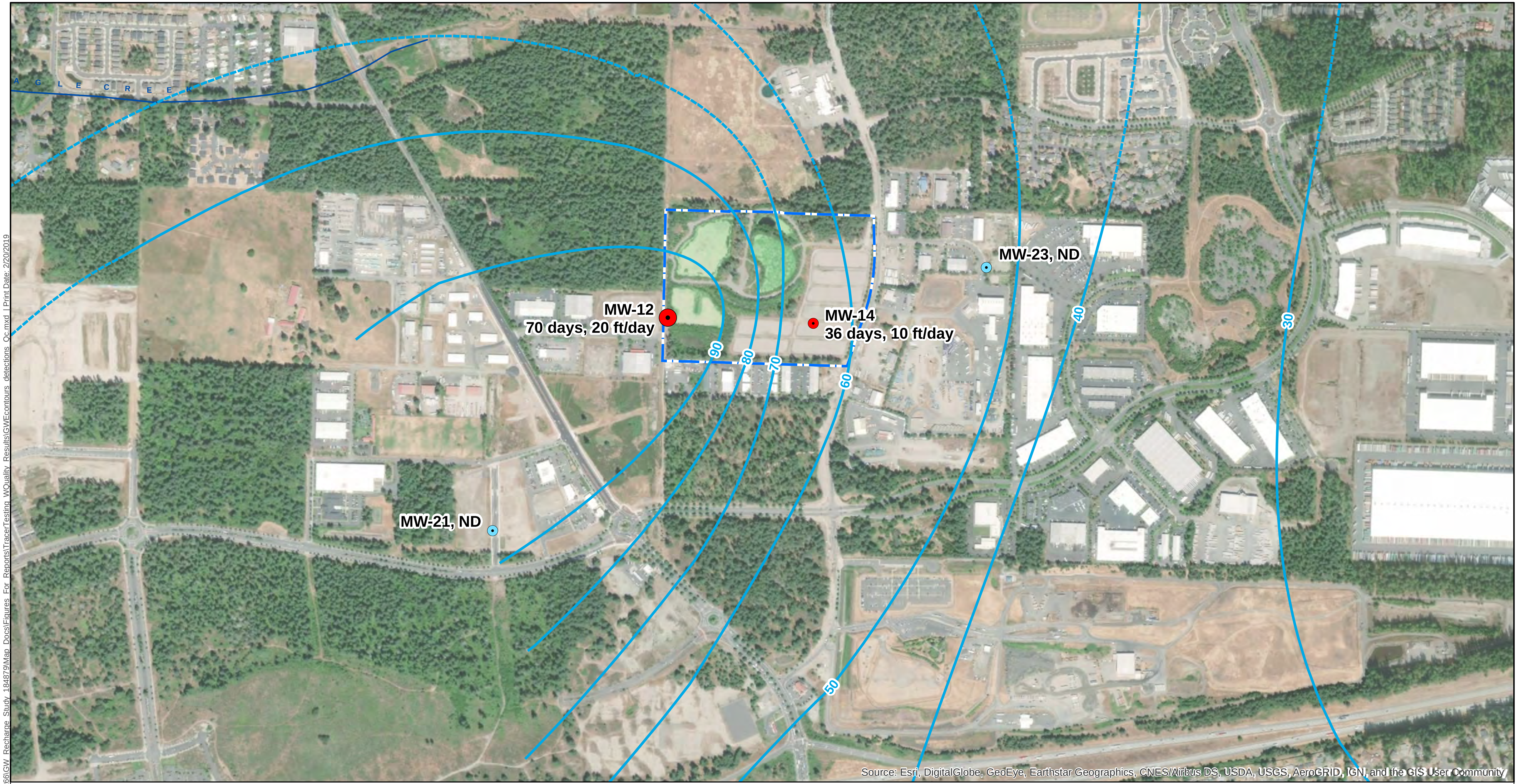
1. Groundwater velocities calculated from total distance traveled (lateral distance and vadose zone depth) divided by time of peak bromide concentration (feet/day).
2. Vertical datum for groundwater elevations is NAVD 88.
3. Groundwater potentiometric elevation contours are based on June, 2018 water elevations.
4. For monitoring wells that display double peaks in tracer concentrations (MW-5 and MW-25), only the first peak is displayed here.

Figure 8-1. Tracer Test Detections - Travel Time and Velocity of Peak Bromide Concentration Shallow (Qva) Aquifer

LOTT Clean Water Alliance
FDR

Source: City of Lacey (2018), Ecology (2015), Esri (2018), Thurston Co Landfill (2018), WSDOT (2018).

Path: G:\Projects\Washington\LOTT_CWA_201266\GW_Recharge_Study_184879\Map_Docs\Figures_For_Reports\TracerTesting_WQuality_Results\Fig_8-1_GWEcontours_detections_Qva.mxd | Print Date: 6/17/2019



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

● Tracer Detection (symbol size proportional to groundwater velocity)

● No Tracer Detection

LOTT Hawks Prairie Recharge Facility

Streams

Groundwater Potentiometric Elevation Contours (ft)
Dashed where data is limited and contours are inferred

Tracer Monitoring Network
⊙ Well Name
Time of Peak Bromide Concentration (days after tracer introduction)
Groundwater Velocity (ft/day)
ND: Non-Detect

NOTE:
1. Groundwater velocities calculated from total distance traveled (lateral distance and vadose zone depth) divided by time of peak bromide concentration (feet/day).
2. Vertical datum for groundwater elevations is NAVD 88.
3. Groundwater potentiometric elevation contours are based on June, 2018 water elevations.

Figure 8-2. Tracer Test Detections - Travel Time and Velocity of Peak Bromide Concentration Sea Level (Qc) Aquifer

N
0 500 1,000
Feet

Source: City of Lacey (2018), Ecology (2015), Esri (2018), Thurston Co Landfill (2018), WSDOT (2018).

Path: G:\Projects\Washington\LOTT CWA 201266\GW Recharge Study 184879\Map Docs\Figures For Reports\TracerTesting WQuality Results\GWEcontours detections Qc.mxd | Print Date: 2/20/2019

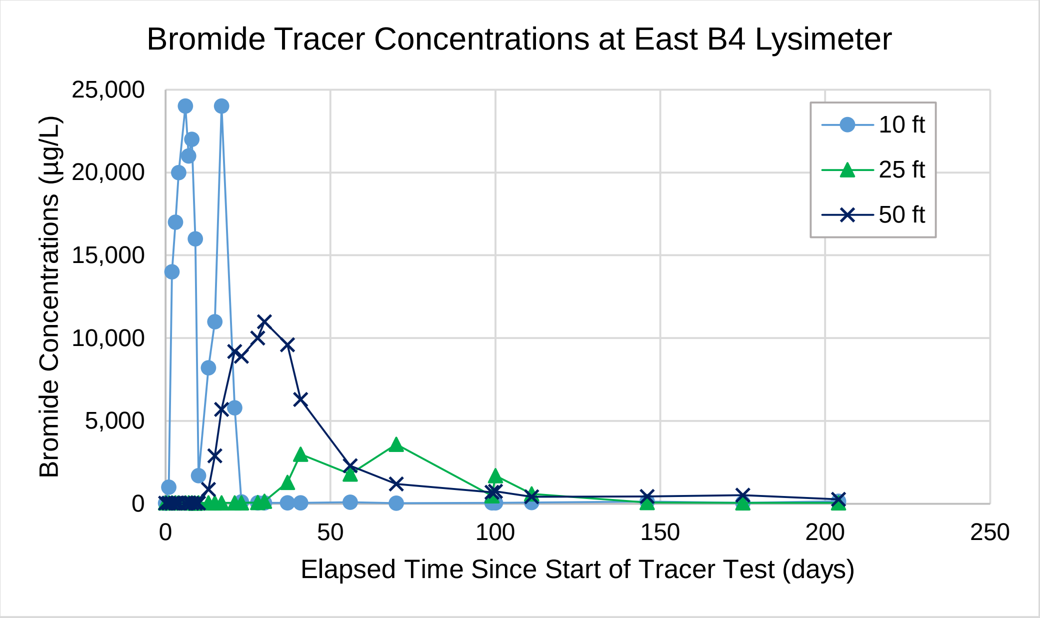


Figure 8-3a. Bromide Tracer Concentrations at East B4 Lysimeters

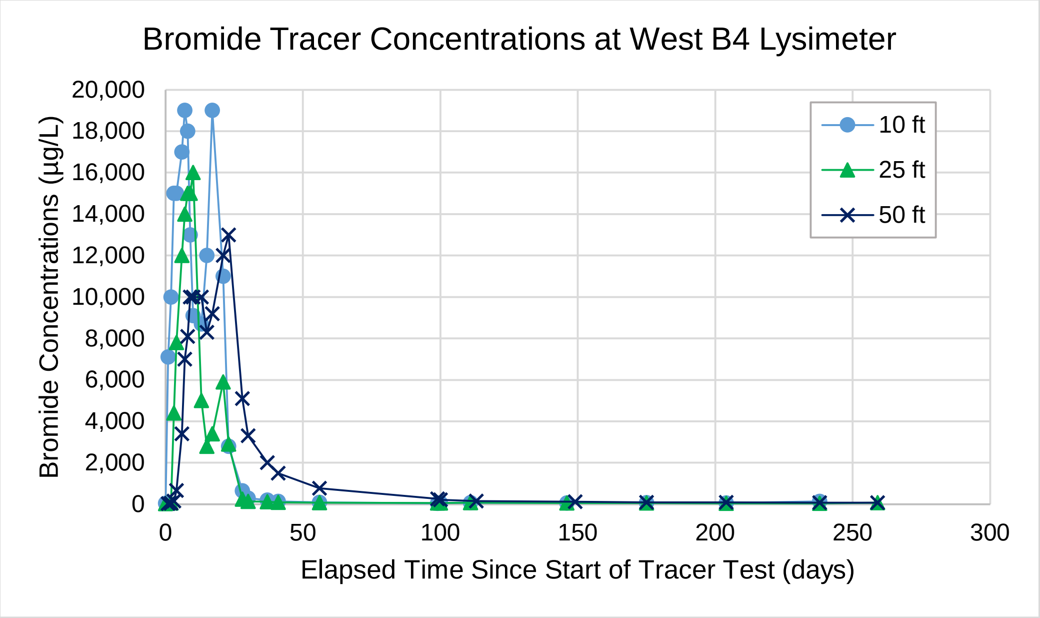
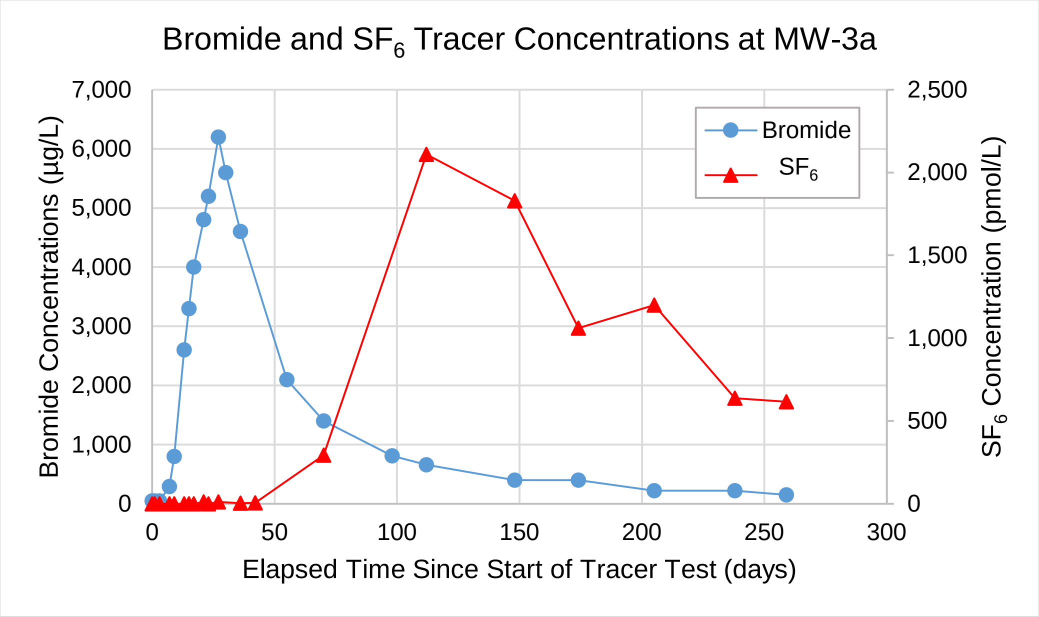
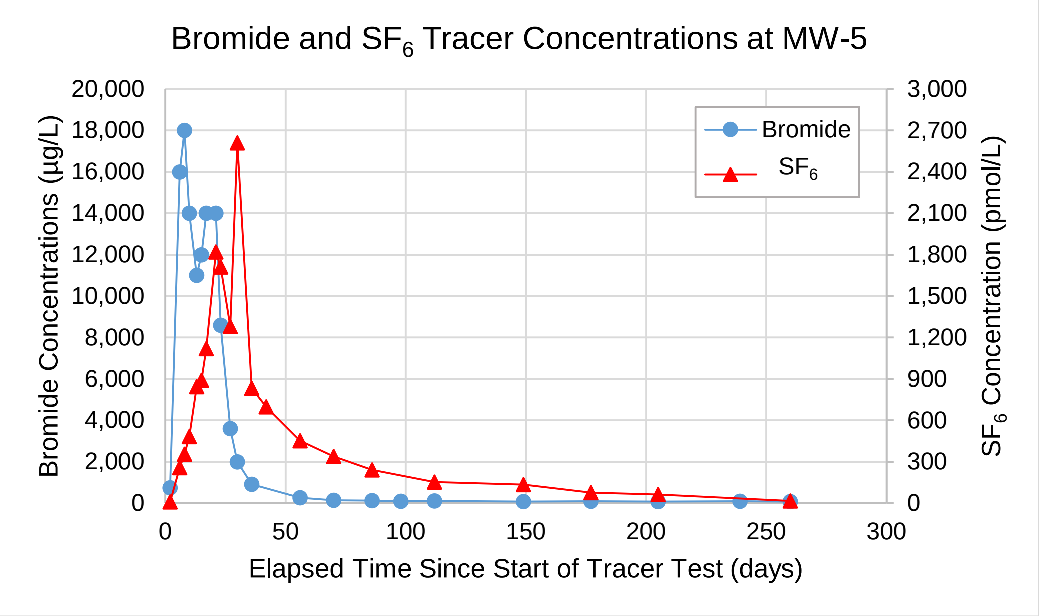


Figure 8-3b. Bromide Tracer Concentrations at West B4 Lysimeters



Note: Inconsistent SF_6 results reported on day 55 (March sampling event).

Figure 8-3c. Tracer Concentrations at MW-3a



Note: Inconsistent SF_6 results reported on day 239 (September sampling event).

Figure 8-3d. Tracer Concentrations at MW-5

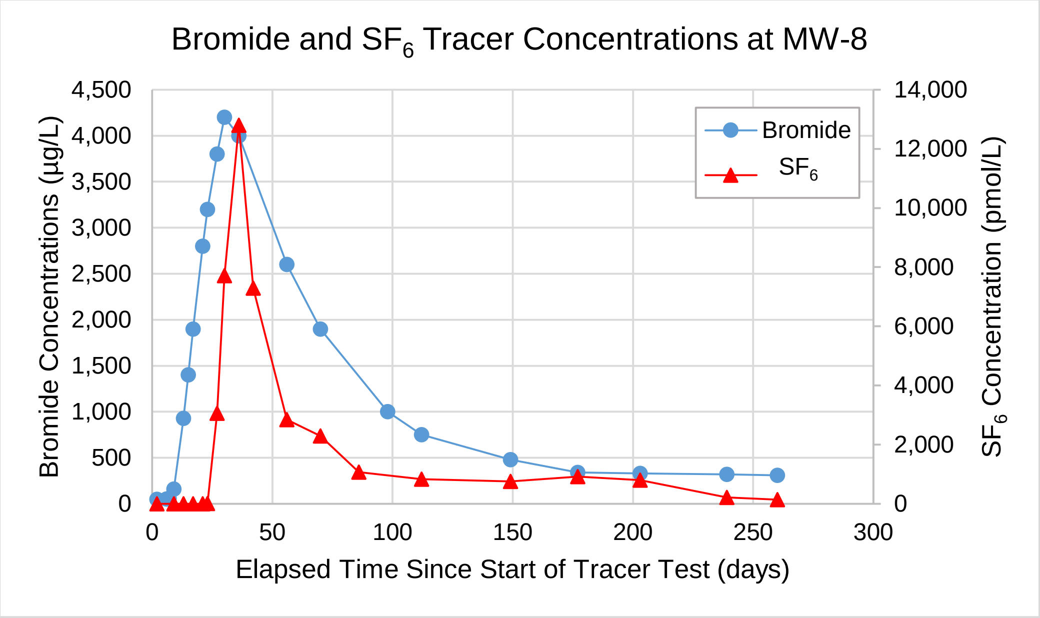


Figure 8-3e. Tracer Concentrations at MW-8

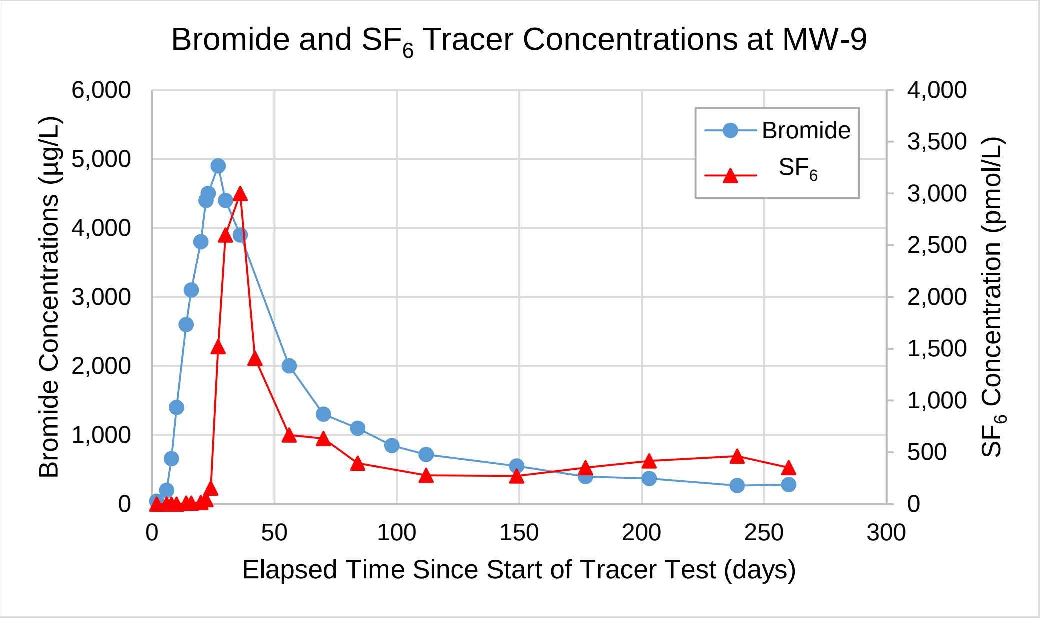


Figure 8-3f. Tracer Concentrations at MW-9

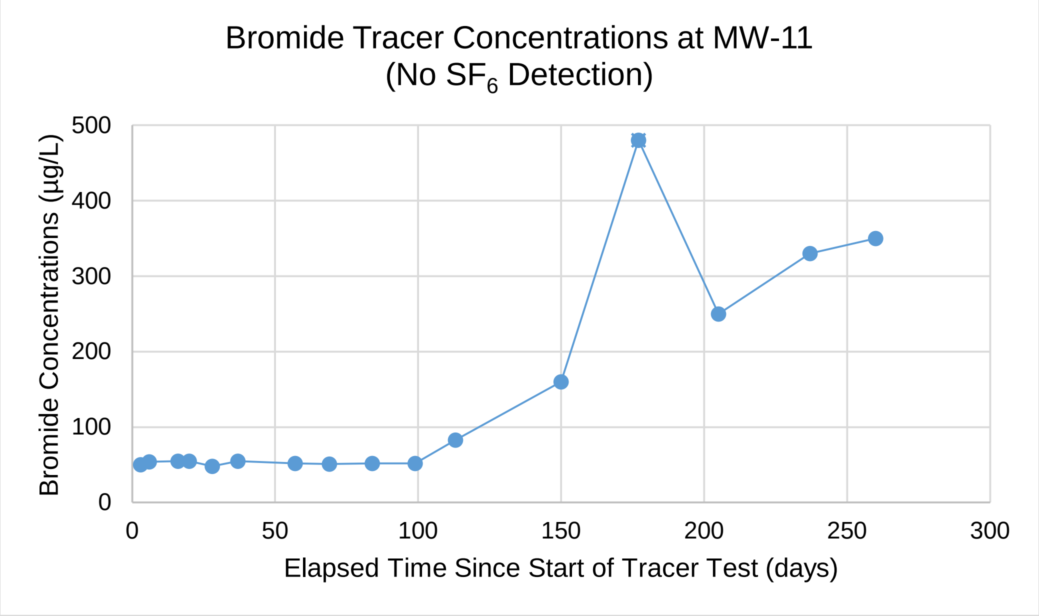


Figure 8-3g. Tracer Concentrations at MW-11

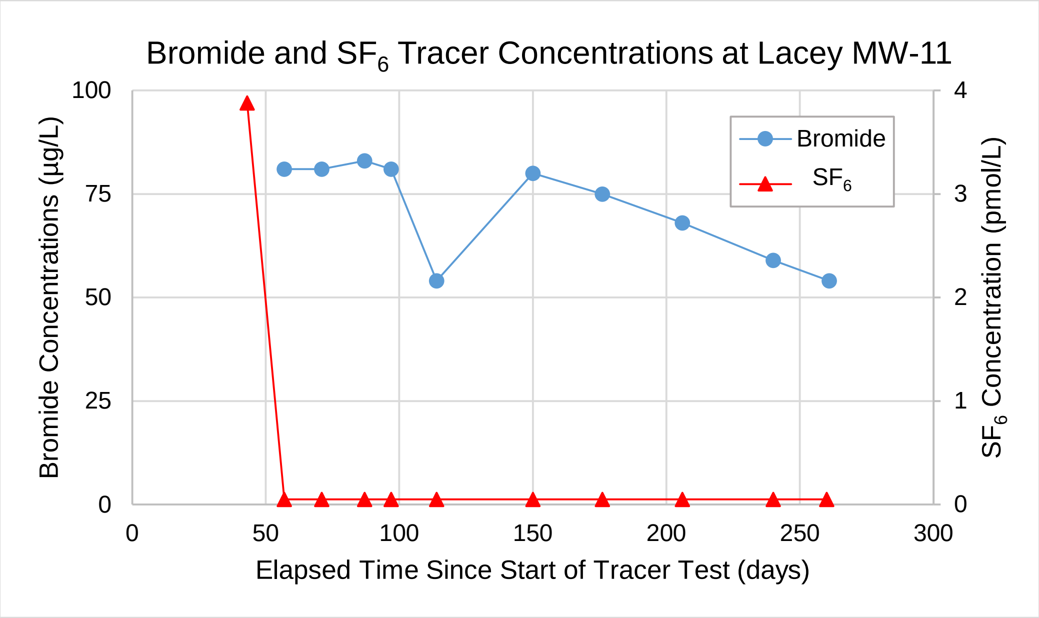


Figure 8-3h. Tracer Concentrations at Lacey MW-11

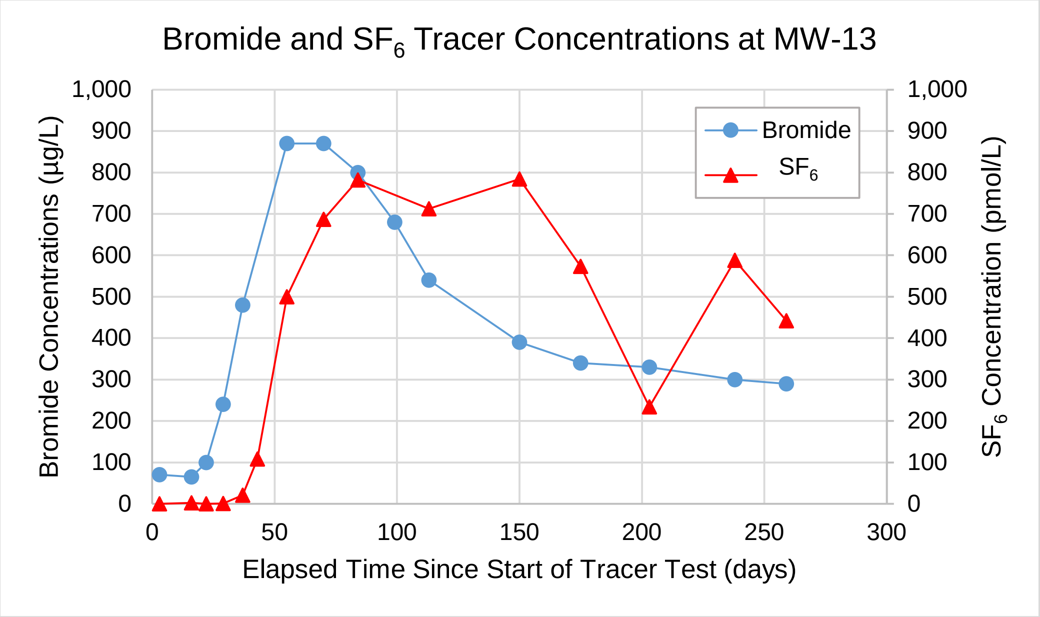
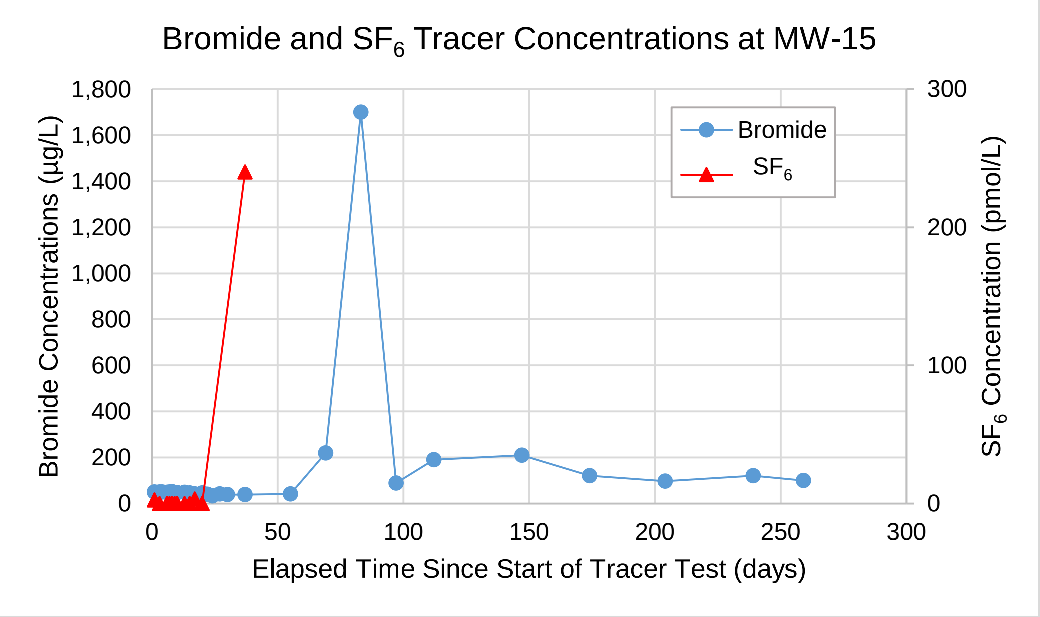
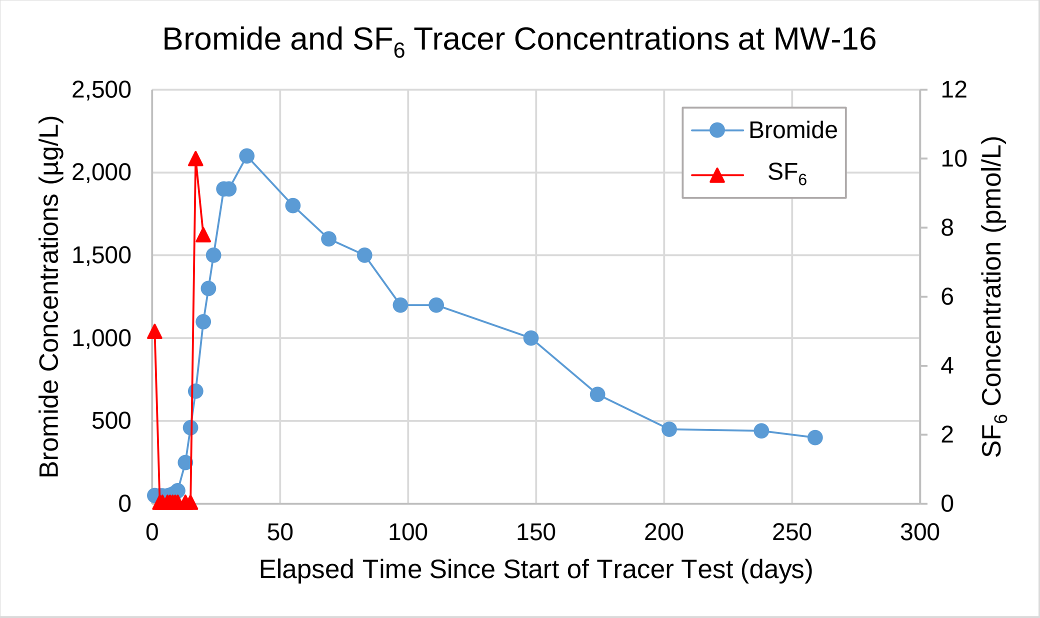


Figure 8-3i. Tracer Concentrations at MW-13



Note: SF_6 was directly injected into MW-15 from day 22–29

Figure 8-3j. Tracer Concentrations at MW-15



Note: SF_6 was directly injected into MW-16 from day 22–29.

Figure 8-3k. Tracer Concentrations at MW-16

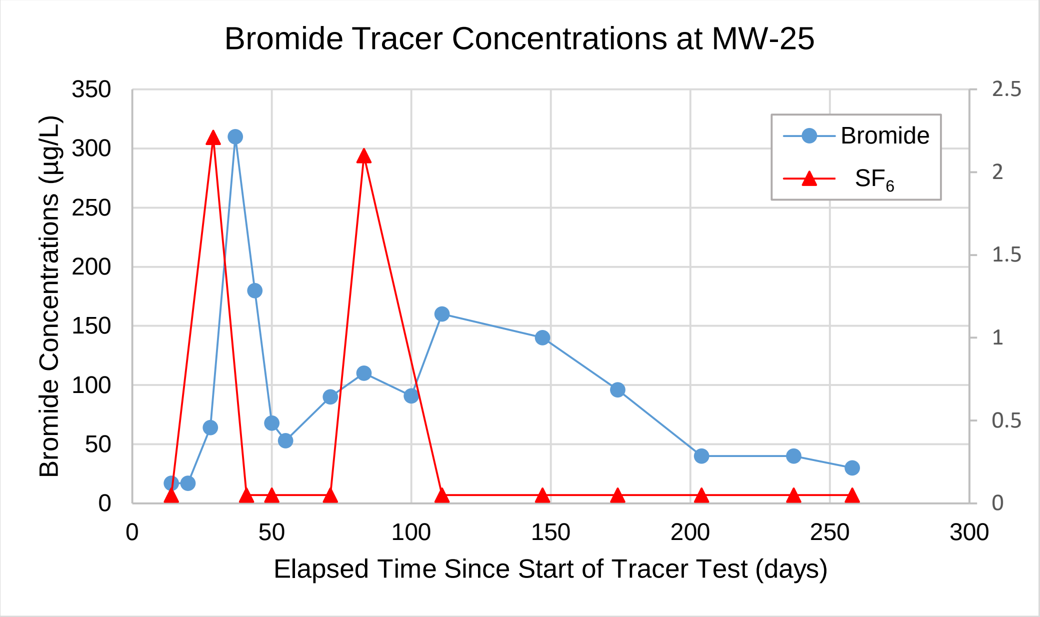
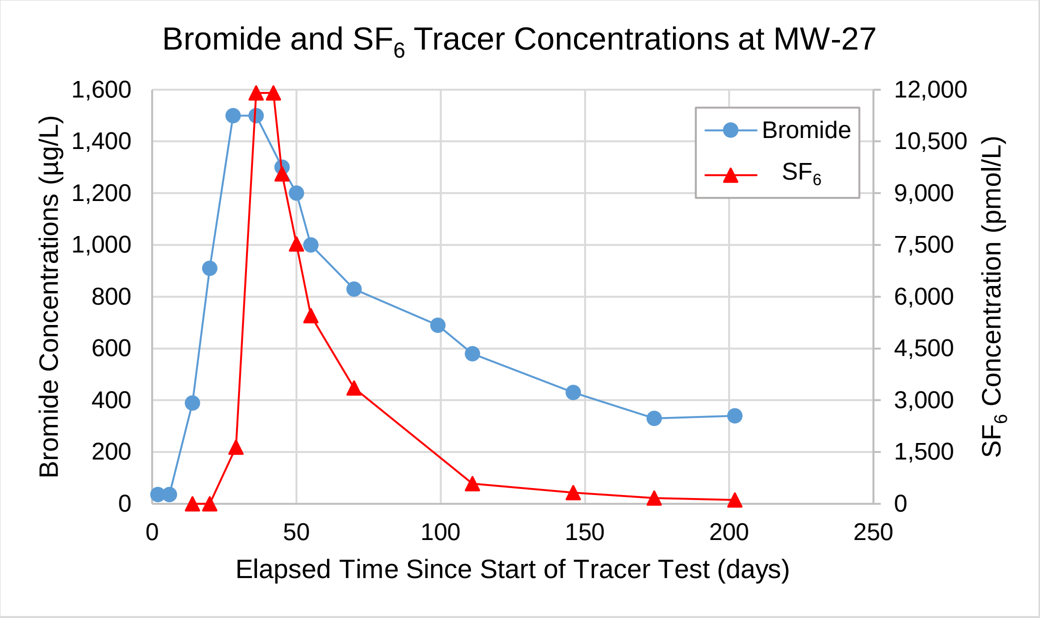


Figure 8-3l. Tracer Concentrations at MW-25



Note: No samples collected after day 202 as well was dry during following sampling events (September and October events).

Figure 8-3m. Tracer Concentrations at MW-27

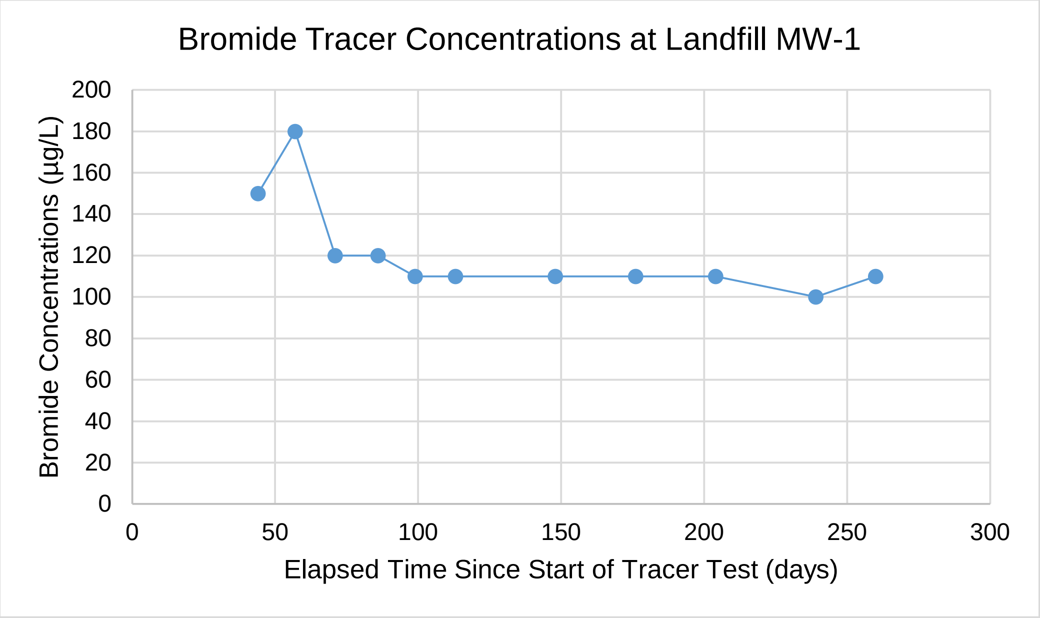
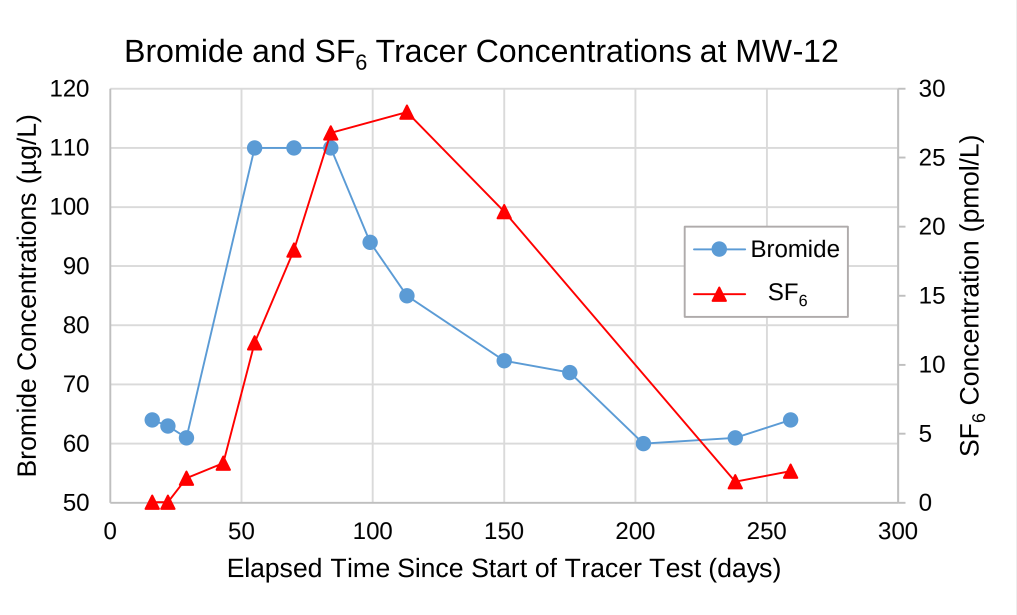


Figure 8-3n. Tracer Concentrations at Thurston County Landfill MW-1



Note: Inconsistent SF_6 results reported on day 55, 175 and 203 (March, July, and August sampling events).

Figure 8-3o. Tracer Concentrations at MW-12

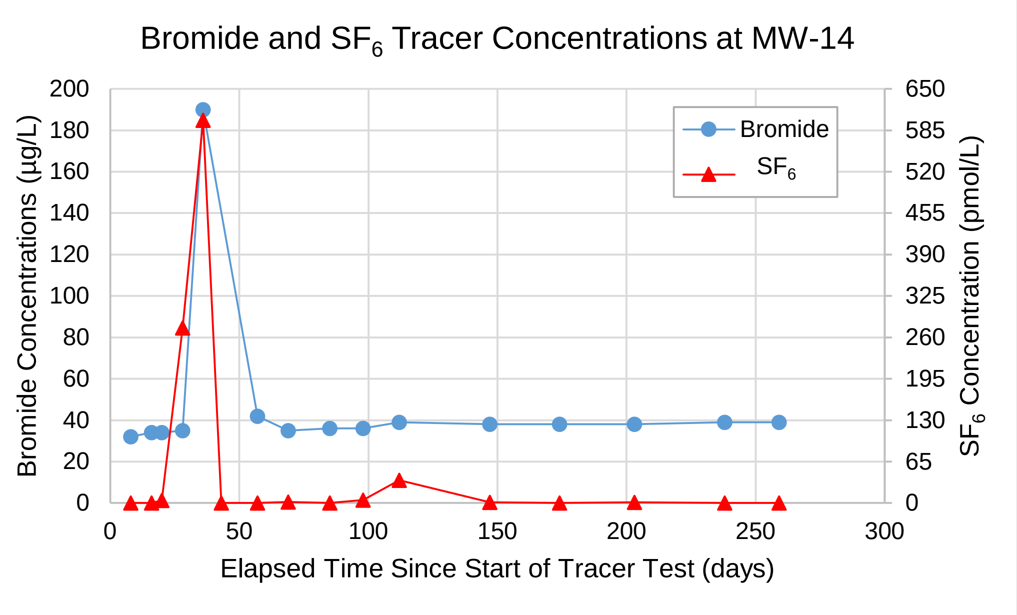
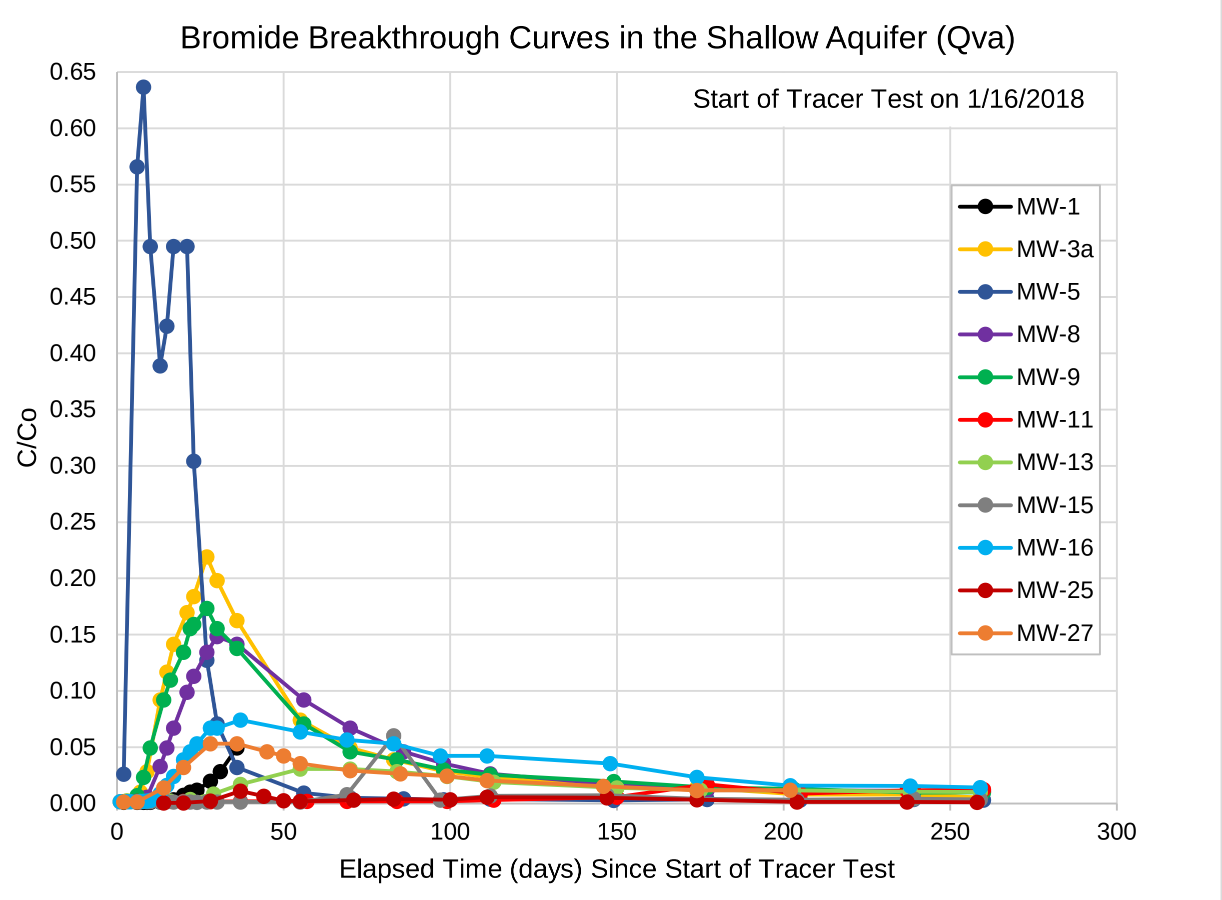
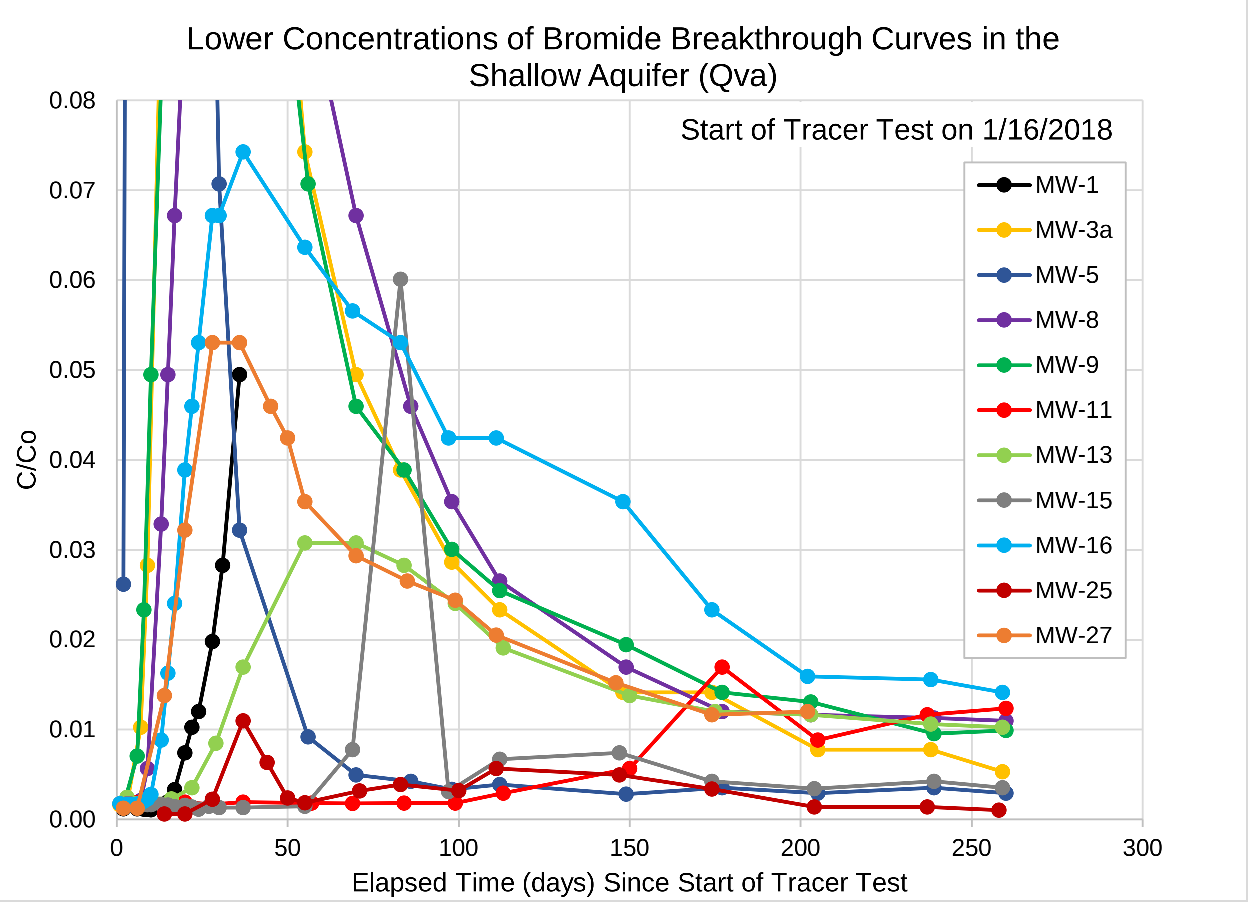


Figure 8-3p. Tracer Concentrations at MW-14



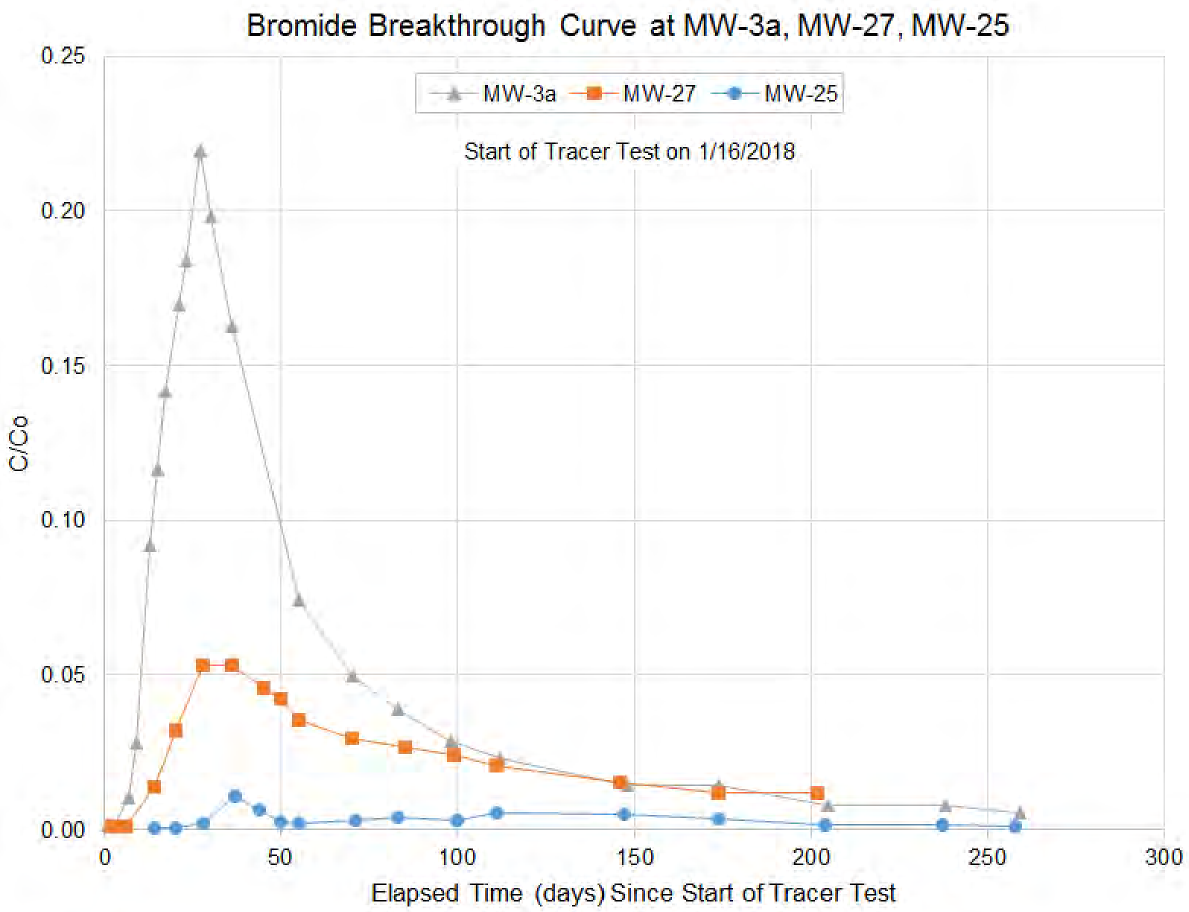
Note: Relative concentrations (C/Co) are calculated by dividing the observed concentration by the average introduced concentration of 28.28 mg/L in reclaimed water.

Figure 8-4. Relative Bromide Concentrations Through Time in the Shallow Aquifer



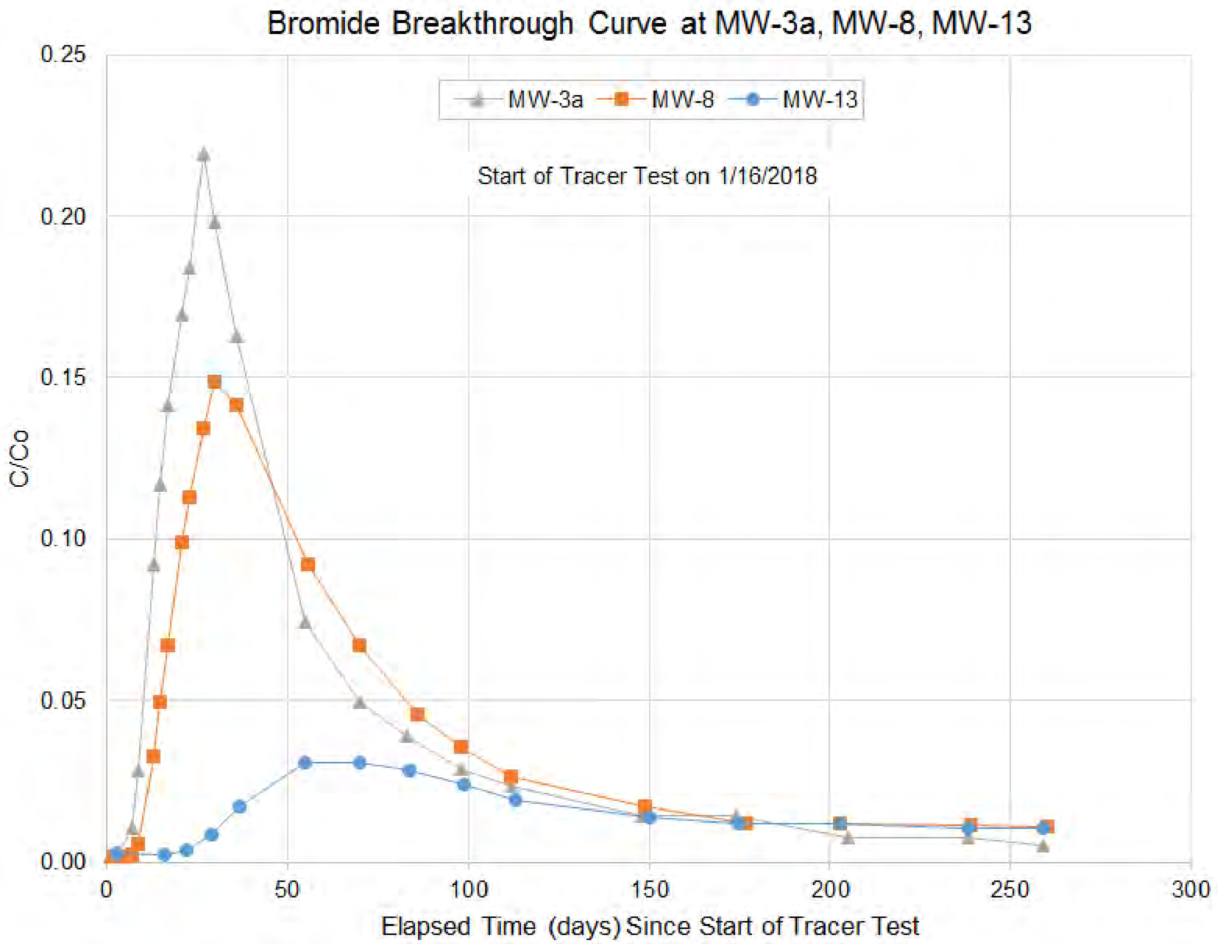
Note: Relative concentrations (C/Co) are calculated by dividing the observed concentration by the average introduced concentration of 28.28 mg/L in reclaimed water.

Figure 8-5. Lower Relative Concentrations of Bromide Through Time in the Shallow Aquifer



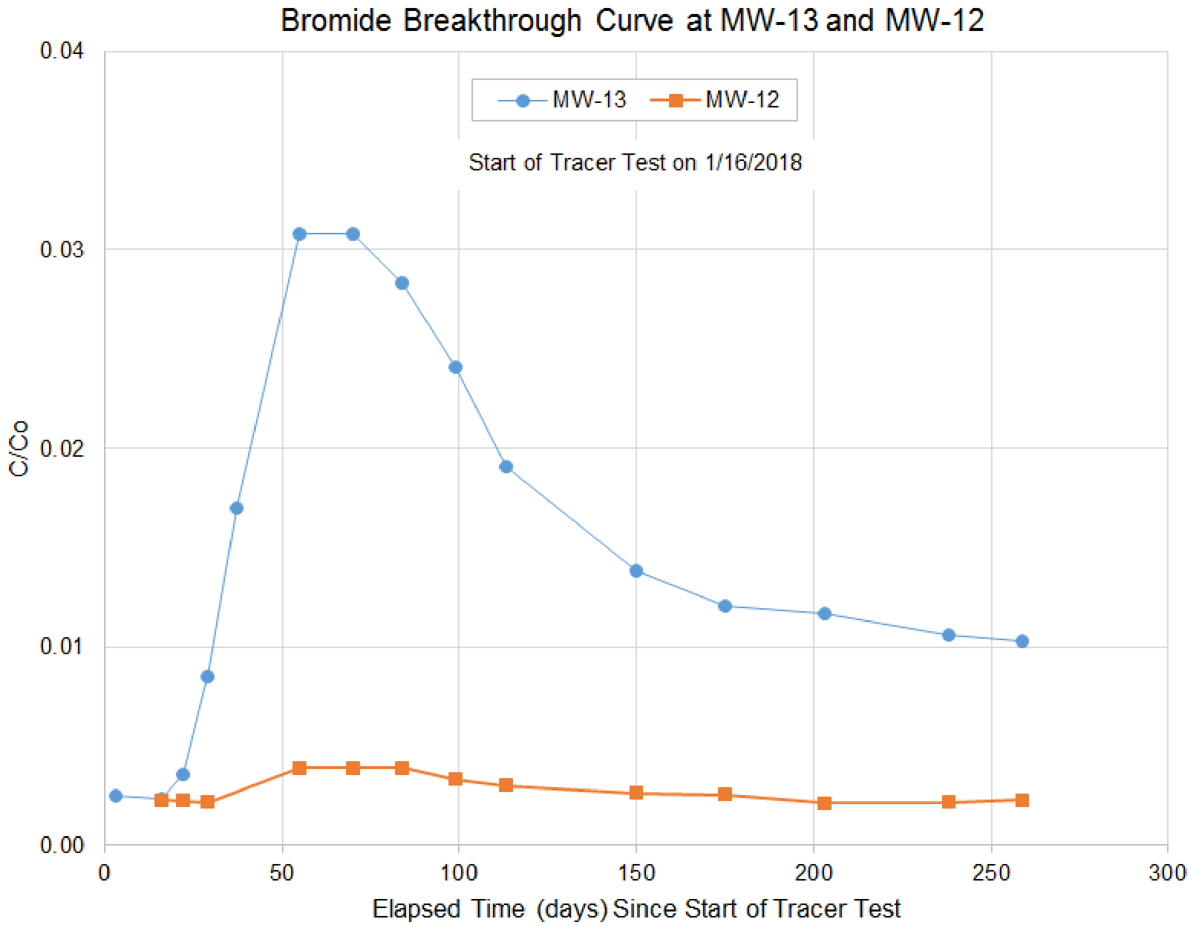
Note: Relative concentrations (C/Co) are calculated by dividing the observed concentration by the average introduced concentration of 28.28 mg/L in reclaimed water.

Figure 8-6. Bromide Concentrations along the Southern Flow Path



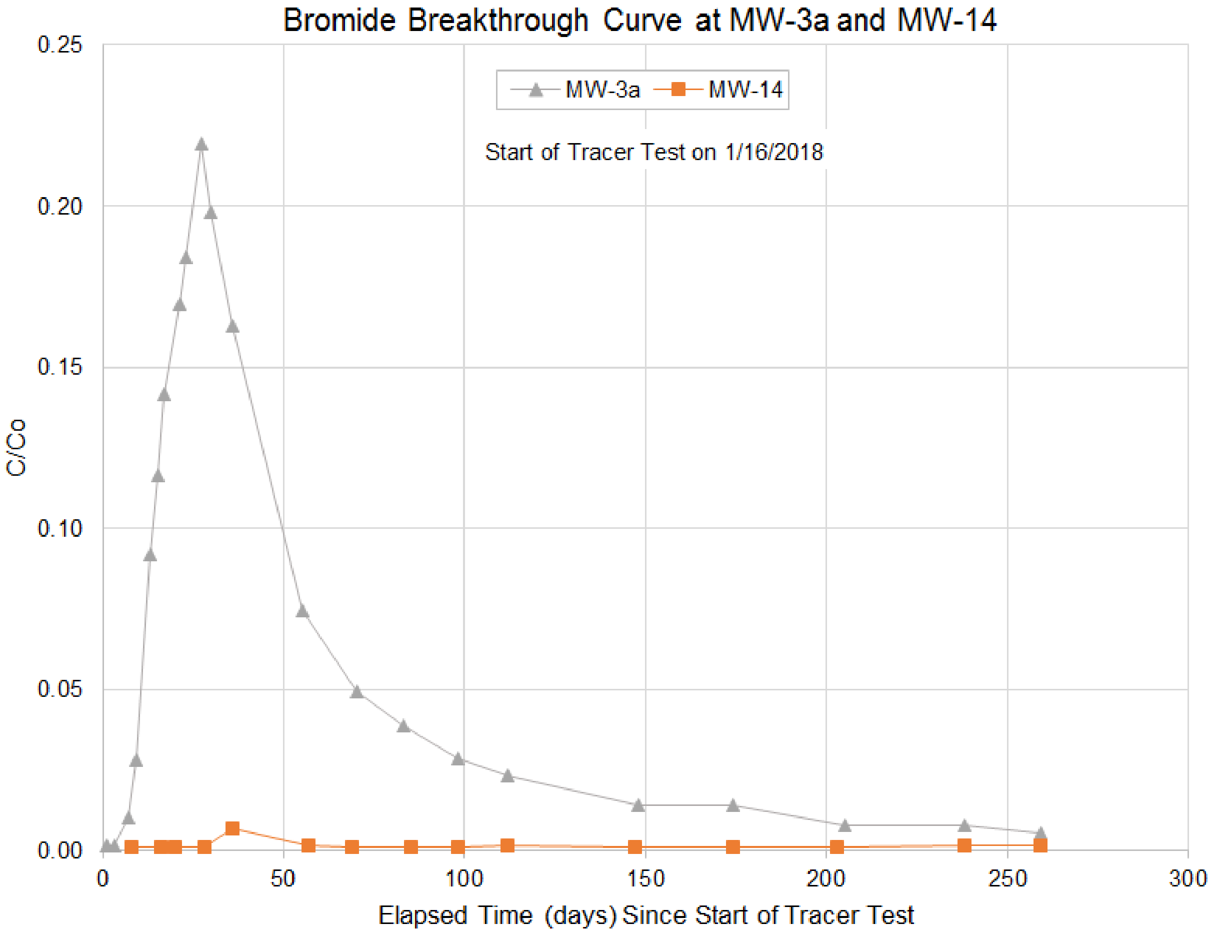
Note: Relative concentrations (C/Co) are calculated by dividing the observed concentration by the average introduced concentration of 28.28 mg/L in reclaimed water.

Figure 8-7. Bromide Concentrations along the Western Flow Path



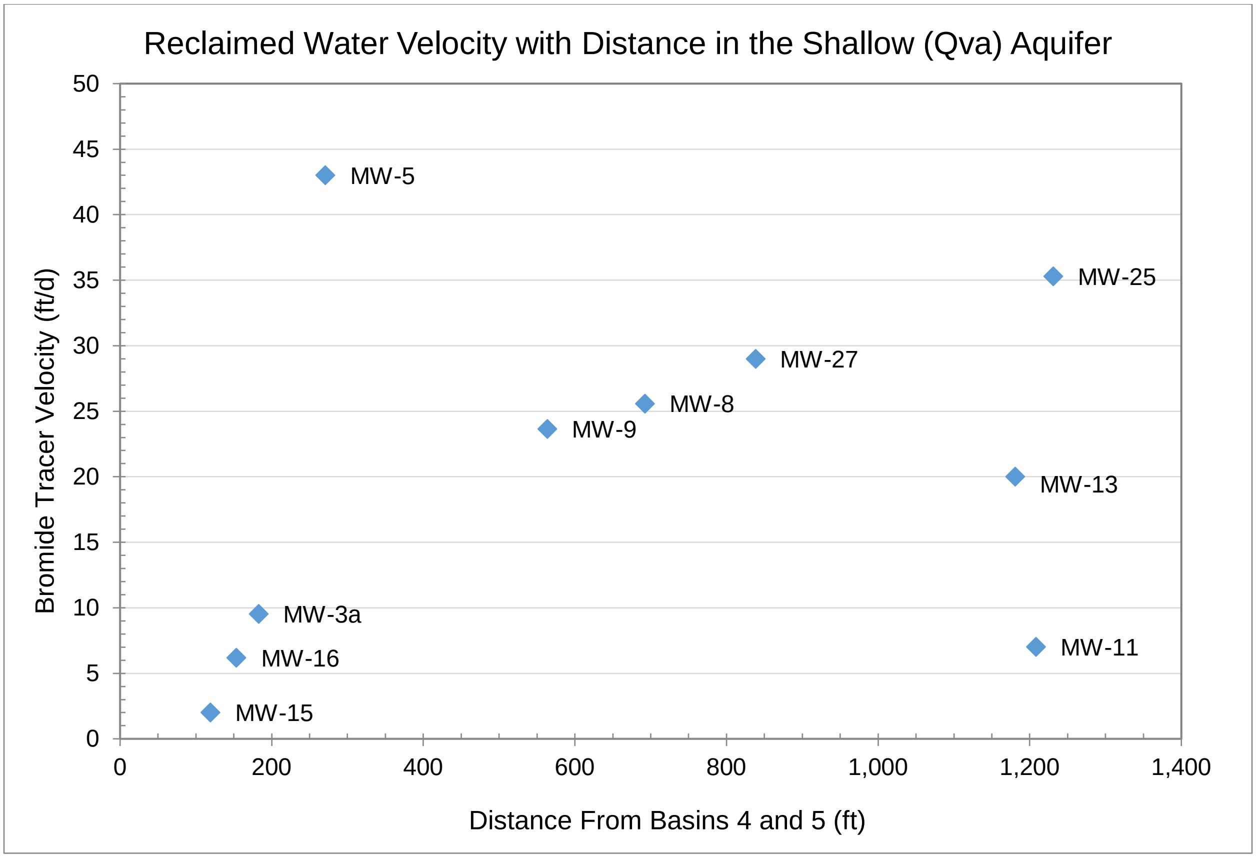
Note: Relative concentrations (C/Co) are calculated by dividing the observed concentration by the average introduced concentration of 28.28 mg/L in reclaimed water.

Figure 8-8. Bromide Concentrations through the Kitsap Formation MW-13 and MW-12



Note: Relative concentrations (C/Co) are calculated by dividing the observed concentration by the average introduced concentration of 28.28 mg/L in reclaimed water.

Figure 8-9. Bromide Concentrations through the Kitsap Formation MW-3a and MW-14



Note: Reclaimed water velocity calculated from time of peak concentration of bromide

Figure 8-10. Observed Reclaimed Water Velocity with Distance from Point of Tracer Introduction

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9.0 Water Quality Monitoring Results

The purpose of monitoring water quality in conjunction with the tracer test was to add to the current understanding of the effectiveness of soil aquifer treatment of reclaimed water, particularly with respect to nutrients and residual chemicals that are infiltrated at the Hawks Prairie property. By examining the local area water quality in relation to the reclaimed water flow path, the fate of residual chemicals introduced through infiltration of reclaimed water can be better understood.

Tabular summaries of all water quality data are provided in **Appendix B**. Associated lab reports may be found in **Appendix C**. The sections below highlight key findings from analysis of the data.

9.1 Reclaimed Water Quality

Reclaimed water quality was fairly consistent throughout the monitoring period. **Table 9-1** provides a summary of key water quality parameters. DO was typically above 5.0 mg/L. TOC averaged 5.8 mg/L, while biodegradable dissolved organic carbon (BDOC) averaged 0.7 mg/L. These values are consistent with previous monitoring of reclaimed water quality in 2014 and 2015 (HDR 2017c).

Nitrate ranged from 0.7 to 2.1 mg/L, averaging 1.5 mg/L. This is lower than the nitrate values observed during previous monitoring (2014 and 2015), when nitrate levels were in the 5 to 7 mg/L range. This reflects modifications to MWRWP operations made subsequent to the 2014/2015 monitoring aimed at maintaining nitrate concentrations below 5 mg/L. Orthophosphate averaged 3.0 mg/L, consistent with the 2014/2015 data.

Reclaimed water temperature influences soil temperature, as can be seen in **Figures 9-1a** and **9-1b.** The influence of reclaimed water temperature on soil temperature is observed to decrease with depth. The shallowest (10-foot) monitoring point had higher temperatures compared to the deeper 25- and 50-foot samples. The shallower monitoring point is more reflective of the reclaimed water temperature, and as the water moves through the vadose zone it cools (soil acts to buffer the temperature). Reclaimed water and soil ttemperature (at all three depths) is highest during the summer months, peaks in August, and is at the lowest temperature in January and February. The shift in temperature reflects ambient air temperature conditions, where the warmer summer months results in a warmer temperature of reclaimed water entering the basins.

9.2 Carbon and Nutrients

Organic carbon and nutrient concentrations are often examined as a means of evaluating the effectiveness of soil aquifer treatment, particularly through the vadose zone. **Figure 9-2** through **Figure 9-5** depict the concentrations of key carbon and nutrient parameters during the quarterly monitoring events, at select locations in the downgradient flow path of reclaimed water, as determined from the tracer study, including the lysimeters and nearby groundwater wells that are organized from left to right in the figures based on increasing travel time from the point of recharge.

The lysimeter data are inconsistent and do not reflect the types of trends that were expected, with concentrations of some parameters being higher than those observed in reclaimed water. For example, the nitrate concentrations in the East 10-foot depth lysimeter were markedly higher than those in reclaimed water, at 5.4, 14.0, and 7.7 mg/L for Quarters 1, 3, and 4, respectively. One potential explanation for this is that nitrate concentrations can become elevated in lysimeter samples as a consequence of wet/dry cycle operation. Organic nitrogen is converted to ammonia when organic compounds biodegrade. This is observed, for example, by the presence of ammonia detected in the West 25-foot and 50-foot lysimeters during the June quarterly sampling event (i.e., quarter 3). During a wetting cycle, there is insufficient oxygen present for nitrification to convert the ammonia to nitrate. The ammonia will accumulate on clays that have significant cation exchange capacity. During a subsequent drying cycle, the adsorbed ammonia is nitrified when sufficient oxygen becomes present and the produced nitrate does not move as there is no flow. The next wetting cycle flushes the mobile nitrate, with lysimeters then often having nitrate concentrations much higher than the influent nitrate concentration. While this explanation for elevated nitrate concentrations has been observed at other soil aquifer treatment evaluation sites, similar anomalies observed with other parameters (e.g., some of the residual chemicals) do not have a clear explanation at this time. It is noted that the monitoring plan was not developed to sample the same “slug” of water as it moved through the vadose zone, so some variability may be attributed to the variability in reclaimed water quality as it enters the infiltration basins.

That said, by the time reclaimed water reaches the saturated groundwater zone immediately downgradient of Basins 4 and 5 (i.e., in Wells MW-5 and MW-3a), water quality changes are observed. TOC decreases by approximately 50 percent, from an average of 5.8 mg/L in reclaimed water to an average of 2.9 mg/L in groundwater at MW-5, reflecting attenuation through the vadose zone likely as a result of biodegradation and sorption. The degree of dilution that contributes to this decrease will be further evaluated in the modeling work. BDOC decreases by approximately 20 percent, from an average of 0.76 mg/L in reclaimed water to an average of 0.61 mg/L at MW-5, further indication of biodegradation. Orthophosphate decreases from an average of 3.6 mg/L in reclaimed water to an average of 2.1 mg/L at MW-5, likely as a result of sorption within the vadose zone.

9.3 Residual Chemicals

The primary focus of this effort is to better understand the fate and transport of residual chemicals that are introduced to the subsurface through the infiltration of reclaimed water. Of the 113 residual chemicals analyzed, including per- and polyfluoroalkyl substances (PFAS), 60 were detected at least once in reclaimed water (prior to entering the basins) throughout the four quarterly sampling events, as identified in **Table 9-2**. **Table 9-3** summarizes the 24 residual chemicals that were consistently detected in reclaimed water in all quarterly sampling events.

These results are consistent with previous monitoring of reclaimed water quality (HDR 2017c). Observed differences include:

- Ten of the chemicals detected in all sampling events in 2018 were not detected consistently in all sampling events in the 2014–2015 monitoring. This includes four of the PFAS chemicals.

- Of the chemicals consistently detected in both the 2018 and 2014–2015 efforts, eight chemicals, including butalbital, carbamazepine, fluoxetine, iohexol, and primidone were detected at higher concentrations in the more recent monitoring effort. Conversely, metformin had lower concentrations in 2018 compared to the 2014-2015 effort. Five chemicals had similar concentrations in both efforts.

It is unknown if the observations of higher concentrations and a greater number of detected chemicals are a function of higher raw wastewater concentrations influent to the MWRWP (which in turn could be a result of increased loadings of the chemicals into the sewer system or reduced water usage by customers in the MWRWP service area), changes in MWRWP treatment performance (i.e., shorter Solids Retention Times [SRTs] compared to those during the 2014/2015 sampling), the general variability regarding the presence and concentration of such chemicals, or some combination of the above.

There are no available data with which to compare the concentrations of these chemicals in influent wastewater during these two time periods or to evaluate the general variability regarding chemical presence. There are data regarding SRT; however, it is limited to the June and August sampling time periods (i.e., SRTs of 23.6 days for June 6, and 18.7 days for August 11). The average SRT of these two time periods (21.2 days) is approximately 40 percent shorter than the average SRT observed at the MWRWP during the 2014/2015 sampling (36.5 days). This indicates that SRT may be a factor in the residual chemical removal efficiencies of the treatment processes at the MWRWP.

The analysis that follows focuses on the subset of residual chemicals that were most consistently detected during the quarterly monitoring events in 2018, as they are the ones that appear to be introduced the most into the subsurface via infiltration of reclaimed water.

Table 9-4 provides a summary of the quarterly monitoring results for the residual chemicals consistently detected in reclaimed water along the dominant reclaimed water flow path determined through the tracer test, both upgradient and downgradient of the Hawks Prairie site. **Figure 9-6a** through **Figure 9-6g** provides a graphical summary of results for select chemicals at key monitoring locations.

Observations from these data include:

- Residual chemicals were consistently not detected in groundwater upgradient of the Hawks Prairie site, in well MW-26, with the exception of sucralose, which was detected during one sampling event.
- As seen on **Figure 9-6a** through **Figure 9-6g**, there is clear decrease in the concentrations of residual chemicals by the time infiltrated reclaimed water reaches downgradient well MW-25, for which the tracer test determined to have a travel time of 37 days from the point of infiltration. Some residual chemicals, including 1,4-dioxane, carbamazepine, and TCEP, were not detected in MW-25. Others, such as acesulame-K, sucralose, and perfluoropentanoic acid, were observed in MW-25, but at markedly lower concentrations than in reclaimed water and in wells between the point of infiltration and MW-25.
- Rates of concentration decrease vary between the chemicals. A rapid decrease is seen in iohexol, with only small concentrations observed beyond 21 days of travel time. A more

gradual decrease is observed with the artificial sweeteners and 1,4-dioxane, likely due to these chemicals being more resistant to biodegradation. The concentrations of these chemicals in downgradient wells may also be influenced by septic systems.

Additional observations regarding residual chemicals detected in groundwater monitoring wells located outside of the flow path described above:

- MW-11. This well, located at the southwest corner of the Hawks Prairie property, has been monitored for presence of residual chemicals during previous efforts (e.g., see 2017c). Results from the Quarter 1 sampling event were similar to those from these previous efforts, so this well was not sampled during subsequent events in 2018, in order to use those sampling resources for other wells of interest (e.g., MW-28). As noted in Section 8.2, tracer was observed in this well, but after a long travel time of 260 days. The concentrations of certain residual chemicals in this well (e.g., 1,4-dioxane, primidone, PFAS, and the artificial sweeteners) are similar to those in wells that are closer to Basins 4 and 5 and that have significantly lower travel times (e.g., MW-8 and MW-9, at 30 and 27 days, respectively). By contrast, the concentrations of residual chemicals in all of these wells are markedly higher than those in MW-25, which has a travel time (37 days) similar to that of MW-8 and MW-9. This suggests that while the travel time to MW-11 may be much longer than that to MW-25, the effects of dilution may be significantly lower at this location than at MW-25. It is also noted that there are no septic systems identified as being upgradient of MW-11.
- MW-20 and MW-28. These wells, located to the southwest of the Hawks Prairie site, are likely in the downgradient flow path of infiltrated reclaimed water, but because no tracer was detected at these locations, they are either beyond the travel time evaluated in the tracer study or at a point where the effects of dilution are significant enough to render the tracers undetected. Only occasional detections, at low concentrations, of residual chemicals were observed in these wells. In MW-20, 4-nonylphenol was detected in two quarterly sampling events, while singular detections were observed of triclosan, NDMA, metformin, and caffeine. In MW-28, singular detections were observed of acesulfame-K, caffeine, 4-nonylphenol, and carbamazepine. It cannot be determined if these results reflect influence to a slight degree by infiltrated reclaimed water versus impacts imparted by other sources, such as from a background level of residual chemicals from surrounding septic systems.
- MW-14. This well is completed in the Sea-Level Aquifer underneath the Hawks Prairie site. As discussed in Section 8.2, tracer was detected in this well, indicating connectivity between the Shallow and Sea-Level Aquifer. Water quality data support that conclusion. Residual chemicals were detected in this well. Both artificial sweeteners were detected in all four quarterly sampling events. Relatively high concentrations (i.e., meaning, similar to concentrations in some Shallow Aquifer wells) of acesulfame-K were observed in Quarters 1 and 2, while much lower concentrations were observed in Quarters 3 and 4. Sucralose concentrations in this well were markedly lower than those observed in Shallow Aquifer wells. 1,4-dioxane and NDMA were detected in three of the four sampling events. Other chemicals detected at least once include caffeine, primidone, and some of the PFAS chemicals. While this supports the conclusion that Shallow Aquifer water is in communication with the Sea-Level Aquifer, it cannot be determined if the sole source of residual chemicals is reclaimed water infiltration or if this deeper aquifer water is also

potentially influenced by other sources of such chemicals located further upgradient (i.e., to the west of the Hawks Prairie site).

9.4 Other Parameters

A wide range of additional parameters were analyzed during this effort. All data are presented in the tabular summary in **Appendix B**. Summaries are provided below.

Disinfection Byproducts

Disinfection byproducts (DBPs) were observed in reclaimed water, likely a result of added chlorine reacting with organic matter in the treated wastewater. Total THMs ranged from 40 to 65 μg/L, consisting mainly of chloroform and bromodichloromethane. One reclaimed water sample in the second quarterly event had an outlier (low) total THM concentration of 9.7 μg/L. HAAs ranged from 20 to 71 μg/L, with a single non-detect in the first event. DBP concentrations decreased as reclaimed water reached the lysimeters, and decreased even more at the wells. DBP concentrations were fairly consistent at sampling points among the events. Chloroform is the most persistent DBP.

Volatile Organic Compounds

The full suite of analytes included in EPA Methods 524.2 (VOCs) was analyzed. One detection was observed in reclaimed water of the pesticide, trans-1,3-dichloropropene, at 0.52 μg/L in Quarter 3. One detection was observed in a lysimeter but not in reclaimed water of the solvent, dichloromethane, at 0.56 μg/L, in Quarter 1.

Metals

Metals analyzed by EPA Method 200.7, such as calcium, iron, and magnesium, were consistently detected in reclaimed water at concentrations typical of Class A reclaimed water. Concentrations from event to event in reclaimed water, lysimeters, and wells were generally consistent. Dissolved metals were detected in reclaimed water as analyzed for in EPA Method 200.8 include copper, manganese, and zinc with average concentrations of 6.0 μg/L, 4.8 μg/L, and 88.3 μg/L, respectively.

Mercury, the only metal analyzed in EPA method 245.1, was not detected in any sampling event. Iron, arsenic, chromium, manganese, and nickel were measured above drinking and groundwater quality standards in lysimeters during the Quarter 4 sampling event.

Table 9-1. Reclaimed Water Quality

	Q1 1/2018	M2 2/2018	M3 3/2018	Q2 4/2018	M5 5/2018	Q3 6/2018	M7 7/2018	Q4 8/2018	M9 9/2018	M10 10/2018	Average
Temp (°C)	13.2	No data	No data	No data	No data	No data	No data	23.6	22.5	21.5	20.2
Dissolved oxygen (mg/L)	5.9	No data	No data	No data	No data	No data	No data	5.0	4.8	5.0	5.2
Total organic carbon (mg/L)	5.5 J	5.6	6.3	5.1	6.1	6.6	5.9	5.5	6.0	5.8	5.8
Biodegradable dis. org. carbon (mg/L)	0.6 J	0.5	0.5	0.6	0.8	1.1	0.6	0.6	0.5 J+	1.0	0.7
Total nitrogen[a] (mg/L)	2.2	2.4	2.8	3.1	2.9	1.7	2.5	2.1	0.9	2.3	2.3
Nitrate[b] (mg/L)	1.5 J	1.7	1.7	2.1	0.7	1.0	2.0	2.1	0.9	1.5	1.5
Orthophosphate (mg/L)	5.1 J	1.3	0.5	3.3	0.2	2.1	4.4	3.9	2.9	6.6	3.0

Notes:

Q = Quarterly monitoring event; M = Monthly monitoring event

Concentrations are the average of 2 reclaimed water samples taken per sampling event.

[a] Sum of TKN and nitrate and nitrite as nitrogen

[b] Nitrate as nitrogen

Table 9-2. Residual Chemicals Detected in Reclaimed Water In At Least One Sampling Event

ANALYTE	Units	MRL	Q1 1/2018		Q2 4/2018		Q3 6/2018		Q4 8/2018	
			RW 1	RW 2	RW 1	RW 2	RW 1	RW 2	RW 1	RW 2
RESIDUAL CHEMICALS										
1,4-Dioxane	ug/L	0.07	0.7 J-	0.55	0.65	--	0.76	0.76	0.74	0.65
1,7-Dimethylxanthine	ng/L	10	ND UJ	17	*ND*	22	*ND*	*ND*	*ND*	*ND*
2,4-D	ng/L	5-25	ND UJ	*ND*	140	*ND*	29	27	*ND*	*ND*
4-nonylphenol - semi quantitative	ng/L	100-500	ND UJ	ND UJ	290 J	3100 J	ND UJ	ND UJ	ND UJ	170 J
Acesulfame-K	ng/L	20-100	ND UJ	440	130	350	180	150	220	150
Acetaminophen	ng/L	5-25	15 J-	160	47 J	12	*ND*	*ND*	*ND*	46
Albuterol	ng/L	5	ND UJ	8.5	10	*ND*	*ND*	*ND*	*ND*	*ND*
Atenolol	ng/L	5	52 J-	230	220	170	160	100	70	*ND*
Bromacil	ng/L	5	ND UJ	5.4	*ND*	*ND*	*ND*	*ND*	ND UJ	*ND*
Butalbital	ng/L	5-25	9.2 J-	*ND*	22	51	41	39	16	13
Caffeine	ng/L	10-50	ND UJ	*ND*	19	*ND*	*ND*	*ND*	*ND*	*ND*
Carbadox	ng/L	5	ND UJ	14	*ND*	*ND*	*ND*	*ND*	ND UJ	*ND*
Carbamazepine	ng/L	5-25	55 J-	330	410 J	160	580	530	730	680
Carisoprodol	ng/L	5	9.6 J-	52	16	37	8.5 J	18	14	18
Clofibric Acid	ng/L	5-25	ND UJ	*ND*	120	50	35	33	*ND*	*ND*
Cotinine	ng/L	10	ND UJ	40	*ND*	*ND*	16	17	27	28
Cyanazine	ng/L	5	ND UJ	9.3	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
DEET	ng/L	10-50	14 J-	22	*ND*	12	55	48	100	48
Diazepam	ng/L	5	ND UJ	*ND*	*ND*	5.4	*ND*	*ND*	*ND*	*ND*
Diclofenac	ng/L	5-25	ND UJ	*ND*	240	*ND*	*ND*	5.7	*ND*	*ND*
Dilantin	ng/L	20	33 J-	130	84	70	89	95	43	48
Diltiazem	ng/L	5	ND UJ	370	20	*ND*	*ND*	*ND*	5.1 J	*ND*
Diuron	ng/L	5	7 J-	24	34	30	54	49	100	*ND*
Erythromycin	ng/L	10	ND UJ	15	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Ethinyl Estradiol - 17 alpha	ng/L	5	ND UJ	*ND*	*ND*	*ND*	*ND*	*ND*	64	37
Fluoxetine	ng/L	10	36 J-	180	210	210	150	130	180	190
Gemfibrozil	ng/L	5-25	ND UJ	*ND*	38	*ND*	*ND*	*ND*	6.1	*ND*
Ibuprofen	ng/L	10	ND UJ	*ND*	180	310	220	320	16	24
Iohexol	ng/L	100	4000 J-	730	1500 J	180	530	760	*ND*	1200
Iopromide	ng/L	5	ND UJ	*ND*	5.6	280	*ND*	*ND*	*ND*	*ND*
Lidocaine	ng/L	5	ND UJ	*ND*	540	*ND*	*ND*	14	ND UJ	*ND*
Lincomycin	ng/L	10	41 J-	76	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Linuron	ng/L	5	ND UJ	*ND*	*ND*	*ND*	*ND*	*ND*	5.4	6.9
Lopressor	ng/L	20	190 J-	450	730	*ND*	480	480	540 J	900
Meclofenamic Acid	ng/L	5	ND UJ	*ND*	300	*ND*	*ND*	5.7	8.6 J	*ND*
Meprobamate	ng/L	5	17 J-	70	91	390	8.1	9.7	30 J	8.4
Metformin	ng/L	5	66 J-	58	86	34	18	7.3	13	*ND*
N-Nitroso dimethylamine (NDMA)	ng/L	2	ND UJ	*ND*	5.1 J	4.4	*ND*	*ND*	2.7	3.4
Norethisterone	ng/L	5	ND UJ	*ND*	*ND*	5.9	*ND*	*ND*	*ND*	*ND*
OUST (Sulfameturon,methyl)	ng/L	5	11 J-	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Pentoxifylline	ng/L	5	ND UJ	*ND*	*ND*	6.2	*ND*	*ND*	ND UJ	*ND*
Primidone	ng/L	10-50	81 J-	310	270 J	120	490	470	280	930
Quinoline	ng/L	5	ND UJ	*ND*	*ND*	*ND*	*ND*	*ND*	14 J	*ND*
Salicylic Acid	ng/L	100-500	ND UJ	*ND*	*ND*	*ND*	130 J	*ND*	*ND*	*ND*
Sucralose	ng/L	100-500	50000 J-	58000 J+	21000	9400	70000	53000	90000	83000
Sulfadimethoxine	ng/L	5	17 J-	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Sulfamethoxazole	ng/L	5-25	ND UJ	*ND*	470	*ND*	*ND*	*ND*	36	*ND*
TCEP	ng/L	10	94 J-	*ND*	120	130	120 J	74	210	220
TCPP	ng/L	100	ND UJ	280	360	330	750	550	1000	1300
TDCPP	ng/L	100	2000 J-	1300	180	260	270	270	450	490
Theobromine	ng/L	10-50	ND UJ	15	*ND*	62	*ND*	*ND*	*ND*	*ND*
Theophylline	ng/L	20	ND UJ	ND UJ	ND UJ	43 J	43 J	ND UJ	ND UJ	95
Thiabendazole	ng/L	5	5.5 J-	*ND*	43	89	*ND*	*ND*	16 J	17
Triclosan	ng/L	10	ND UJ	*ND*	12 J	*ND*	80 J	81	80 J	65
Trimethoprim	ng/L	5	ND UJ	*ND*	57 J	*ND*	*ND*	*ND*	*ND*	*ND*
PFAS										
Perfluoro octanoic acid - PFOA	ng/L	5	15 J-	13	20 J	19	13	11	13	16
Perfluoro-1-butanesulfonate	ng/L	5	9.6 J-	9.5	8.3	8.8	9.1	9.1	13	13
Perfluoro-1-butanesulfonic acid	ng/L	5	9.6 J-	9.5	7	8.3	8.4	8.3	12	13
Perfluoro-n-hexanoic acid	ng/L	5	46 J-	46	32	67	26	47	26	72
Perfluoropentanoic acid	ng/L	5-25	62 J-	64	50	130	52	96	53	150

Notes:

Q = Quarterly sampling event; RW = Reclaimed Water

Data Qualifiers: J = estimated value; J+ = estimated value, biased high; J- = Estimated Value, biased low; UJ = non-detect (estimated)

Table 9-3. Residual Chemicals Consistently Detected in Reclaimed Water

ANALYTE	Unit	MRL	Q1 1/2018		Q2 4/2018		Q3 6/2018		Q4 8/2018		Average[a]	Concentration Range Previously Reported[b,c]
			RW 1	RW 2	RW 1	RW 2	RW 1	RW 2	RW 1	RW 2		
RESIDUAL CHEMICALS												
1,4-Dioxane	µg/L	0.07	0.7 J-	0.55	0.65	--	0.76	0.76	0.74	0.65	0.7	0.71–0.73
Acesulfame-K	ng/L	20–100	*ND* UJ	440	130	350	180	150	220	150	205	180–850
Atenolol	ng/L	5	52 J-	230	220	170	160	100	70	*ND*	126	36–110
Butalbital	ng/L	5–25	9.2 J-	*ND*	22	51	41	39	16	13	24.5	7.3–11
Carbamazepine	ng/L	5–25	55 J-	330	410 J	160	580	530	730	680	434	190–300
Carisoprodol	ng/L	5	9.6 J-	52	16	37	8.5 J	18	14	18	21.6	N/A
DEET	ng/L	10–50	14 J-	22	*ND*	12	55	48	100	48	39	N/A
Dilantin	ng/L	20	33 J-	130	84	70	89	95	43	48	74	N/A
Diuron	ng/L	5	7 J-	24	34	30	54	49	100	*ND*	38	N/A
Fluoxetine	ng/L	10	36 J-	180	210	210	150	130	180	190	161	35–65
Iohexol	ng/L	100	4000 J-	730	1500 J	180	530	760	*ND*	1200	1125	240–860
Lopressor	ng/L	20	190 J-	450	730	*ND*	480	480	540 J	900	474	190–290
Meprobamate	ng/L	5	17 J-	70	91	390	8.1	9.7	30 J	8.4	78.0	N/A
Metformin	ng/L	5	66 J-	58	86	34	18	7.3	13	*ND*	35.9	61–2600
Primidone	ng/L	10–50	81 J-	310	270 J	120	490	470	280	930	369	64–190
Sucralose	ng/L	100–500	50000 J-	58000 J+	21000	9400	70000	53000	90000	83000	54300	35000–68000
TCEP	ng/L	10	94 J-	*ND*	120	130	120 J	74	210	220	122	39–130
TCPP	ng/L	100	*ND* UJ	280	360	330	750	550	1000	1300	584	200–560
TDCPP	ng/L	100	2000 J-	1300	180	260	270	270	450	490	653	N/A
PFAS												
Perfluoro octanoic acid: PFOA	ng/L	5	15 J-	13	20 J	19	13	11	13	16	15.0	N/A
Perfluoro-1-butanesulfonate	ng/L	5	9.6 J-	9.5	8.3	8.8	9.1	9.1	13	13	10.1	N/A
Perfluoro-1-butanesulfonic acid	ng/L	5	9.6 J-	9.5	7	8.3	8.4	8.3	12	13	9.5	N/A
Perfluoro-n-hexanoic acid	ng/L	5	46 J-	46	32	67	26	47	26	72	45.3	18–81
Perfluoropentanoic acid	ng/L	5–25	62 J-	64	50	130	52	96	53	150	82.1	N/A

Notes: Q = Quarterly sampling event; RW = Reclaimed Water.

[a] Non-detect values were assumed to be the MRL value for averaging.

[b] Data from Table 5-10 in Reclaimed Water Characterization Tech Memo (2017c). N/A indicates a parameter not present in the prior table.

[c] Chemicals present in the prior report that did not have detections in all quarters in this event are: Cotinine and Iopromide

Table 9-4. Residual Chemical Concentrations along the Groundwater Flow Path Upgradient and Downgradient from Hawks Prairie Site

ANALYTE	Units	MRL	MW-26				Reclaimed Water[1]				West B4 Lysimeter - 10 ft				West B4 Lysimeter - 25 ft			
			Q1 1/2018	Q2 4/2018	Q3 6/2018	Q4 8/2018	Q1 1/2018	Q2 4/2018	Q3 6/2018	Q4 8/2018	Q1 1/2018	Q2 4/2018	Q3 6/2018	Q4 8/2018	Q1 1/2018	Q2 4/2018	Q3 6/2018	Q4 8/2018
RESIDUAL CHEMICALS																		
1,4-Dioxane	ug/L	0.07	ND	--	ND	ND	0.6	0.7	0.8	0.7	0.39	0.65	0.75	0.63	0.49	0.59	0.65	0.69
Acesulfame-K	ng/L	20-100	ND	ND	ND	ND	230.0	240.0	165.0	185.0	440	79	ND	160	1000	100	ND	150
Atenolol	ng/L	5	ND	ND	ND	ND	141.0	195.0	130.0	37.5	100	130	97	ND	15	43	72	44
Butalbital	ng/L	5-25	ND	ND	ND	ND	7.1	36.5	40.0	14.5	10	16 J	27	9.5	9.6	6.7	29	20
Carbamazepine	ng/L	5-25	ND	ND	ND	ND	192.5	285.0	555.0	705.0	360	830	650	360	260	850	600	540
Carisoprodol	ng/L	5	ND	ND	ND	ND	30.8	26.5	13.3	16.0	29	22	15	6.8	14	24	21	10 J-
DEET	ng/L	10-50	ND	ND	ND	ND	18.0	11.0	51.5	74.0	35	ND	76	50	19	ND	67	120
Dilantin	ng/L	20	ND	ND	ND	ND	81.5	77.0	92.0	45.5	82	36	62	ND	34	34	47	ND UJ
Diuron	ng/L	5	ND	ND	ND	ND	15.5	32.0	51.5	52.5	5.7	25	73	23	6.6	25	90	47 J-
Fluoxetine	ng/L	10	ND	ND	ND	ND	108.0	210.0	140.0	185.0	ND	ND	ND	ND	ND	ND	ND	ND UJ
Iohexol	ng/L	100	ND	ND	ND	ND	2365.0	840.0	645.0	650.0	1100	340	400	260	430	200	520	350
Lopressor	ng/L	20	ND	ND	ND	ND	320.0	375.0	480.0	720.0	59	510	300	220	32	110	180	240
Meprobamate	ng/L	5	ND	ND	ND	ND	43.5	240.5	8.9	19.2	34	56	5.9	12	21	26	ND	10
Metformin	ng/L	5	ND	ND	ND	ND	62.0	60.0	12.7	9.0	ND	ND	ND	ND	ND	ND	ND	ND
Primidone	ng/L	10-50	ND	ND	ND	ND	195.5	195.0	480.0	605.0	210	ND	120	320	130	ND	160	320
Sucralose	ng/L	100-500	ND	160	ND	ND	54000.0	15200.0	61500.0	86500.0	56000 J+	12000	71000	90000	43000 J+	16000	92000	470000
TCEP	ng/L	10	ND	ND	ND	ND	52.0	125.0	97.0	215.0	240	190	140	160	ND	160	120	240 J-
TCPP	ng/L	100	ND	ND	ND	ND	190.0	345.0	650.0	1150.0	200	120	240	460	ND	ND	170	1100 J+
TDCPP	ng/L	100	ND	ND	ND	ND	1650.0	220.0	270.0	470.0	1300	100	ND	150	380	ND	ND	170
PFAS																		
Perfluoro octanoic acid - PFOA	ng/L	5	ND	ND	ND	ND	14.0	19.5	12.0	14.5	19	18 J	15 J	15	20	15	16 J	17
Perfluoro-1-butanesulfonate	ng/L	5	ND	ND	ND	ND	9.6	8.6	9.1	13.0	12	15	12	13	14	14	14	9.9
Perfluoro-1-butanesulfonic acid	ng/L	5	ND	ND	ND	ND	9.6	7.7	8.4	12.5	12	14 J	10	11	14	13	11	9
Perfluoro-n-hexanoic acid	ng/L	5	ND	ND	ND	ND	46.0	49.5	36.5	49.0	62	60	50	31	44	70	36	31
Perfluoropentanoic acid	ng/L	5-25	ND	ND	ND	ND	63.0	90.0	74.0	101.5	83	71	100	60	71	96	63	54

Table 9-4 (continued). Residual Chemical Concentrations along the Groundwater Flow Path Upgradient and Downgradient from Hawks Prairie Site

ANALYTE	Units	MRL	West B4 Lysimeter - 50 ft				East B4 Lysimeter - 10 ft				East B4 Lysimeter - 25 ft				East B4 Lysimeter - 50 ft			
			Q1 1/2018	Q2 4/2018	Q3 6/2018	Q4 8/2018	Q1 1/2018	Q2 4/2018	Q3 6/2018	Q4 8/2018	Q1 1/2018	Q2 4/2018	Q3 6/2018	Q4 8/2018	Q1 1/2018	Q2 4/2018	Q3 6/2018	Q4 8/2018
RESIDUAL CHEMICALS																		
1,4-Dioxane	ug/L	0.07	0.41	--	0.56	0.66	0.47	0.64	0.45	0.34	0.4	0.67	0.61	0.61	0.5	0.68	0.6	0.55
Acesulfame-K	ng/L	20-100	250	--	33	170	540	98	*ND*	110	420	180	*ND*	140	*ND*	200	31	180
Atenolol	ng/L	5	*ND*	--	5.5	25	110	120	30 J	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Butalbital	ng/L	5-25	*ND*	--	36	54	6.7	8.5	36	14	9.8	20	35	20	12	21	40	31
Carbamazepine	ng/L	5-25	430	--	570	610	310	810	550 J	470	370	520	630	750	360	610	530	480
Carisoprodol	ng/L	5	19	--	35	15	26	17	28	8.1	12	24	23	14	14	*ND*	30	13
DEET	ng/L	10-50	12	--	94	160	20	*ND*	130 J	500	19	*ND*	25	97	54	*ND*	19	63
Dilantin	ng/L	20	*ND*	--	31	*ND*	23	*ND*	20	*ND*	*ND*	*ND*	55	*ND*	*ND*	*ND*	*ND*	*ND*
Diuron	ng/L	5	20	--	*ND*	40	15	18	*ND*	*ND*	5	5.5	*ND*	24	*ND*	*ND*	*ND*	*ND*
Fluoxetine	ng/L	10	*ND*	--	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Iohexol	ng/L	100	54	--	320	410	340	500	*ND*	140	*ND*	*ND*	200	200	2200	*ND*	*ND*	100
Lopressor	ng/L	20	29	--	20	130	160	*ND*	340	110	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Meprobamate	ng/L	5	34	--	*ND*	7.3	57	*ND*	*ND UJ*	22	7.6	*ND*	5	28	41	*ND*	*ND*	12
Metformin	ng/L	5	*ND*	--	*ND*	*ND*	*ND*	*ND*	11 J-	*ND*	5.1 J	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Primidone	ng/L	10-50	70	--	240	260	240	*ND*	210	200	46	*ND*	310	330	120	*ND*	150	300
Sucralose	ng/L	100-500	69000	--	66000	92000	32000	21000	56000	66000	35000 J+	21000	72000	94000	66000	18000	64000	80000
TCEP	ng/L	10	120	--	130	150	*ND*	140	180	130	150	190	160	190	140 J+	110	140	140
TCPP	ng/L	100	150	--	180	480	*ND*	*ND*	350	1000	*ND*	110	170	1200	220	*ND*	110	490
TDCPP	ng/L	100	120	--	*ND*	140	300	*ND*	*ND UJ*	*ND*	1300	*ND*	*ND*	190	*ND R*	*ND*	*ND*	*ND*
PFAS																		
Perfluoro octanoic acid - PFOA	ng/L	5	13	17	12	13	11	15	7.2	ND	17	31	17	15	20	14	19	21
Perfluoro-1-butanesulfonate	ng/L	5	16	18	16	14	16	12	21	27	24	13	13	12	19	16	18	15
Perfluoro-1-butanesulfonic acid	ng/L	5	16	16	14	14	16	11	20	26	24	12	12	11	19	15	15	14
Perfluoro-n-hexanoic acid	ng/L	5	42	65	46	39	44	58	56	80	45	72	46	42	53	55	60	47
Perfluoropentanoic acid	ng/L	5-25	87	84	84	77	70	76	83	120	82	85	83	76	100	83	89	77

Table 9-4 (continued). Residual Chemical Concentrations along the Groundwater Flow Path Upgradient and Downgradient from Hawks Prairie Site

ANALYTE	Units	MRL	MW-5				MW-3a				MW-9				MW-27			
			Q1 1/2018	Q2 4/2018	Q3 6/2018	Q4 8/2018	Q1 1/2018	Q2 4/2018	Q3 6/2018	Q4 8/2018	Q1 1/2018	Q2 4/2018	Q3 6/2018	Q4 8/2018	Q1 1/2018	Q2 4/2018	Q3 6/2018	Q4 8/2018
RESIDUAL CHEMICALS																		
1,4-Dioxane	ug/L	0.07	0.49	--	0.69	0.61	0.44	0.61	0.67	0.55	0.39	--	0.49	0.49	0.26	--	0.29	0.3
Acesulfame-K	ng/L	20-100	100	110	*ND*	250	300	160	200	160	320	*ND*	180	170	290	380	170	180
Atenolol	ng/L	5	*ND*	*ND*	6.3	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Butalbital	ng/L	5-25	*ND*	23	33	19	9	23	48	22	6.3	23	24	20	ND	15	18	13
Carbamazepine	ng/L	5-25	350	640	760	680	340	500	690	520	260	*ND*	410	410	110	150	220	220
Carisoprodol	ng/L	5	25	16	22	*ND*	7.6	8	13	5.7	7.6	*ND*	12	*ND*	*ND*	*ND*	*ND*	*ND*
DEET	ng/L	10-50	18	*ND*	30	10	*ND*	*ND*	23	*ND*	13	*ND*	11	*ND*	*ND*	*ND*	*ND*	*ND*
Dilantin	ng/L	20	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Diuron	ng/L	5	22	21	56	23	5	8.5	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	ND	*ND*	*ND*	*ND*
Fluoxetine	ng/L	10	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	ND	*ND*	*ND*	*ND*
Iohexol	ng/L	100	97	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	21	*ND*	*ND*	*ND*	11	*ND*	*ND*	*ND*
Lopressor	ng/L	20	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Meprobamate	ng/L	5	36	18	*ND*	*ND*	5.4	17	ND	7.3	16	*ND*	*ND*	*ND*	*ND*	5.6	*ND*	*ND*
Metformin	ng/L	5	*ND*	*ND*	*ND*	*ND*	690	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	10	17	*ND*	*ND*	*ND*
Primidone	ng/L	10-50	120	*ND*	100	30	72	52	120	68	90	*ND UJ*	79	48	48	20	24	*ND*
Sucralose	ng/L	100-500	32000	14000	74000	82000	40000 J+	16000	69000	61000	24000	38000	49000	54000	22000	15000	27000	32000
TCEP	ng/L	10	170 J	170	130	120	*ND*	120	*ND*	100	*ND*	ND	96	76	*ND UJ*	48	22	22
TCPP	ng/L	100	*ND*	*ND*	160	280	*ND*	*ND*	170	260	*ND*	*ND*	*ND*	*ND*	*ND UJ*	*ND*	*ND*	*ND*
TDCPP	ng/L	100	380	*ND*	*ND*	120	260	*ND*	110	ND	140	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
PFAS																		
Perfluoro octanoic acid - PFOA	ng/L	5	15	14	14	15 J	18	17 J	18	14 J	14	17	11	13	11	11	11	9.4
Perfluoro-1-butanesulfonate	ng/L	5	14	17	20	23	20	15	17	18	15	15	15	16	8.1	10	9.5	12
Perfluoro-1-butanesulfonic acid	ng/L	5	14	16	18	22	20	13	15	16	15	13	12	15	8.1	9.9	8	9.9
Perfluoro-n-hexanoic acid	ng/L	5	57	61	49	48	51	62	50	43	44	56	42	37	32	35	27	28
Perfluoropentanoic acid	ng/L	5-25	93	94	92	94	90	72	93	75	80	87	61	63	58	46	46	38

Table 9-4 (continued). Residual Chemical Concentrations along the Groundwater Flow Path Upgradient and Downgradient from Hawks Prairie Site

ANALYTE	Units	MRL	MW-8				MW-25				MW-11			
			Q1 1/2018	Q2 4/2018	Q3 6/2018	Q4 8/2018	Q1 1/2018	Q2 4/2018	Q3 6/2018	Q4 8/2018	Q1 1/2018	Q2 4/2018	Q3 6/2018	Q4 8/2018
RESIDUAL CHEMICALS														
1,4-Dioxane	ug/L	0.07	0.4	--	0.59	0.61	*ND*	--	*ND*	*ND*	0.32	**N.S.**	**N.S**	**N.S**
Acesulfame-K	ng/L	20-100	340	340	60	200	*ND*	71	*49*	*64*	330	**N.S.**	**N.S**	**N.S**
Atenolol	ng/L	5	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	**N.S.**	**N.S**	**N.S**
Butalbital	ng/L	5-25	*ND*	23	36	27	*ND*	*ND*	*ND*	*ND*	*ND*	**N.S.**	**N.S**	**N.S**
Carbamazepine	ng/L	5-25	330	450	500	510	*ND*	*ND*	*ND*	*ND*	37	**N.S.**	**N.S**	**N.S**
Carisoprodol	ng/L	5	*ND*	5.6	12	7.7	*ND*	*ND*	*ND*	*ND*	*ND*	**N.S.**	**N.S**	**N.S**
DEET	ng/L	10-50	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	**N.S.**	**N.S**	**N.S**
Dilantin	ng/L	20	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	**N.S.**	**N.S**	**N.S**
Diuron	ng/L	5	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	**N.S.**	**N.S**	**N.S**
Fluoxetine	ng/L	10	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	**N.S.**	**N.S**	**N.S**
Iohexol	ng/L	100	11	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	**N.S.**	**N.S**	**N.S**
Lopressor	ng/L	20	ND	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	**N.S.**	**N.S**	**N.S**
Meprobamate	ng/L	5	5.2	15	*ND*	5.8	*ND*	*ND*	*ND*	*ND*	*ND*	**N.S.**	**N.S**	**N.S**
Metformin	ng/L	5	*ND*	*ND*	*ND*	9.6	*ND*	*ND*	*ND*	*ND*	*ND*	**N.S.**	**N.S**	**N.S**
Primidone	ng/L	10-50	65	*ND*	80	67	*ND*	*ND*	*ND*	*ND*	49	**N.S.**	**N.S**	**N.S**
Sucralose	ng/L	100-500	31000	21000	61000	72000	*3400*	4900	*5000*	*5000*	17000	**N.S.**	**N.S**	**N.S**
TCEP	ng/L	10	*ND*	130	88	98	*ND*	*ND*	*ND*	*ND*	*ND*	**N.S.**	**N.S**	**N.S**
TCPP	ng/L	100	*ND*	*ND*	*ND*	110	*ND*	*ND*	*ND*	*ND*	*ND*	**N.S.**	**N.S**	**N.S**
TDCPP	ng/L	100	280	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	**N.S.**	**N.S**	**N.S**
PFAS														
Perfluoro octanoic acid - PFOA	ng/L	5	19	16	18	14	*ND*	*ND*	*ND*	*ND*	29	**N.S.**	**N.S**	**N.S**
Perfluoro-1-butanesulfonate	ng/L	5	18	14	17	19	*ND*	*ND*	*ND*	*ND*	9.8	**N.S.**	**N.S**	**N.S**
Perfluoro-1-butanesulfonic acid	ng/L	5	18	13	13	18	*ND*	ND	*ND*	*ND*	9.8	**N.S.**	**N.S**	**N.S**
Perfluoro-n-hexanoic acid	ng/L	5	49	60	47	45	*ND*	ND	*5.6*	*ND*	32	**N.S.**	**N.S**	**N.S**
Perfluoropentanoic acid	ng/L	5-25	90	87	80	71	*8.2*	9.6	*9.3*	*5.9*	61	**N.S.**	**N.S**	**N.S**

Notes:

[a] Average of the 2 reclaimed water samples per quarter.

ND = not detected

N.S. = well was not sampled that quarter

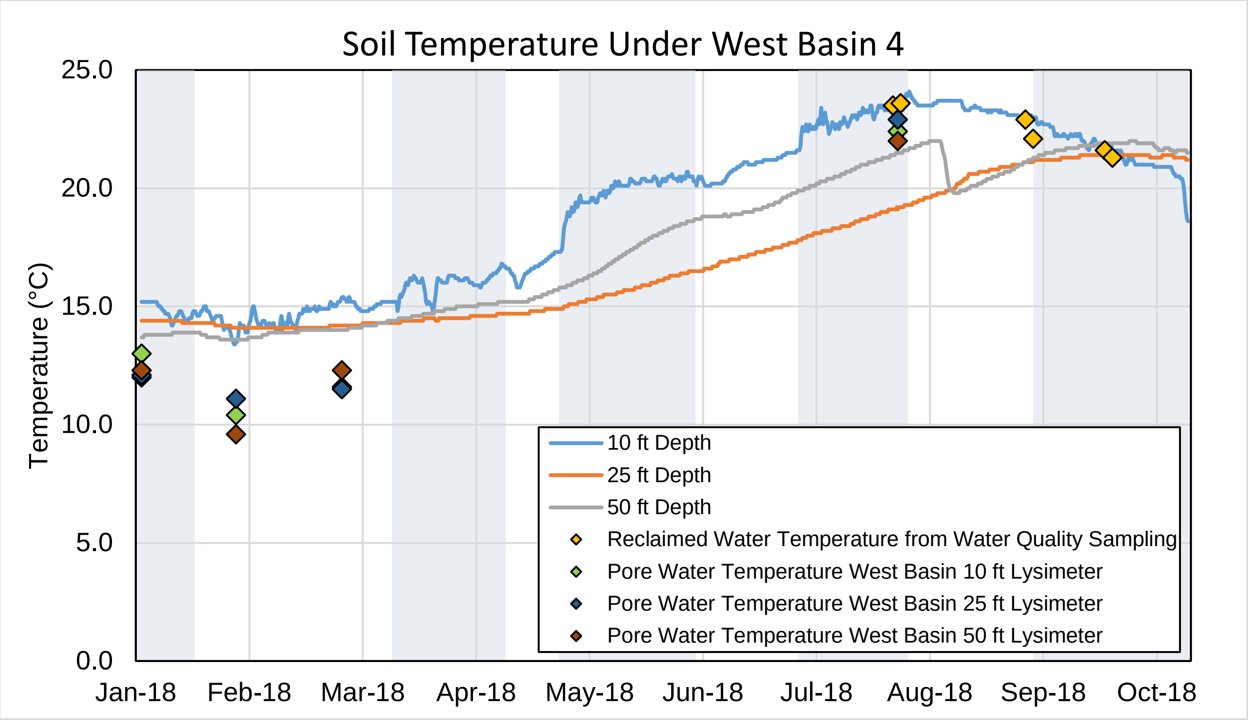


Figure 9-1a. Observed Temperature under West Basin 4

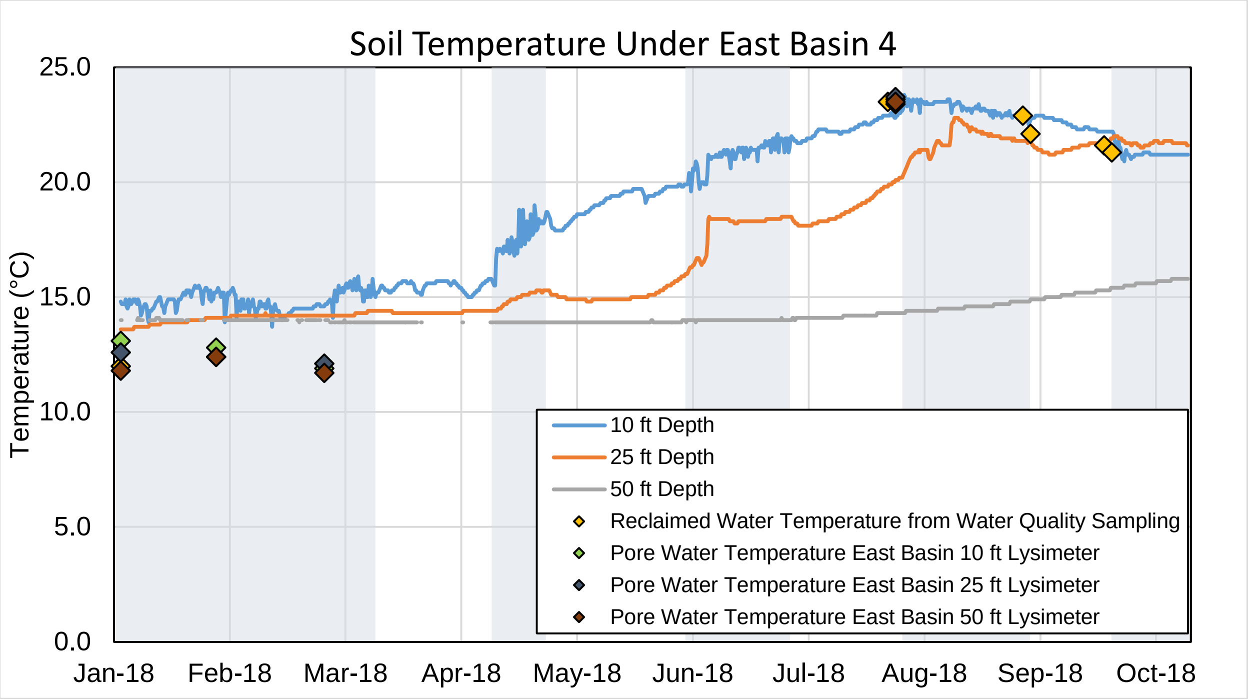
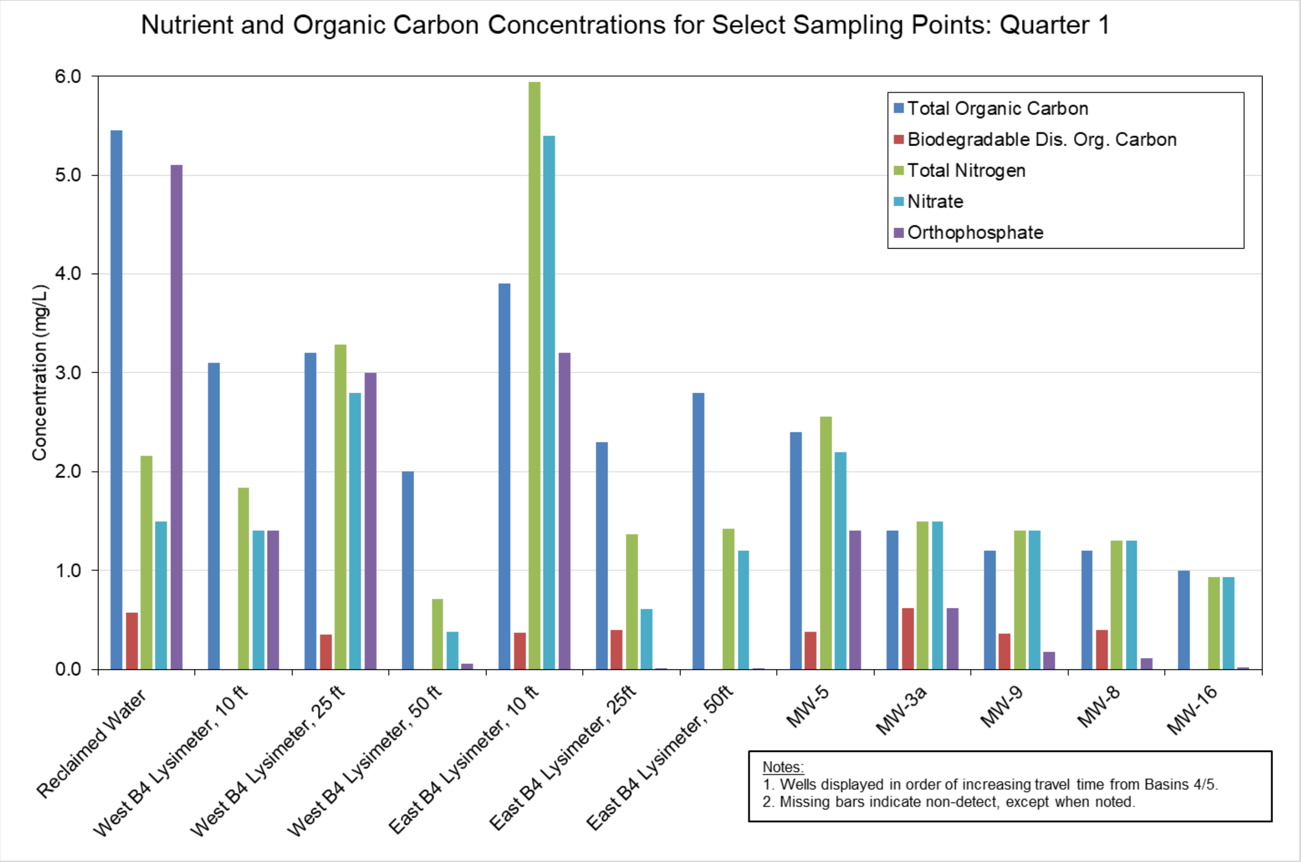


Figure 9-1b. Observed Temperature under East Basin 4



Notes:
1. Wells displayed in order of increasing travel time from Basins 4/5.
2. Missing bars indicate non-detect, except when noted.

Figure 9-2. Carbon and Nutrients: Quarter 1

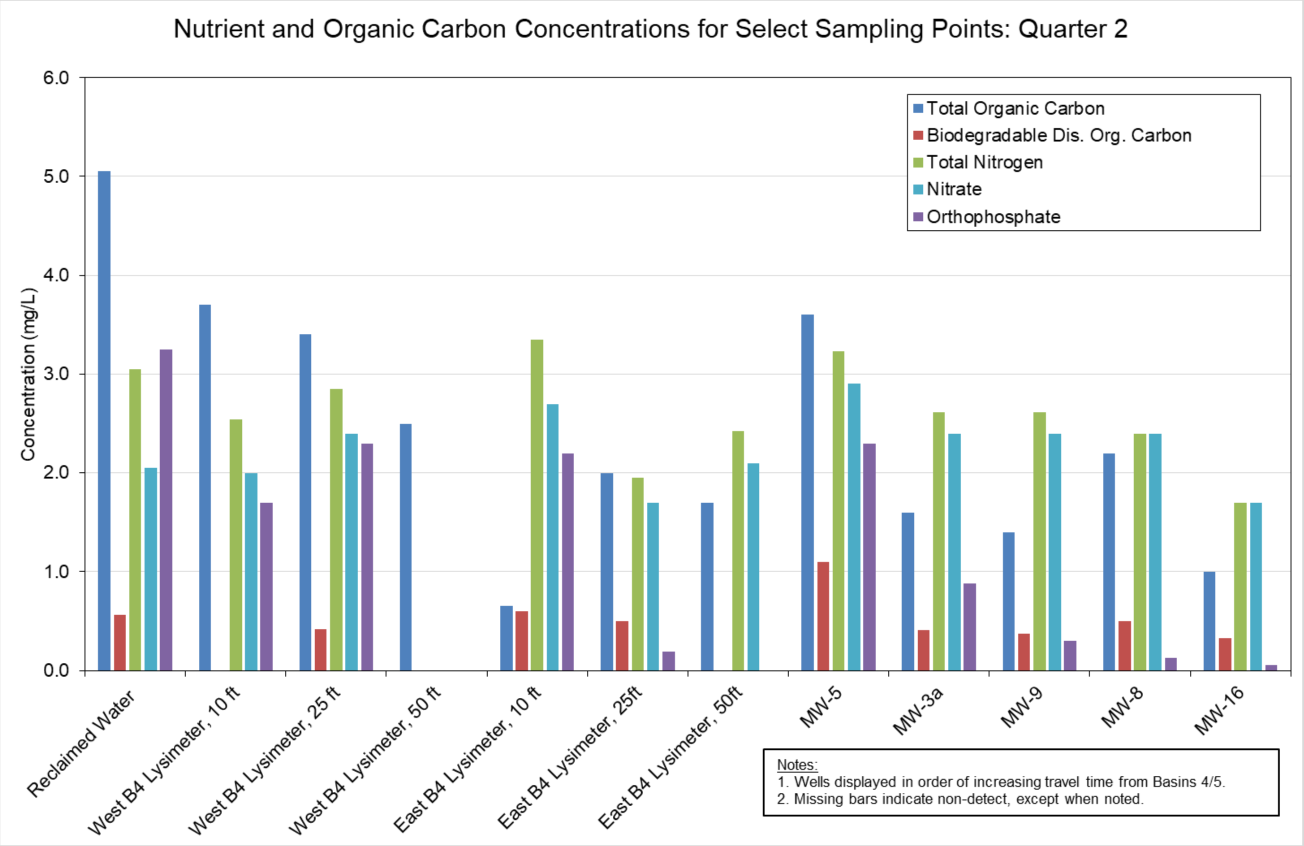
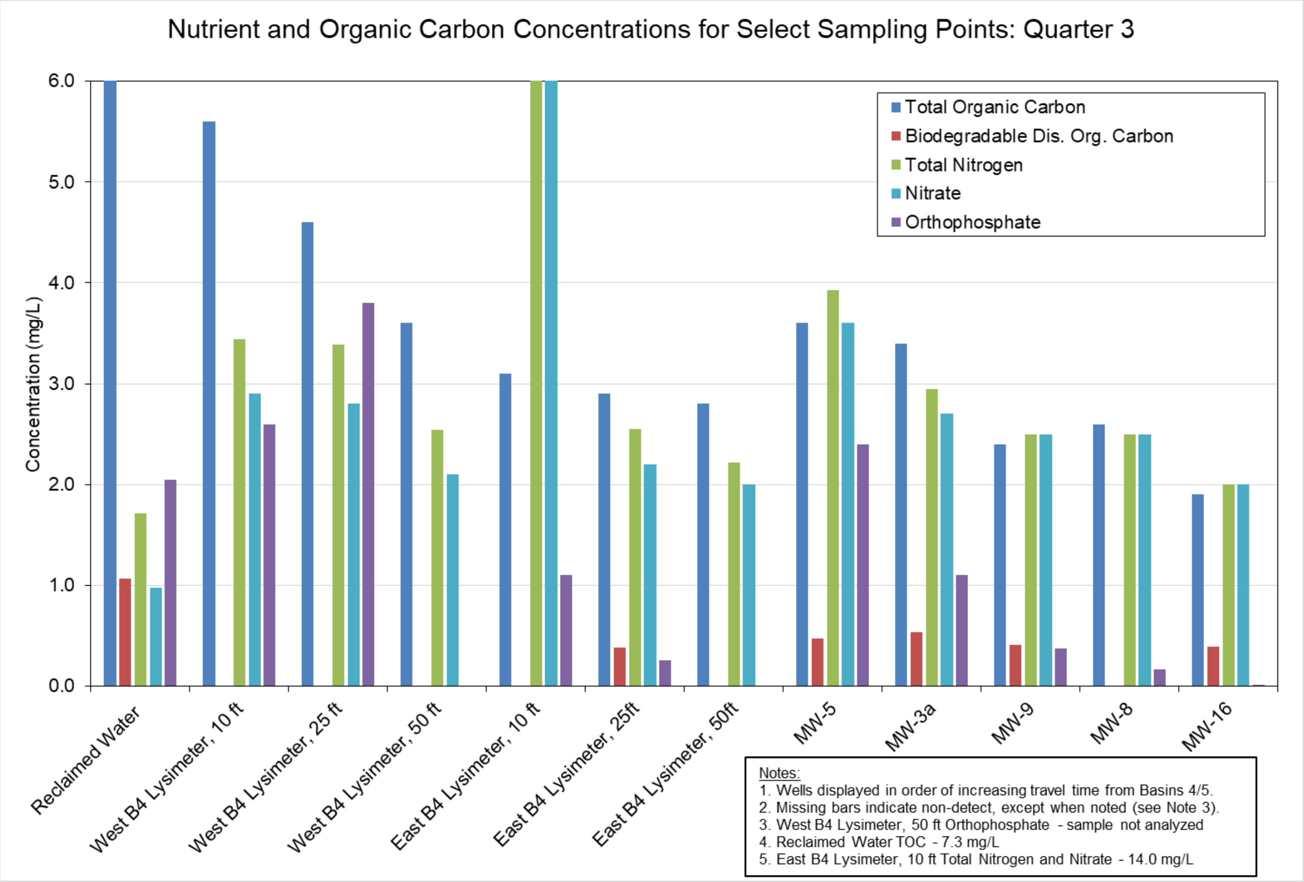
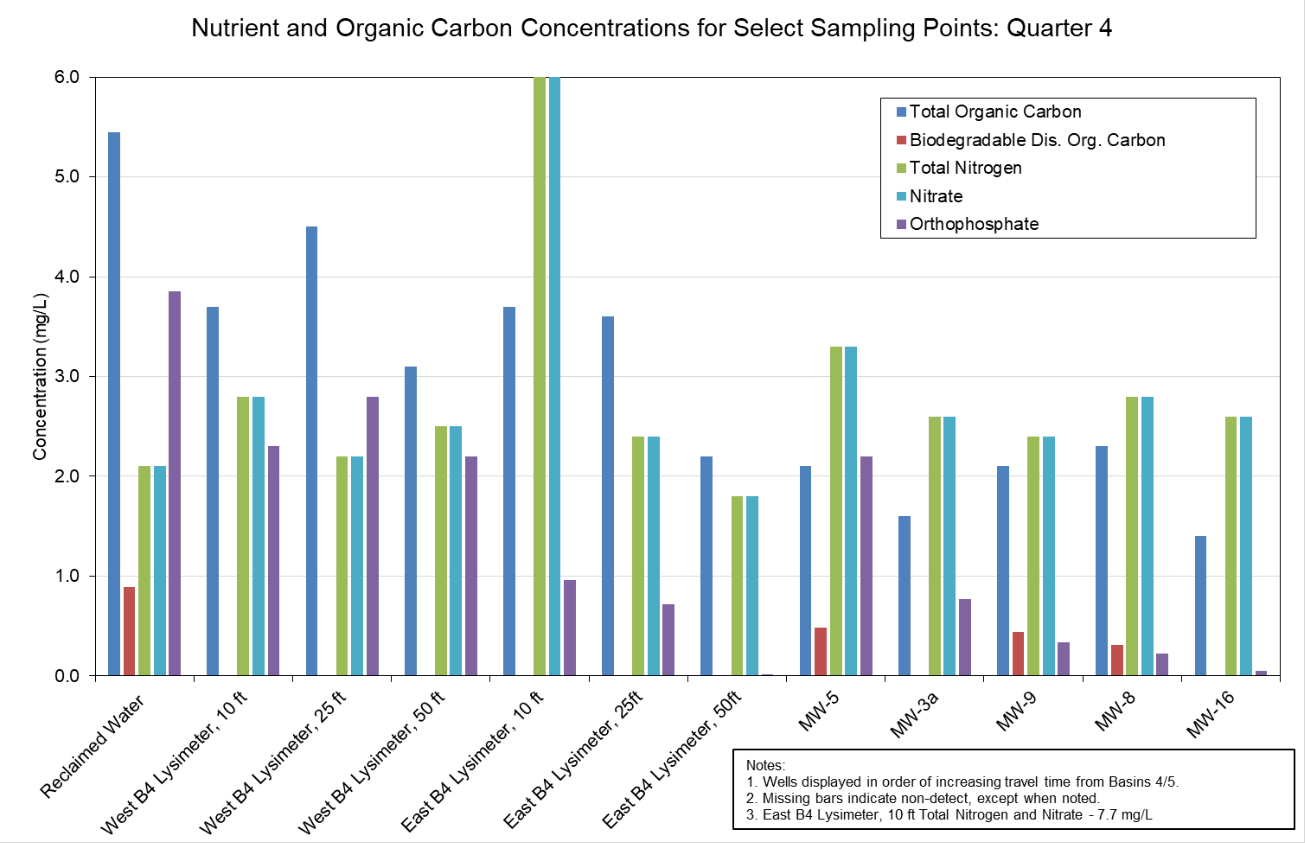


Figure 9-3. Carbon and Nutrients: Quarter 2



Notes:
1. Wells displayed in order of increasing travel time from Basins 4/5.
2. Missing bars indicate non-detect, except when noted (see Note 3).
3. West B4 Lysimeter, 50 ft Orthophosphate - sample not analyzed
4. Reclaimed Water TOC - 7.3 mg/L
5. East B4 Lysimeter, 10 ft Total Nitrogen and Nitrate - 14.0 mg/L

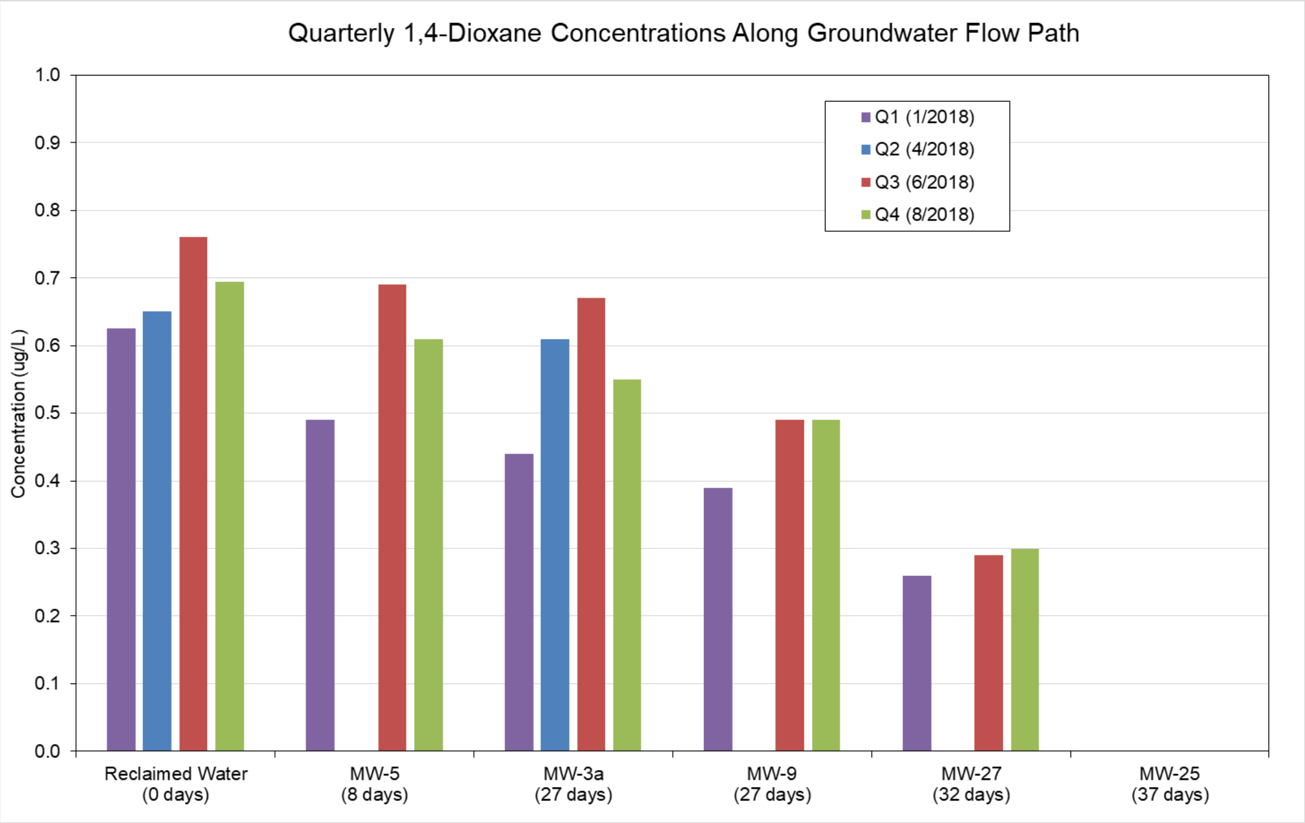
Figure 9-4. Carbon and Nutrients: Quarter 3



Nutrient and Organic Carbon Concentrations for Select Sampling Points: Quarter 4

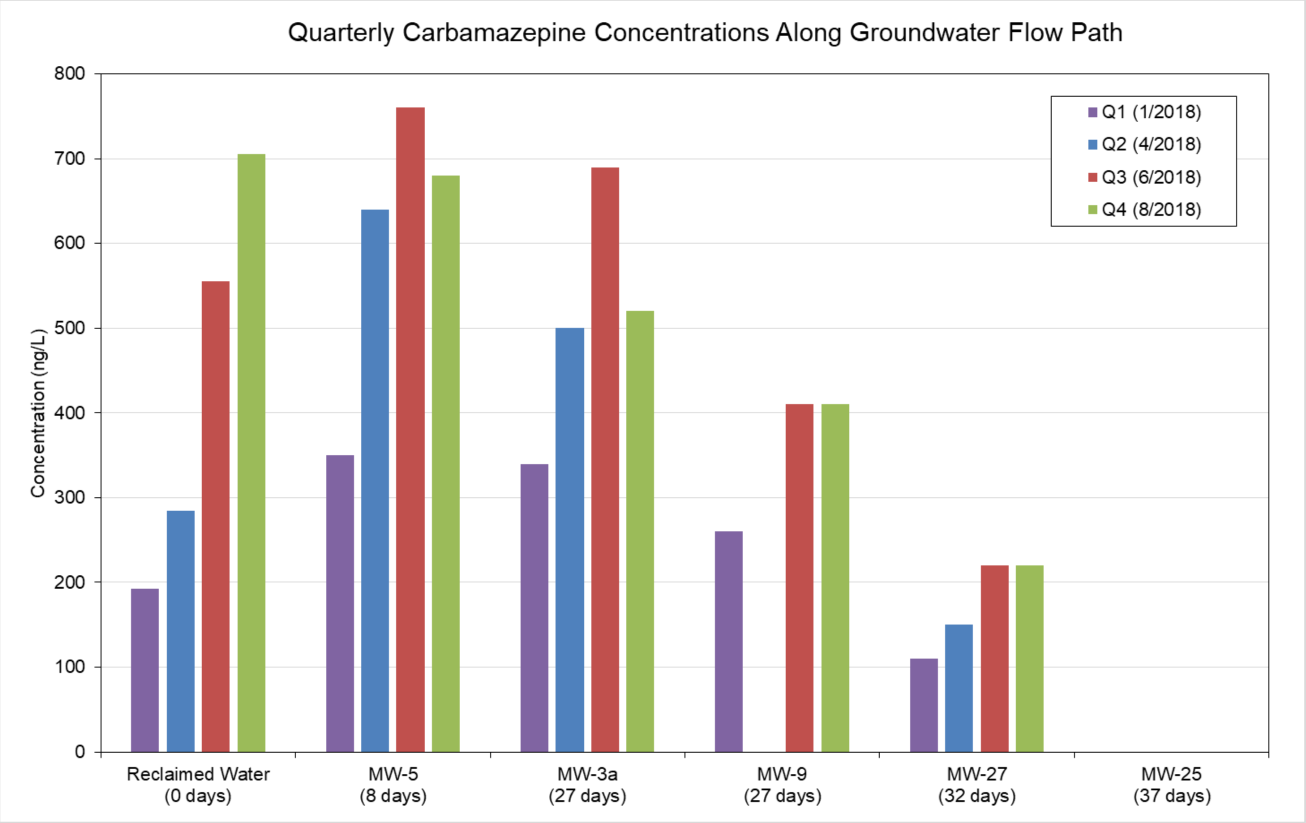
Notes:
1. Wells displayed in order of increasing travel time from Basins 4/5.
2. Missing bars indicate non-detect, except when noted.
3. East B4 Lysimeter, 10 ft Total Nitrogen and Nitrate - 7.7 mg/L

Figure 9-5. Carbon and Nutrients: Quarter 4



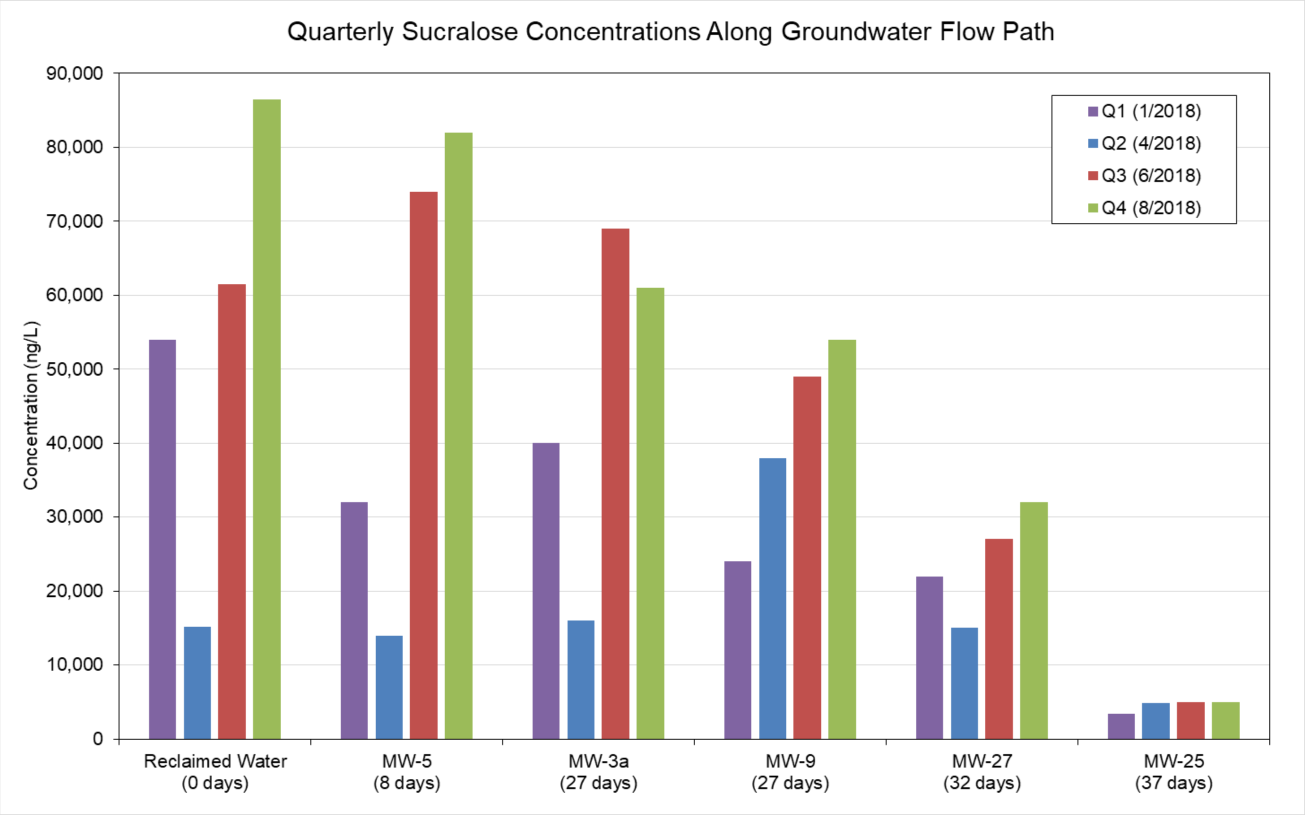
Note: Days represent time of peak concentration from start of tracer test.

Figure 9-6a. Quarterly 1,4-Dioxane Concentrations Along Groundwater Flow Path



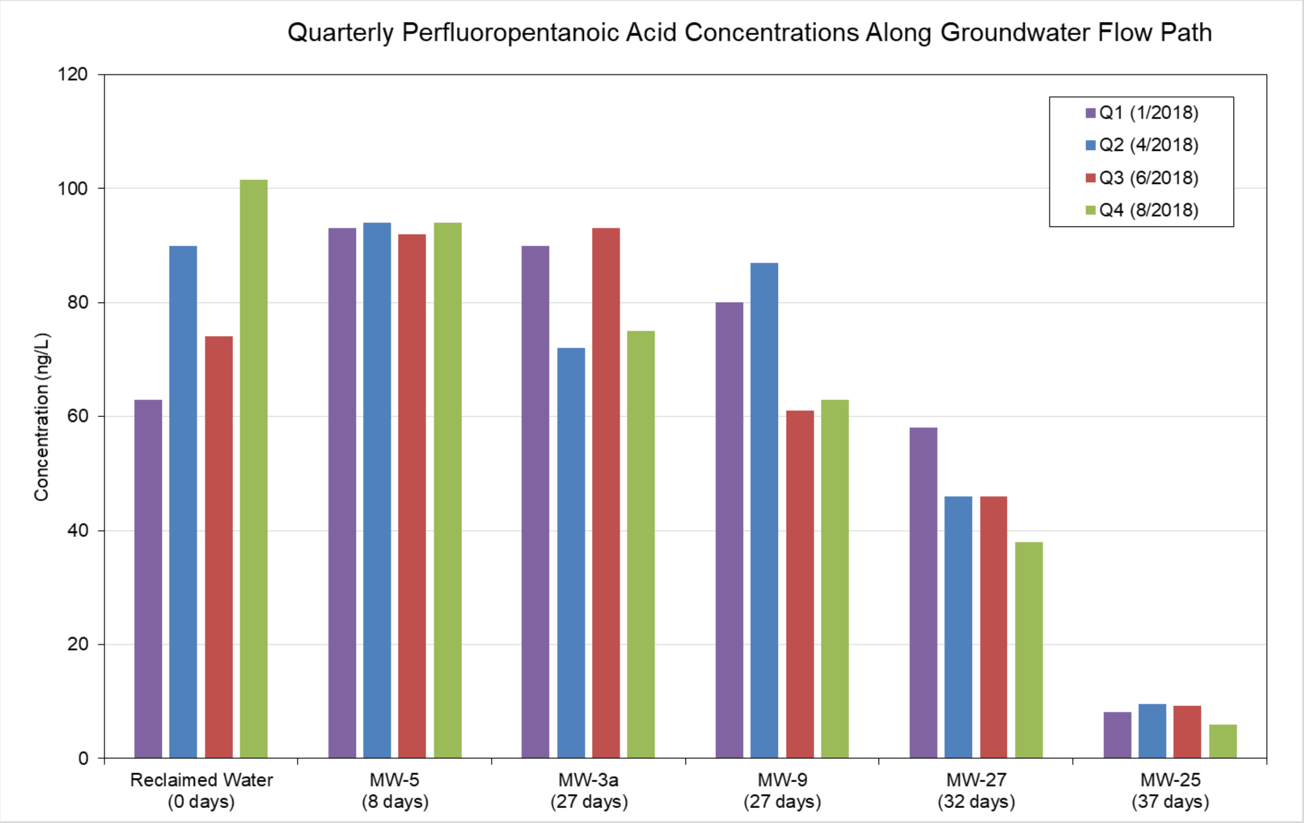
Note: Days represent time of peak concentration from start of tracer test.

Figure 9-6b. Quarterly Carbamazepine Concentrations Along Groundwater Flow Path



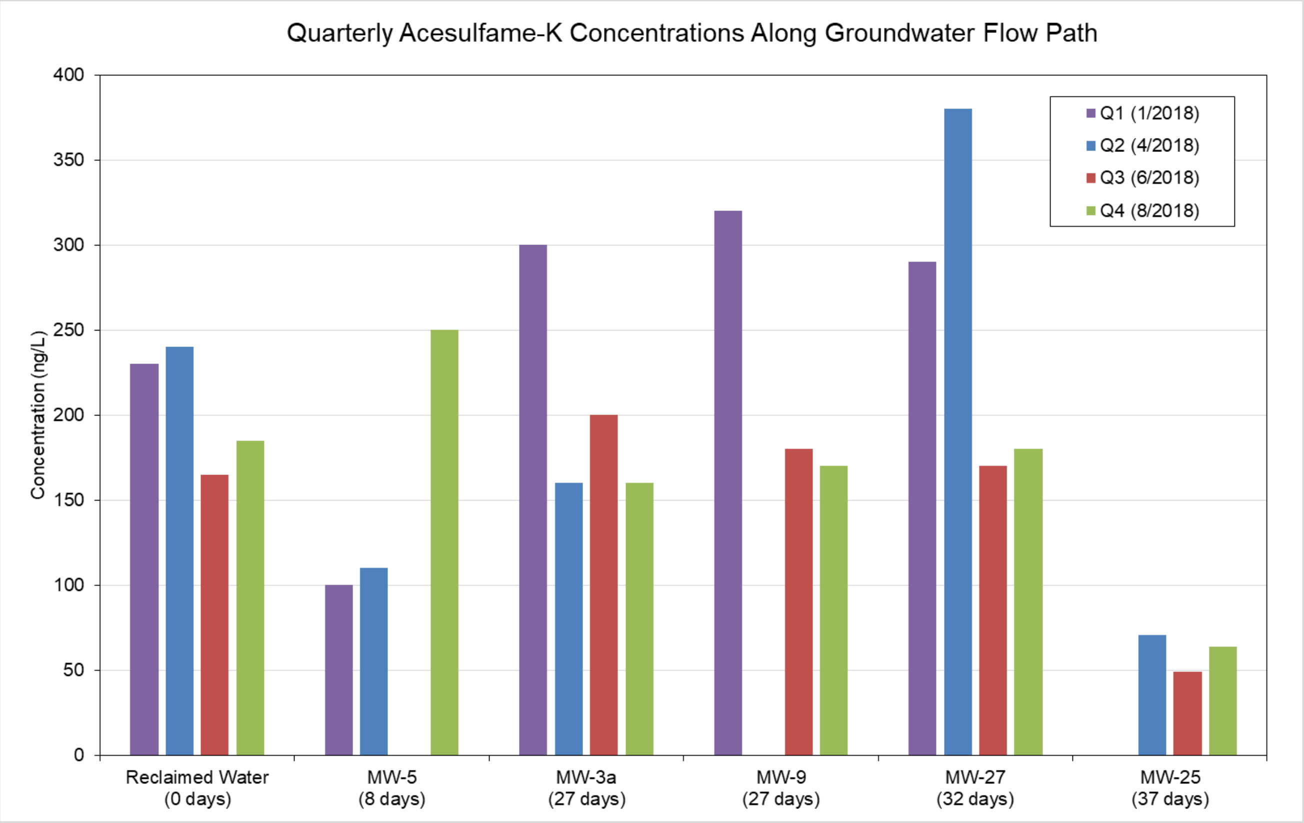
Note: Days represent time of peak concentration from start of tracer test.

Figure 9-6c. Quarterly Sucralose Concentrations Along Groundwater Flow Path



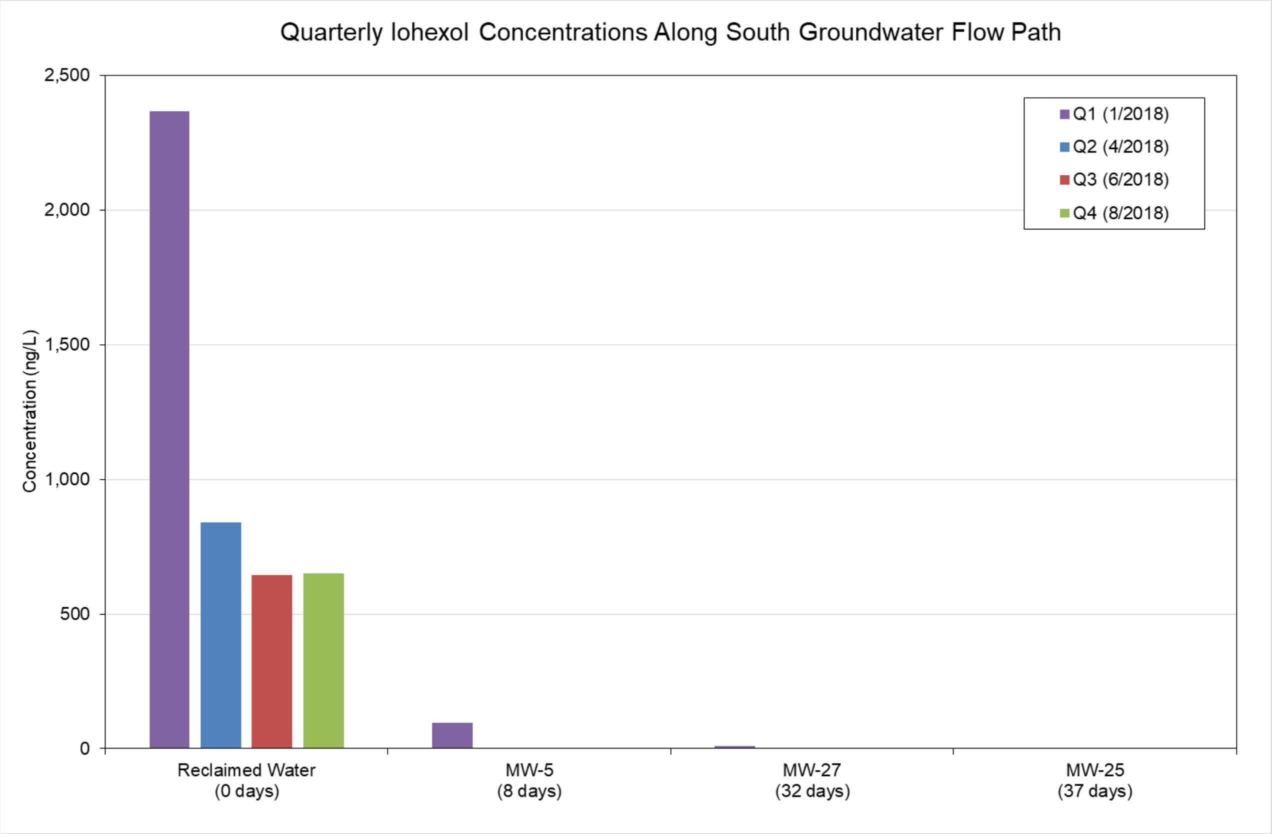
Note: Days represent time of peak concentration from start of tracer test.

Figure 9-6d. Quarterly Perfluoropentanoic Acid Concentrations Along Groundwater Flow Path



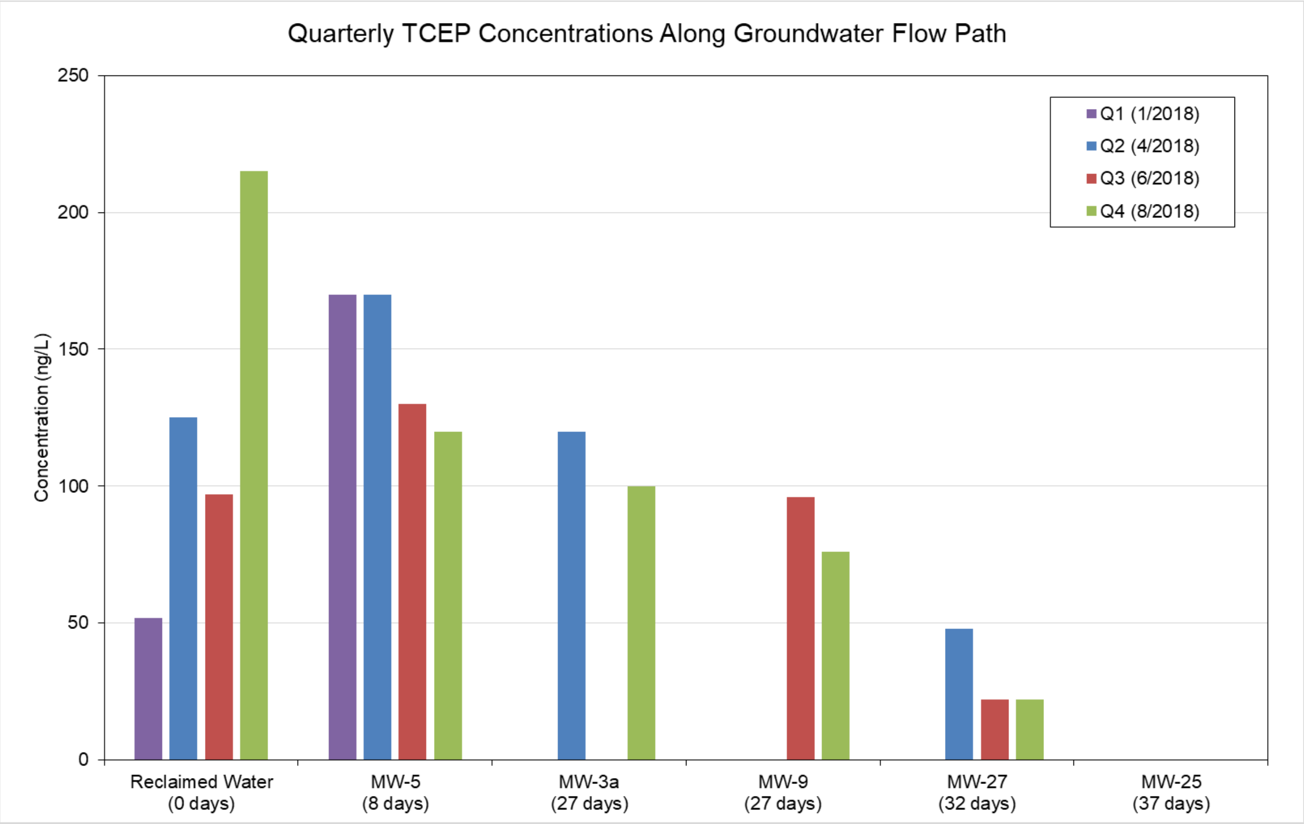
Note: Days represent time of peak concentration from start of tracer test.

Figure 9-6e. Quarterly Acesulfame-K Concentrations Along Groundwater Flow Path



Note: Days represent time of peak concentration from start of tracer test.

Figure 9-6f. Quarterly Iohexol Concentrations Along Groundwater Flow Path



Note: Days represent time of peak concentration from start of tracer test.

Figure 9-6g. Quarterly TCEP Concentrations Along Groundwater Flow Path

10.0 Summary

A tracer test and water quality monitoring were conducted from January to October 2018, as part of the RWIS. Tracer testing was used to determine reclaimed water flow velocities to monitoring wells and to identify dominant flow paths as reclaimed water travels through the vadose zone and aquifers. Results from groundwater quality monitoring were used to assess changes in residual chemical concentrations that occur over time as reclaimed water moves downgradient from the recharge basins.

10.1 Tracer Testing

Two tracers (bromide and SF_6) were used to tag reclaimed water infiltrated into Basins 4 and 5 from January 16 to February 3, 2018. SF_6 was also introduced directly into groundwater beneath the recharge basins from February 7 to 14, 2018 through monitor wells. Sampling for tracers was conducted from January to October 2018. Tracers were observed in monitoring wells MW-1, MW-3a, MW-5, MW-8, MW-9, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16, MW-25, and MW-27. The farthest monitoring wells with tracer detections were MW-11 and MW-25, approximately 1,200 feet away to the west and southwest, respectively, from Basins 4 and 5. Key findings from the tracer test are:

- The tracer test confirmed that the reclaimed water flow path in the Shallow (Qva) Aquifer extends to the west, southwest, and south of the recharge basins. This flow path is consistent with that previously described.
- Flow paths from the infiltration basins to the Sea-Level (Qc) Aquifer exist as indicated by detections at MW-12 and MW-14.
- There is a preferential flow path through the unsaturated zone intersecting the groundwater table near MW-5 with a travel time of 8 days to MW-5.
- There is a strong connection within the saturated portion of the Shallow Aquifer underneath Basin 4 to MW-8 and MW-27.
- Based on observed bromide concentration at the lysimeters and the nearest monitoring wells, including MW-3a, MW-5, MW-8, MW-9, and MW-16 typical travel times through the vadose zone to the groundwater are about 30 to 40 days, with most of the tracer slug passing these monitoring wells within the first 100 days.
- Travel time to the nearby monitoring wells near Basins 4 and 5 (including MW-5, MW-8 and MW-9) was less than that predicted by observations at the lysimeters and observed at wells screened directly below the basin (MW-15 and MW-16), therefore it was not possible to distinguish travel time solely in the vadose zone to calculate travel times or reclaimed water velocities only in the saturated portion of the shallow aquifer.
- Reclaimed water velocities observed at monitoring wells in the Shallow Aquifer range from 2 to 43 ft/d.
- Within the dominant flow path to the southwest reclaimed water velocities greater than 30 ft/d are observed.

- Reclaimed water takes at least 29 days to move through the Kitsap Formation based on delayed time of first arrival at MW-14 in the Sea-Level Aquifer compared to the time of first arrival at MW-3a in the Shallow Aquifer.
- The subsurface is heterogeneous underneath and near the infiltration basins as demonstrated by the range of reclaimed water velocities in the study area.

10.2 Water Quality Monitoring

Water quality was monitored in reclaimed water, vadose zone pore water, and groundwater at multiple locations during the same time period as the tracer test. While the fate and transport of residual chemicals are the primary focus of this effort, a large parameter list was analyzed, including nutrients and DBPs. Key findings from the water quality monitoring are:

- By the time reclaimed water reaches the saturated groundwater zone immediately downgradient of Basins 4 and 5 (i.e., in Wells MW-5 and MW-3a), water quality changes are observed that reflect the occurrence of soil aquifer treatment. TOC decreases by approximately 50 percent, from an average of 5.8 mg/L in reclaimed water to an average of 2.9 mg/L in groundwater at Well MW-5, reflecting attenuation through the vadose zone likely as a result of biodegradation and sorption. Orthophosphate, measured monthly, decreases from an average of 3.6 mg/L in reclaimed water to an average of 2.1 mg/L at MW-5, likely as a result of sorption within the vadose zone.
- Of the 113 residual chemicals analyzed, 60 were detected at least once in reclaimed water (prior to entering the basins) throughout the four quarterly sampling events. Twenty-four (24) residual chemicals were consistently detected in reclaimed water in all quarterly sampling events.
- There is a clear decrease in concentrations of residual chemicals by the time infiltrated reclaimed water reaches downgradient well MW-25, for which the tracer test determined to have a travel time of 37 days from the point of infiltration. Some residual chemicals, including 1,4-dioxane, carbamazepine, and TCEP, were not detected in MW-25. Others, such as acesulame-K, sucralose, and perfluoropenatonic acid, were observed in MW-25, but at markedly lower concentrations than in both reclaimed water and wells between the point of infiltration and MW-25.
- Rates of concentration decrease vary between the chemicals. A rapid decrease is seen in iohexol, with only small concentrations observed beyond 21 days of travel time. A more gradual decrease is observed with the artificial sweeteners and 1,4-dioxane, chemicals which are more resistant to degradation.
- The effects of dilution appear to be reflected in the data, but have not been thoroughly evaluated. This is most clearly indicated by studying together the tracer test and water quality monitoring results for two wells that are approximately the same horizontal distance from Basins 4 and 5 (MW-11 and MW-25). The results indicate a long travel time to MW-11, with the presence of multiple residual chemicals at concentrations similar to wells underneath the recharge basins. By contrast, the results indicate a relatively short travel time to MW-25, with only a few detections of residual chemicals at markedly lower concentrations than observed at MW-11. This suggests that while there may be a

preferential flow path south toward MW-25, the reclaimed water is subject to significant dilution by the time it reaches that point. This will be further investigated during the groundwater modeling effort to be conducted in the next phase of the RWIS.

- There were residual chemical detections in two wells located further to the southwest of the Hawks Prairie site (MW-20 and MW-28). These wells are likely in the downgradient flow path of infiltrated reclaimed water, but because no tracer was detected at these locations, they are either beyond the travel time evaluated in the tracer study or at a point where the effects of dilution are significant enough to render the tracers undetected. Only occasional detections, at low concentrations, of residual chemicals were observed in these wells. It cannot be determined, based solely on analysis of these data, if these results reflect influence to a slight degree by infiltrated reclaimed water versus impacts imparted by other sources, such as area septic systems.
- Water quality data support the conclusion of the tracer test that there is connectivity between the Shallow and Sea-Level Aquifers. Residual chemicals were detected in deep well MW-14. While this supports the conclusion that Shallow Aquifer water is in communication with the Sea-Level Aquifer, it cannot be determined if the sole source of residual chemicals is reclaimed water infiltration or if this deeper aquifer water is also potentially influenced by other sources of such chemicals located further upgradient (i.e., to the west of the Hawks Prairie site).

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Appendix A: Groundwater Levels Collected During Water Quality Sampling

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Groundwater Elevations Observed During Water Quality Sampling, January - October, 2018

Shallow (Qva) Aquifer											
Monitoring Well	Sampling Month	January	February	March	April	May	June	July	August	September	October
MW-1	Date		2/13/2018	NS	NS	NS	NS	NS	NS	NS	NS
	Groundwater Elevation (ft)		141.43								
MW-2	Date		2/13/2018	NS	NS	NS	NS	NS	NS	NS	NS
	Groundwater Elevation (ft)		142.17								
MW-3A	Date	1/16/2018	2/12/2018	3/12/2018	4/9/2018	5/8/2018	6/13/2018	7/9/2018	8/9/2018	9/11/2018	10/2/2018
	Groundwater Elevation (ft)	133.57	136.95	136.05	134.23	134.78	131.85	128.17	126.13	122.42	122.42
MW-5	Date	1/11/2018	2/12/2018	3/13/2018	4/12/2018	5/8/2018	6/14/2018	7/12/2018	8/9/2018	9/12/2018	10/3/2018
	Groundwater Elevation (ft)	141.76	143.67	141.77	0.00	140.21	135.18	129.87	127.63	124.88	124.39
MW-6	Date		2/13/2018	NS	NS	NS	NS	NS	NS	NS	NS
	Groundwater Elevation (ft)		145.01								
MW-7	Date		2/13/2018	NS	NS	NS	NS	NS	NS	NS	NS
	Groundwater Elevation (ft)		143.01								
MW-8	Date	1/11/2018	2/12/2018	3/13/2018	4/12/2018	5/8/2018	6/14/2018	7/12/2018	8/7/2018	9/12/2018	10/3/2018
	Groundwater Elevation (ft)	117.35	120.18	120.68	119.43	120.01	117.84	115.27	113.61	111.30	110.93
MW-9	Date	1/11/2018	2/12/2018	3/13/2018	4/10/2018	5/8/2018	6/14/2018	7/12/2018	8/7/2018	9/12/2018	10/3/2018
	Groundwater Elevation (ft)	130.05	132.88	132.04	130.39	130.33	127.92	125.38	124.20	120.43	120.37
MW-11	Date	1/11/2018	2/14/2018	3/14/2018	4/10/2018	5/9/2018	6/15/2018	7/12/2018	8/9/2018	9/10/2018	10/3/2018
	Groundwater Elevation (ft)	89.68	94.12	97.03	97.11	98.14	96.62	93.90	90.92	87.87	86.12
Lacey MW-11	Date	1/13/2018	2/28/2018	3/14/2018	4/13/2018	5/10/2018	6/15/2018	7/11/2018	8/10/2018	9/13/2018	10/4/2018
	Groundwater Elevation (ft)	109.28	110.28	110.35	110.26	110.33	110.17	109.94	109.62	109.26	109.05
MW-13	Date	1/13/2018	2/14/2018	3/12/2018	4/10/2018	5/9/2018	6/15/2018	7/10/2018	8/7/2018	9/11/2018	10/2/2018
	Groundwater Elevation (ft)	103.59	109.15	110.55	109.80	110.69	108.57	105.24	101.05	95.11	94.91
MW-15	Date	1/12/2018	2/12/2018	3/12/2018	4/9/2018	5/8/2018	6/12/2018	7/9/2018	8/8/2018	9/12/2018	10/2/2018
	Groundwater Elevation (ft)	138.61	141.07	140.43	139.25	139.59	137.77	136.30	135.30	133.63	133.56
MW-16	Date	1/15/2018	2/13/2018	3/12/2018	4/9/2018	5/7/2018	6/13/2018	7/9/2018	8/6/2018	9/11/2018	10/2/2018
	Groundwater Elevation (ft)	138.88	142.67	141.35	139.44	140.18	137.09	134.75	132.64	130.50	130.13
MW-20	Date	1/10/2018	2/14/2018	3/14/2018	4/10/2018	5/7/2018	6/12/2018	7/10/2018	8/8/2018	9/11/2018	10/2/2018
	Groundwater Elevation (ft)	87.90	93.50	96.77	96.77	97.68	96.51	93.99	90.82	87.35	85.81
MW-22	Date			3/14/2018	4/11/2015	5/10/2018	6/14/2018	NS	NS	NS	NS
	Groundwater Elevation (ft)			93.82	94.02	95.47	93.71				
MW-24	Date	1/13/2018	2/6/2018	3/13/2018	4/9/2018	5/9/2018	6/14/2018	7/11/2018	8/9/2018	9/13/2018	10/1/2018
	Groundwater Elevation (ft)	147.21	151.26	148.45	146.97	147.63	144.26	142.19	140.30	138.42	137.92
MW-25	Date	1/12/2018	2/14/2018	3/12/2018	4/9/2018	5/7/2018	6/12/2018	7/9/2018	8/8/2018	9/10/2018	10/1/2018
	Groundwater Elevation (ft)	89.19	93.47	96.31	96.48	97.41	96.73	94.61	92.10	89.20	87.70
MW-26	Date	1/12/2018	2/14/2018	3/13/2018	4/10/2018	5/8/2018	6/11/2018	7/9/2018	8/6/2018	9/10/2018	10/1/2018
	Groundwater Elevation (ft)	154.00	156.28	155.70	154.99	155.40	154.36	153.67	153.34	152.18	151.35
MW-27	Date	1/10/2018	2/14/2018	3/12/2018	4/11/2018	5/7/2018	6/11/2018	7/9/2018	8/6/2018	NS	NS
	Groundwater Elevation (ft)	123.64	125.20	124.92	124.02	124.01	122.85	121.54	118.21		

Note.

NS = Not sampled

NR = Not recorded

Groundwater Elevations in NAVD88 (ft)

Groundwater Elevations Observed During Water Quality Sampling, January - October, 2018

Shallow (Qva) Aquifer

Monitoring Well	Sampling Month	January	February	March	April	May	June	July	August	September	October
MW-28	Date	1/13/2018	2/27/2018	3/15/2018	4/11/2018	5/7/2018	6/12/2018	7/10/2018	8/7/2018	9/10/2018	10/1/2018
	Groundwater Elevation (ft)	90.21	97.97	98.96	100.20	99.52	98.38	95.87	92.62	88.83	87.03
TC Lanfill MW-10S	Date	NS	NS	3/14/2018	4/12/2018	5/9/2018	6/13/2018	7/11/2018	8/8/2018	9/12/2018	10/3/2018
	Groundwater Elevation (ft)			125.72	124.99	125.23	124.13	123.07	122.18	121.28	120.82
TC Lanfill MW-1	Date	NS	NS	3/1/2018	4/12/2018	5/9/2018	6/13/2018	7/11/2018	8/8/2018	9/12/2018	10/3/2018
	Groundwater Elevation (ft)			89.70	90.18	91.27	90.80	88.87	87.13	84.79	83.34

Sea Level (Qc) Aquifer

Monitoring Well	Sampling Month	January	February	March	April	May	June	July	August	September	October
MW-12	Date	1/13/2018	2/14/2018	3/12/2018	4/10/2018	5/9/2018	6/15/2018	7/10/2018	8/7/2018	9/11/2018	10/2/2018
	Groundwater Elevation (ft)	87.12	91.54	94.40	94.50	95.29	93.61	91.15	88.63	85.57	84.34
MW-14	Date	1/12/2018	2/13/2018	3/14/2018	4/11/2018	5/8/2018	6/12/2018	7/9/2018	8/7/2018	9/11/2018	10/2/2018
	Groundwater Elevation (ft)	61.40	63.62	65.38	65.94	66.08	64.32	62.69	59.82	59.29	58.06
MW-21	Date	1/13/2018	NS	3/12/2018	4/11/2018	5/10/2018	6/14/2018	7/10/2018	8/10/2018	9/13/2018	10/1/2018
	Groundwater Elevation (ft)	84.58		92.86	93.43	94.69	92.71	90.37	87.14	84.11	83.03
MW-23	Date	1/13/2018	2/13/2018	3/13/2018	4/11/2018	5/9/2018	6/14/2018	7/12/2018	8/6/2018	9/10/2018	10/1/2018
	Groundwater Elevation (ft)	53.65	NR	57.25	57.33	57.28	55.99	53.79	52.04	51.29	51.24

Note.
NS = Not sampled
NR = Not recorded
Groundwater Elevations in NAVD88 (ft)

Appendix B: Water Quality Tables

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Appendix B - Water Quality Summary

January Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std^1	Groundwater Quality Std^2	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						1/15/2018		1/15/2018		1/15/2018		1/15/2018 - 1/19/2018						1/15/2018 - 1/18/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																							
pH		units				7.14		7.14		7.07		6.36		7.56		7.38		6.75		6.88		7.07	
Temperature		˚C				12		12		14.4		13		12.1		12.3		13.1		12.6		11.8	
Conductivity		µS/cm				397.9		397.9		426.6		466.1		479		468.2		537		529		481.6	
Oxidation Reduction Potential (ORP)		mV				342.3		342.3		569.6		40.8		69.9		52.4		168		12.8		-5.7	
Dissolved Oxygen		mg/L				6.35		6.35		5.45		5.57		6.07		6		5.42		4.3		7.53	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																							
Chloride	EPA 300.0	mg/L	1	250	250	48	J	48	J	48		46		44		44		46		55		51	
Sulfate	EPA 300.0	mg/L	0.5	250	250	27	J	27	J	27		24		25		22		26		27		27	
Biodegradable Dis. Org. Carbon	EPA 524.2	mg/L	0.3	N/A	N/A	0.62	J	0.51	J	0.52		ND		0.35		ND		0.37		0.4	J+	ND	
Dissolved Organic Carbon	EPA 524.3	mg/L	0.3	N/A	N/A	4.2	J	4.4	J	4.5		5.8		3.2	J+	3.5	J+	3.2	J+	1.6	J+	2.1	J+
Total Dissolved Solid (TDS)	E160.1/SM2540C	mg/L	10	500	500	350	J	340	J	350		270		260		270		330		300		270	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	5.5	J	5.4	J	5.4		3.1		3.2		2		3.9		2.3		2.8	
NUTRIENTS																							
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		0.065		ND		ND		ND	
Kjeldahl Nitrogen	EPA 351.2	mg/L	0.2	N/A	N/A	0.72	J	0.72	J	0.6		0.44		0.49		0.33		0.54		0.76		0.22	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1	10	10	1.6	J	1.6	J	1.4		1.4		2.8		0.38		5.4		0.61		1.2	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05	1	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Total Nitrate + Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	1.6	J	1.6	J	1.4		1.4		2.8		0.38		5.4		0.61		1.2	
Total Nitrogen (calc.)	calculated	mg/L		N/A	N/A	2.32		2.32		2		1.84		3.29		0.71		5.94		1.37		1.42	
Phosphorus as P	SM4500-PE/EPA 365.1	mg/L	0.02	N/A	N/A	4.4	J	4.6	J	5.8		1.5		3.1		0.052		2.9		ND		ND	
Orthophosphate as P	SM4500-PE/EPA 365.2	mg/L	0.01	N/A	N/A	4.8	J	4.8	J	5.4		1.4		3		0.06		3.2		0.011		0.004	
METALS (DISSOLVED)																							
Calcium	EPA 200.7	mg/L	1	N/A	N/A	34	J	33	J	33		29		28		26		30		31		27	
Dissolved Silica	EPA 200.7	mg/L	0.5	N/A	N/A	38	J	37	J	37		29		32		30		34		28		25	
Iron	EPA 200.7	mg/L	0.02	0.3	0.3	ND	UJ	ND	UJ	ND		0.12		0.11		0.21		0.15		ND		ND	
Magnesium	EPA 200.7	mg/L	0.1	N/A	N/A	9.4	J	9.1	J	9.3		8.7		8.4		8.4		8.5		9.3		8	
Potassium	EPA 200.7	mg/L	1	N/A	N/A	--		--		--		--		--		--		--		--		--	
Sodium	EPA 200.7	mg/L	1	N/A	N/A	51	J	50	J	50		46		45		49		48		51		56	
Arsenic	EPA 200.8	µg/L	1	10	0.05	ND	UJ	ND	UJ	ND		2.4		7.6		ND		1.9		1.3		1	
Cadmium	EPA 200.8	µg/L	0.5	5	10	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Chromium	EPA 200.8	µg/L	1	100	50	ND	UJ	ND	UJ	ND		3.7		2		12		6.2		ND		ND	
Copper	EPA 200.8	µg/L	2	1300	1000	14	J	13	J	11		8.6		12		ND		9.4		4.3		5.1	
Lead	EPA 200.8	µg/L	0.5	15	50	ND	UJ	ND	UJ	ND		ND		ND		1		ND		ND		ND	
Manganese	EPA 200.8	µg/L	2	50	50	ND	UJ	ND	UJ	ND		350		19		400		4.8		85		310	
Nickel	EPA 200.8	µg/L	5	100	N/A	ND	UJ	ND	UJ	ND		87		33		160		46		21		48	
Selenium	EPA 200.8	µg/L	5	50	10	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Silver	EPA 200.8	µg/L	0.5	100	N/A	ND	UJ	ND	UJ	ND		ND		1.3		ND		ND		ND		ND	
Zinc	EPA 200.8	µg/L	20	5000	5000	83	J	82	J	78		23		ND		ND		ND		ND		ND	
Mercury	EPA 245.1	µg/L	0.2	2	2	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
RESIDUAL CHEMICALS																							
1,4-Dioxane	EPA 522	µg/L	0.07	N/A	N/A	0.7	J-	0.65	J-	0.55		0.39		0.49		0.41		0.47		0.4		0.5	
1,7-Dimethylxanthine	LC-MS-MS	ng/L	10	N/A	N/A	ND	UJ	ND	UJ	17		ND		ND		ND		ND		ND		ND	
2,4-D	LC-MS-MS	ng/L	5	70	100	ND	UJ	ND	UJ	ND		ND		5.1		ND		ND		ND		ND	
4-nonylphenol - semi quantitative	LC-MS-MS	ng/L	100	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	460	J	1500	J	9400		570	J	4900	J	5700	J
4-tert-octylphenol	LC-MS-MS	ng/L	50	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Acesulfame-K	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	810	J-	440		440		1000		250		540		420		ND	
Acetaminophen	LC-MS-MS	ng/L	5	N/A	N/A	15	J-	5.4	J-	160		19		19		15		13		7.5		ND	
Albuterol	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	8.5		8		5.2		ND		6.5		ND		ND	
Amoxicillin (semi-quantitative)	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND (<80)	UJ	ND	UJ	ND	UJ	ND	UJ
Andorostenedione	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Atenolol	LC-MS-MS	ng/L	5	N/A	N/A	52	J-	41	J-	230		100		15		ND		110		ND		ND	
Atrazine	LC-MS-MS	ng/L	5	3000	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Bendroflumethiazide	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Bezafibrate	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
BPA	LC-MS-MS	ng/L	10	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Bromacil	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	5.4		ND		ND		ND		ND		ND		ND	
Butalbital	LC-MS-MS	ng/L	5	N/A	N/A	9.2	J-	ND	UJ	ND		10		9.6		ND		6.7		9.8		12	
Butylparben	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Caffeine	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Carbadox	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	14		ND		ND		ND		ND		ND		ND	
Carbamazepine	LC-MS-MS	ng/L	5	N/A	N/A	55	J-	50	J-	330		360		260		430		310		370		360	

Appendix B - Water Quality Summary

January Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						1/15/2018		1/15/2018		1/15/2018		1/15/2018 - 1/19/2018						1/15/2018 - 1/18/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Carisoprodol	LC-MS-MS	ng/L	5	N/A	N/A	9.6	J-	9.2	J-	52		29		14		19		26		12		14	
Chloramphenicol	LC-MS-MS	ng/L	10	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Chloridazon	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Chlorotoluron	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Cimetidine	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Clofibric Acid	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Cotinine	LC-MS-MS	ng/L	10	N/A	N/A	ND	UJ	ND	UJ	40		ND		ND		19		ND		ND		ND	
Cyanazine	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	9.3		ND		ND		ND		ND		ND		ND	
DACT	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND (<50)		ND		ND		ND	
DEA	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
DEET	LC-MS-MS	ng/L	10	N/A	N/A	14	J-	ND	UJ	22		35		19		12		20		19		54	
Dehydronifedipine	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
DIA	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Diazepam	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Diclofenac	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Dilantin	LC-MS-MS	ng/L	20	N/A	N/A	33	J-	26	J-	130		82		34		ND		23		ND		ND	
Diltiazem	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	370		ND		ND		ND		ND		ND		ND	
Diuron	LC-MS-MS	ng/L	5	N/A	N/A	7	J-	6.6	J-	24		5.7		6.6		20		15		5		ND	
Erythromycin	LC-MS-MS	ng/L	10	N/A	N/A	ND	UJ	ND	UJ	15		ND		ND		10		ND		ND		ND	
Estradiol	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Estriol	LC-MS-MS	ng/L	10	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Estrone	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Ethinyl Estradiol - 17 alpha	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Ethylparaben	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Flumeqine	LC-MS-MS	ng/L	10	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Fluoxetine	LC-MS-MS	ng/L	10	N/A	N/A	36	J-	27	J-	180		ND		ND		ND		ND		ND		ND	
Gemfibrozil	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Ibuprofen	LC-MS-MS	ng/L	10	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Iohexal	LC-MS-MS	ng/L	10	N/A	N/A	4000	J-	3800	J-	730		1100		430		54		340		ND		2200	
Iopromide	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		27	
Isobutylparaben	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Isoproturon	LC-MS-MS	ng/L	100	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Ketoprofen	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Ketorolac	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		5.3		ND		ND	
Lidocaine	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		20		27		44		12		33		ND	
Lincomycin	LC-MS-MS	ng/L	10	N/A	N/A	41	J-	44	J-	76		43		41		ND		65		ND		ND	
Linuron	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		7.9		6.2		ND		ND		ND		ND	
Lopressor	LC-MS-MS	ng/L	20	N/A	N/A	190	J-	170	J-	450		59		32		29		160		ND		ND	
Meclofenamic Acid	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Meprobamate	LC-MS-MS	ng/L	5	N/A	N/A	17	J-	12	J-	70		34		21		34		57		7.6		41	
Metazachlor	LC-MS-MS	ng/L	5	N/A	N/A	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	
Metformin	LC-MS-MS	ng/L	5	N/A	N/A	66	J-	67	J-	58		ND		ND		ND		ND		5.1	J	ND	
Methylparaben	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Metolachlor	LC-MS-MS	ng/L	5	N/A	N/A	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R
Naproxen	LC-MS-MS	ng/L	10	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Nifedipine	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
N-Nitroso dimethylamine (NDMA)	LC-MS-MS	ng/L	2	N/A	N/A	ND	UJ	2.4	J-	ND		ND		ND		3.9		ND		ND		ND	
Norethisterone	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		5		ND	
OUST (Sulfameturon,methyl)	LC-MS-MS	ng/L	5	N/A	N/A	11	J-	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Oxolinic acid	LC-MS-MS	ng/L	10	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Pentoxifylline	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Phenazone	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Primidone	LC-MS-MS	ng/L	5	N/A	N/A	81	J-	58	J-	310		210		130		70		240		46		120	
Progesterone	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Propazine	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Propylparaben	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Quinoline	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	7.2	J-	ND		ND		ND		ND		ND		ND		ND	
Salicylic Acid	LC-MS-MS	ng/L	100	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND	UJ	ND	
Simazine	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Sucralose	LC-MS-MS	ng/L	100	N/A	N/A	50000	J-	28000	J-	58000	J+	56000	J+	43000	J+	69000		32000		35000	J+	66000	
Sulfachloropyridazine	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Sulfadiazine	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Sulfadimethoxine	LC-MS-MS	ng/L	5	N/A	N/A	17	J-	ND	UJ	ND		ND		39		ND		ND		19		ND	
Sulfamerazine	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	

Appendix B - Water Quality Summary

January Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	**METHOD**	**UNITS**	**MRL**	**Drinking Water Std^1**	**Groundwater Quality Std^2**	**Reclaimed Water 1**		**Reclaimed Water 1-Duplicate**		**Reclaimed Water 2**		**West B4 Lysimeter, 10 ft**		**West B4 Lysimeter, 25 ft**		**West B4 Lysimeter, 50 ft**		**East B4 Lysimeter, 10 ft**		**East B4 Lysimeter, 25ft**		**East B4 Lysimeter, 50 ft**	
DATE						1/15/2018		1/15/2018		1/15/2018		1/15/2018 - 1/19/2018						1/15/2018 - 1/18/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Sulfamethazine	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Sulfamethizole	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Sulfamethoxazole	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		62		ND		73		110		150	
Sulfathiazole	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND (<20)		ND		ND		ND	
TCEP	LC-MS-MS	ng/L	10	N/A	N/A	94	J-	14	J-	ND		240		ND		120		ND		150		140	J+
TCPP	LC-MS-MS	ng/L	100	N/A	N/A	ND	UJ	110	J-	280		200		ND		150		ND		ND		220	
TDCPP	LC-MS-MS	ng/L	100	N/A	N/A	2000	J-	1700	J-	1300		1300		380		120		300		1300		ND	R
Testosterone	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Theobromine	LC-MS-MS	ng/L	10	N/A	N/A	ND	UJ	ND	UJ	15		ND		ND		ND		10		ND		ND	
Theophylline	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Thiabendazole	LC-MS-MS	ng/L	5	N/A	N/A	5.5	J-	5.7	J-	ND		ND		ND		ND		8.8		ND		ND	
Triclocarban	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Triclosan	LC-MS-MS	ng/L	10	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Trimethoprim	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Warfarin	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
PFAS																							
Perfluoro butanoic acid- PFBA	MWH PFC	ng/L	10	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		10	
Perfluoro octanesulfonate-PFOS	MWH PFC	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Perfluoro octanesulfonic acid - PFOS	MWH PFC	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Perfluoro octanoic acid - PFOA	MWH PFC	ng/L	5	N/A	N/A	15	J-	16	J-	13		19		20		13		11		17		20	
Perfluoro-1-butanesulfonate	MWH PFC	ng/L	5	N/A	N/A	9.6	J-	10	J-	9.5		12		14		16		16		24		19	
Perfluoro-1-butanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	9.6	J-	10	J-	9.5		12		14		16		16		24		19	
Perfluoro-1-hexanesulfonate	MWH PFC	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Perfluoro-1-hexanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Perfluoro-n-decanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Perfluoro-n-heptanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Perfluoro-n-hexanoic acid	MWH PFC	ng/L	5	N/A	N/A	46	J-	53	J-	46		62		44		42		44		45		53	
Perfluoro-n-nonanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		5.7	
Perfluoropentanoic acid	MWH PFC	ng/L	5	N/A	N/A	62	J-	64	J-	64		83		71		87		70		82		100	
DBPs																							
Bromodichloromethane	EPA 524.2	µg/L	0.5	N/A	N/A	6.8	J-	6.6	J-	6.7		4.2		3		ND		6.3		ND		ND	
Bromoform	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Chlorodibromomethane	EPA 524.2	µg/L	0.5	N/A	N/A	0.67	J-	0.66	J-	0.73		ND		ND		ND		ND		ND		ND	
Chloroform (Trichloromethane)	EPA 524.2	µg/L	0.5	N/A	N/A	39	J-	37	J-	36		28		20		5.8		41		2.5		25	
Total THM	EPA 524.2	µg/L	0.5	N/A	N/A	46	J-	44	J-	43		32		23		5.8		47		2.5		25	
Bromochloroacetic acid	SM 6251B	µg/L	1	N/A	N/A	3.2	J-	2.7	J-	ND		ND		ND		ND		1.9		2.4		ND	
Dibromoacetic acid	SM 6251B	µg/L	1	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Dichloroacetic acid	SM 6251B	µg/L	1	N/A	N/A	11	J-	19	J-	ND		1.2		1.1		ND		9.7		14		ND	
Monobromoacetic acid	SM 6251B	µg/L	1	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Monochloroacetic acid	SM 6251B	µg/L	2	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Trichloroacetic acid	SM 6251B	µg/L	1	N/A	N/A	9.4	J-	18	J-	ND		1.4		ND		ND		8.8		14		ND	
Total Haloacetic Acids (HAA5)	SM 6251B	µg/L	2	N/A	N/A	20	J-	37	J-	ND		2.6		ND		ND		18		28		ND	
Bacteria																							
E. Coli Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	A		A		A		A		A		A		A		A		A	
E. Coli Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total Coliform Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	P		P		P		A		P		A		P		P		P	
Total Coliform Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	17.8		118.4		109.1		ND		11.1		ND		28.8		15.0		12.4	
VOCs																							
1,1,1,2-Tetrachloroethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
1,1,1-Trichloroethane	EPA 524.2	µg/L	0.5	200	0.2	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
1,1,2,2-Tetrachloroethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
1,1,2-Trichloroethane	EPA 524.2	µg/L	0.5	5	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloroethane	EPA 524.2	µg/L	0.5	N/A	1	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloroethylene	EPA 524.2	µg/L	0.5	7	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
1,2,3-Trichlorobenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
1,2,3-Trichloropropane	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
1,2,4-Trichlorobenzene	EPA 524.2	µg/L	0.5	70	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
1,2,4-Trimethylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
1,2-Dichloroethane	EPA 524.2	µg/L	0.5	5	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
1,2-Dichloropropane	EPA 524.2	µg/L	0.5	5	0.6	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
1,3,5-Trimethylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
1,3-Dichloropropane	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
2,2-Dichloropropane	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	

Appendix B - Water Quality Summary

January Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						1/15/2018		1/15/2018		1/15/2018		1/15/2018 - 1/19/2018						1/15/2018 - 1/18/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
2-Butanone (MEK)	EPA 524.2	µg/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
2-Hexanone	EPA 524.2	µg/L	10	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
4-Methyl-2-Pentanone (MIBK)	EPA 524.2	µg/L	5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Benzene	EPA 524.2	µg/L	0.5	5	1	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Bromobenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Bromochloromethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Bromoethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Bromomethane (Methyl Bromide)	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Carbon disulfide	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Carbon Tetrachloride	EPA 524.2	µg/L	0.5	5	0.3	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Chlorobenzene	EPA 524.2	µg/L	0.5	100	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Chloroethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Chloromethane (Methyl Chloride)	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
cis-1,2-Dichloroethylene	EPA 524.2	µg/L	0.5	70	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
cis-1,3-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Dibromomethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Dichlorodifluoromethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Dichloromethane	EPA 524.2	µg/L	0.5	5	5	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		0.56	
Di-isopropyl ether	EPA 524.2	µg/L	3	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Ethyl benzene	EPA 524.2	µg/L	0.5	700	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Hexachlorobutadiene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Isopropylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
m,p-Xylenes	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
m-Dichlorobenzene (1,3-DCB)	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Methyl Tert-butyl ether (MTBE)	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Naphthalene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
n-Butylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
n-Propylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
o-Chlorotoluene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
o-Dichlorobenzene (1,2-DCB)	EPA 524.2	µg/L	0.5	600	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
o-Xylene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
p-Chlorotoluene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
p-Dichlorobenzene (1,4-DCB)	EPA 524.2	µg/L	0.5	75	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
p-Isopropyltoluene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
sec-Butylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Styrene	EPA 524.2	µg/L	0.5	100	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
tert-amyl Methyl Ether	EPA 524.2	µg/L	3	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
tert-Butyl Ethyl Ether	EPA 524.2	µg/L	3	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
tert-Butylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Tetrachloroethylene (PCE)	EPA 524.2	µg/L	0.5	5	0.8	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Toluene	EPA 524.2	µg/L	0.5	1000	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Total 1,3-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Total xylenes	EPA 524.2	µg/L	0.5	10000	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
trans-1,2-Dichloroethylene	EPA 524.2	µg/L	0.5	100	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
trans-1,3-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Trichloroethylene (TCE)	EPA 524.2	µg/L	0.5	5	3	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Trichlorofluoromethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Trichlorotrifluoroethane (Freon)	EPA 524.2	µg/L	0.5	N/A	N/A	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	
Vinyl chloride (VC)	EPA 524.2	µg/L	0.3	2	0.02	ND	UJ	ND	UJ	ND		ND		ND		ND		ND		ND		ND	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

(2) Established by the Washington State Department of Ecology in WAC 173-200-040

J = Value is detected and the result is estimated

J- = Value is detected and the result is estimated and biased low

J+ = Value is detected and the result is estimated and biased high

UJ = Result is a non-detect and the value is estimated

R = Result rejected

*Drinking water and groundwater quality standards are for total metals.

Appendix B - Water Quality Summary

January Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3A		MW-5		MW-8		MW-9		MW-11		MW-14		MW-15		MW-16		MW-20		MW-25		MW-26		MW-27	
DATE						1/16/2018		1/11/2018		1/11/2018		1/11/2018		1/11/2018		1/12/2018		1/12/2018		1/15/2018		1/10/2018		1/12/2018		1/12/2018		1/10/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																													
pH		units				6.9		7.02		6.91		6.98		6.97		7.55		7		6.86		7.24		7.29		6.37		6.81	
Temperature		˚C				13.6		12.4		13.4		13.2		12.1		12.1		13.8		12.7		10.8		10.4		10.3		12	
Conductivity		µS/cm				528		369.5		350.7		333.3		293.8		214		380.8		352.9		149.5		156.8		117.2		247.1	
Oxidation Reduction Potential (ORP)		mV				192.4		179.2		176.3		184		186.8		144.3		173.4		176.3		96.2		108.9		193.2		150.1	
Dissolved Oxygen		mg/L				5.06		7.45		6.28		7.01		4.89		5.39		5.04		5.82		4.89		7.79		8.89		7.22	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																													
Chloride	EPA 300.0	mg/L	1	250	250	51		53		47		44		35		18		50		45		6.3		9.1		6.1		32	
Sulfate	EPA 300.0	mg/L	0.5	250	250	26		27		25		23		20		11		26		23		5.3		9.6		5.7		18	
Biodegradable Dis. Org. Carbon	EPA 524.2	mg/L	0.3	N/A	N/A	0.62	J+	0.38		0.4		0.36		ND		ND		ND		ND		ND		ND		ND		ND	
Dissolved Organic Carbon	EPA 524.3	mg/L	0.3	N/A	N/A	1.6	J+	2.6	J+	1.3	J+	1.4	J+	1	J+	0.8	J+	3.3	J+	2.4	J+	0.84	J+	1.3	J+	1	J+	0.85	J+
Total Dissolved Solid (TDS)	E160.1/SM2540C	mg/L	10	500	500	270		300		280		260		250		180		300		270		150		140		110		220	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	1.4		2.4		1.2		1.2		0.7		0.36		1.6		1		0.57		ND		0.36		0.74	
NUTRIENTS																													
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Kjeldahl Nitrogen	EPA 351.2	mg/L	0.2	N/A	N/A	ND		0.36		ND		ND		ND		ND		0.34		ND		ND		ND		ND		ND	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1	10	10	1.5		2.2		1.3		1.4		1.3		1.2		1.5		0.93		0.76		0.9		1.9		1.3	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05	1	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total Nitrate + Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	1.5		2.2		1.3		1.4		1.3		1.2		1.5		0.93		0.76		0.9		1.9		1.3	
Total Nitrogen (calc.)	calculated	mg/L		N/A	N/A	1.5		2.56		1.3		1.4		1.3		1.2		1.84		0.93		0.76		0.9		1.9		1.3	
Phosphorus as P	SM4500-PE/EPA 365.1	mg/L	0.02	N/A	N/A	0.55		2.2		0.097		0.18		0.028		0.066		0.99		ND		ND		ND		ND		ND	
Orthophosphate as P	SM4500-PE/EPA 365.2	mg/L	0.01	N/A	N/A	0.62		1.4		0.11		0.18		0.02		0.043		1		0.02		0.009		0.015		0.015		0.014	
METALS (DISSOLVED)																													
Calcium	EPA 200.7	mg/L	1	N/A	N/A	28		32		30		30		29		23		29		28		19		16		18		27	
Dissolved Silica	EPA 200.7	mg/L	0.5	N/A	N/A	26		29		26		26		43		30		30		24		25		28		19		24	
Iron	EPA 200.7	mg/L	0.02	0.3	0.3	0.86		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Magnesium	EPA 200.7	mg/L	0.1	N/A	N/A	9.7		9.1		10		9.7		23		15		9		8		10		12		4.9		9.8	
Potassium	EPA 200.7	mg/L	1	N/A	N/A	--		8.5		3.1		2.8		--		--		--		--		--		--		--		--	
Sodium	EPA 200.7	mg/L	1	N/A	N/A	53		49		45		41		12		8.6		52		48		7.3		7.8		6.1		23	
Arsenic	EPA 200.8	µg/L	1	10	0.05	2.7		3		1.1		1.4		ND		ND		4.5		ND		ND		ND		ND		ND	
Cadmium	EPA 200.8	µg/L	0.5	5	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chromium	EPA 200.8	µg/L	1	100	50	ND		ND		ND		ND		1.4		1.5		ND		ND		ND		1.5		ND		ND	
Copper	EPA 200.8	µg/L	2	1300	1000	7.1		12		5.6		5.5		2.6		ND		7.4		3.7		ND		ND		ND		2.5	
Lead	EPA 200.8	µg/L	0.5	15	50	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Manganese	EPA 200.8	µg/L	2	50	50	ND		ND		ND		ND		ND		ND		ND		ND		11		17		16		ND	
Nickel	EPA 200.8	µg/L	5	100	N/A	5.4		ND		ND		ND		5.6		ND		5.5		ND		ND		ND		ND		ND	
Selenium	EPA 200.8	µg/L	5	50	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Silver	EPA 200.8	µg/L	0.5	100	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Zinc	EPA 200.8	µg/L	20	5000	5000	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Mercury	EPA 245.1	µg/L	0.2	2	2	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
RESIDUAL CHEMICALS																													
1,4-Dioxane	EPA 522	µg/L	0.07	N/A	N/A	0.44		0.49		0.4		0.39		0.32		0.17		0.43		0.32		ND		ND		ND		0.26	
1,7-Dimethylxanthine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2,4-D	LC-MS-MS	ng/L	5	70	100	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
4-nonylphenol - semi quantitative	LC-MS-MS	ng/L	100	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	390	J	ND	UJ	ND	UJ	ND	UJ	200	J	ND	UJ	ND	UJ	ND	UJ
4-tert-octylphenol	LC-MS-MS	ng/L	50	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Acesulfame-K	LC-MS-MS	ng/L	20	N/A	N/A	300		100		340		320		330		11000		ND		ND		37		ND		ND		290	
Acetaminophen	LC-MS-MS	ng/L	5	N/A	N/A	10		9.9		7.8		7.7		ND		ND		8.3		ND		ND		ND		ND		ND	
Albuterol	LC-MS-MS	ng/L	5	N/A	N/A	ND		5.4		ND		5.4		ND		ND		ND		ND		ND		ND		ND		ND	
Amoxicillin (semi-quantitative)	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Andorostenedione	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Atenolol	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Atrazine	LC-MS-MS	ng/L	5	3000	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bendroflumethiazide	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bezafibrate	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
BPA	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromacil	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		5.9		5.8		ND		ND		5.3		ND		ND		ND		ND		5	
Butalbital	LC-MS-MS	ng/L	5	N/A	N/A	9		ND		ND		6.3		ND		ND		8		ND		ND		ND		ND		ND	
Butylparben	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Caffeine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		340		ND		ND		ND		ND		ND		ND	
Carbadox	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		5.2		ND		ND		ND		5.2	J
Carbamazepine	LC-MS-MS	ng/L	5	N/A	N/A	340		350		330		260		37		ND		380		210		ND		ND		ND		110	
Carisoprodol	LC-MS-MS	ng/L	5	N/A	N/A	7.6		25		ND		7.6		ND		ND		18		ND		ND		ND		ND		ND	
Chloramphenicol	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloridazon	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chlorotoluron	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cimetidine	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Clofibric Acid	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cotinine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cyanazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DACT	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

Appendix B - Water Quality Summary

January Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3A		MW-5		MW-8		MW-9		MW-11		MW-14		MW-15		MW-16		MW-20		MW-25		MW-26		MW-27	
DATE						1/16/2018		1/11/2018		1/11/2018		1/11/2018		1/11/2018		1/12/2018		1/12/2018		1/15/2018		1/10/2018		1/12/2018		1/12/2018		1/10/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DEA	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DEET	LC-MS-MS	ng/L	10	N/A	N/A	ND		18		ND		13		ND		ND		ND		ND		ND		ND		ND		ND	
Dehydronifedipine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DIA	LC-MS-MS	ng/L	5	N/A	N/A	ND		5.7		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diazepam	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diclofenac	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dilantin	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diltiazem	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diuron	LC-MS-MS	ng/L	5	N/A	N/A	5		22		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Erythromycin	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estradiol	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estriol	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estrone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethinyl Estradiol - 17 alpha	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethylparaben	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Flumeqine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Fluoxetine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Gemfibrozil	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ibuprofen	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Iohexal	LC-MS-MS	ng/L	10	N/A	N/A	ND		97		11		21		ND		ND		ND		ND		ND		ND		ND		11	
Iopromide	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isobutylparaben	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isoproturon	LC-MS-MS	ng/L	100	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketoprofen	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketorolac	LC-MS-MS	ng/L	5	N/A	N/A	ND		5.4		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Lidocaine	LC-MS-MS	ng/L	5	N/A	N/A	20		43		6.3		7.6		ND		ND		27		ND		ND		ND		ND		ND	
Lincomycin	LC-MS-MS	ng/L	10	N/A	N/A	ND		41		ND		41		ND		ND		ND		ND		ND		ND		ND		ND	
Linuron	LC-MS-MS	ng/L	5	N/A	N/A	7.8		6.8		5.1		5.7		5.1		ND		6.2		ND		ND		ND		ND		6.2	
Lopressor	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Meclofenamic Acid	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Meprobamate	LC-MS-MS	ng/L	5	N/A	N/A	5.4		36		5.2		16		ND		ND		12		ND		ND		ND		ND		ND	
Metazachlor	LC-MS-MS	ng/L	5	N/A	N/A	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R
Metformin	LC-MS-MS	ng/L	5	N/A	N/A	690		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		17	
Methylparaben	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Metolachlor	LC-MS-MS	ng/L	5	N/A	N/A	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R	ND	R
Naproxen	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Nifedipine	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
N-Nitroso dimethylamine (NDMA)	LC-MS-MS	ng/L	2	N/A	N/A	ND		ND		ND		ND		ND		3.7		ND		ND		ND		ND		ND		ND	
Norethisterone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
OUST (Sulfameturon,methyl)	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Oxolinic acid	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Pentoxifylline	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Phenazone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Primidone	LC-MS-MS	ng/L	5	N/A	N/A	72		120		65		90		49		51		44		51		ND		ND		ND		48	
Progesterone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Propazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Propylparaben	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Quinoline	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		7.6		ND		ND		ND		ND	
Salicylic Acid	LC-MS-MS	ng/L	100	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Simazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		25		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sucralose	LC-MS-MS	ng/L	100	N/A	N/A	40000	J+	32000		31000		24000		17000		2100		33000		31000		ND		3400		ND		22000	
Sulfachloropyridazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ
Sulfadiazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfadimethoxine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		19		ND		ND		ND		ND		ND		ND		ND		19	J+
Sulfamerazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethizole	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethoxazole	LC-MS-MS	ng/L	5	N/A	N/A	310		150		310		310		220		50		320		290		ND		12		ND		180	
Sulfathiazole	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TCEP	LC-MS-MS	ng/L	10	N/A	N/A	ND		170	J	ND		ND		ND		ND		200		22		ND		ND		ND		ND	UJ
TCPP	LC-MS-MS	ng/L	100	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ
TDCPP	LC-MS-MS	ng/L	100	N/A	N/A	260		380		280		140		ND		ND		ND		ND		ND		ND		ND		ND	
Testosterone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Theobromine	LC-MS-MS	ng/L	10	N/A	N/A	ND		14		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Theophylline	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Thiabendazole	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		5.5		ND		ND		ND		ND	
Triclocarban	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Triclosan	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		12		ND		ND		12	
Trimethoprim	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Warfarin	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
PFAS																													
Perfluoro butanoic acid- PFBA	MWH PFC	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

Appendix B - Water Quality Summary

January Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3A		MW-5		MW-8		MW-9		MW-11		MW-14		MW-15		MW-16		MW-20		MW-25		MW-26		MW-27	
DATE						1/16/2018		1/11/2018		1/11/2018		1/11/2018		1/11/2018		1/12/2018		1/12/2018		1/15/2018		1/10/2018		1/12/2018		1/12/2018		1/10/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Perfluoro octanesulfonate-PFOS	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro octanesulfonic acid - PFOS	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro octanoic acid - PFOA	MWH PFC	ng/L	5	N/A	N/A	18		15		19		14		29		13		20		14		ND		ND		ND		11	
Perfluoro-1-butanesulfonate	MWH PFC	ng/L	5	N/A	N/A	20		14		18		15		9.8		ND		20		13		ND		ND		ND		8.1	
Perfluoro-1-butanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	20		14		18		15		9.8		ND		20		13		ND		ND		ND		8.1	
Perfluoro-1-hexanesulfonate	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro-1-hexanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro-n-decanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro-n-heptanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro-n-hexanoic acid	MWH PFC	ng/L	5	N/A	N/A	51		57		49		44		32		13		56		41		ND		ND		ND		32	
Perfluoro-n-nonanoic acid	MWH PFC	ng/L	5	N/A	N/A	5.6		ND		6.8		ND		ND		ND		ND		7.6		ND		ND		ND		ND	
Perfluoropentanoic acid	MWH PFC	ng/L	5	N/A	N/A	90		93		90		80		61		27		94		80		ND		8.2		ND		58	
DBPs																													
Bromodichloromethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		2.4		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromoform	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chlorodibromomethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloroform (Trichloromethane)	EPA 524.2	µg/L	0.5	N/A	N/A	16		44		10		15		5.4		0.82		13		5.5		ND		ND		ND		6.1	
Total THM	EPA 524.2	µg/L	0.5	N/A	N/A	16		46		10		15		5.4		0.82		13		5.5		ND		ND		ND		6.1	
Bromochloroacetic acid	SM 6251B	µg/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		1.6		ND		ND	
Dibromoacetic acid	SM 6251B	µg/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dichloroacetic acid	SM 6251B	µg/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		15		ND		ND	
Monobromoacetic acid	SM 6251B	µg/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Monochloroacetic acid	SM 6251B	µg/L	2	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		2.6		ND		ND	
Trichloroacetic acid	SM 6251B	µg/L	1	N/A	N/A	1.4		ND		ND		ND		ND		ND		ND		ND		ND		34		ND		ND	
Total Haloacetic Acids (HAA5)	SM 6251B	µg/L	2	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		52		ND		ND	
Bacteria																													
E. Coli Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	A		A		A		A		A		A		A		A		A		A		A		A	
E. Coli Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total Coliform Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	A		A		A		A		A		P		A		P		A		A		P		A	
Total Coliform Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	ND		ND		ND		ND		ND		5.3		ND		101.3		ND		ND		1.0		ND	
VOCs																													
1,1,1,2-Tetrachloroethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,1-Trichloroethane	EPA 524.2	µg/L	0.5	200	0.2	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,2,2-Tetrachloroethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,2-Trichloroethane	EPA 524.2	µg/L	0.5	5	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloroethane	EPA 524.2	µg/L	0.5	N/A	1	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloroethylene	EPA 524.2	µg/L	0.5	7	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3-Trichlorobenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3-Trichloropropane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,4-Trichlorobenzene	EPA 524.2	µg/L	0.5	70	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,4-Trimethylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2-Dichloroethane	EPA 524.2	µg/L	0.5	5	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2-Dichloropropane	EPA 524.2	µg/L	0.5	5	0.6	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,3,5-Trimethylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,3-Dichloropropane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2,2-Dichloropropane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2-Butanone (MEK)	EPA 524.2	µg/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2-Hexanone	EPA 524.2	µg/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
4-Methyl-2-Pentanone (MIBK)	EPA 524.2	µg/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Benzene	EPA 524.2	µg/L	0.5	5	1	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromobenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromochloromethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromoethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromomethane (Methyl Bromide)	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbon disulfide	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbon Tetrachloride	EPA 524.2	µg/L	0.5	5	0.3	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chlorobenzene	EPA 524.2	µg/L	0.5	100	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloroethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloromethane (Methyl Chloride)	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
cis-1,2-Dichloroethylene	EPA 524.2	µg/L	0.5	70	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
cis-1,3-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dibromomethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dichlorodifluoromethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dichloromethane	EPA 524.2	µg/L	0.5	5	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Di-isopropyl ether	EPA 524.2	µg/L	3	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethyl benzene	EPA 524.2	µg/L	0.5	700	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Hexachlorobutadiene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isopropylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
m,p-Xylenes	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
m-Dichlorobenzene (1,3-DCB)	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Methyl Tert-butyl ether (MTBE)	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

Appendix B - Water Quality Summary

January Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3A		MW-5		MW-8		MW-9		MW-11		MW-14		MW-15		MW-16		MW-20		MW-25		MW-26		MW-27	
DATE						1/16/2018		1/11/2018		1/11/2018		1/11/2018		1/11/2018		1/12/2018		1/12/2018		1/15/2018		1/10/2018		1/12/2018		1/12/2018		1/10/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Naphthalene	EPA 524.2	µg/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
n-Butylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
n-Propylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
o-Chlorotoluene	EPA 524.2	µg/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
o-Dichlorobenzene (1,2-DCB)	EPA 524.2	µg/L	0.5	600	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
o-Xylene	EPA 524.2	µg/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
p-Chlorotoluene	EPA 524.2	µg/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
p-Dichlorobenzene (1,4-DCB)	EPA 524.2	µg/L	0.5	75	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
p-Isopropyltoluene	EPA 524.2	µg/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
sec-Butylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Styrene	EPA 524.2	µg/L	0.5	100	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
tert-amyl Methyl Ether	EPA 524.2	µg/L	3	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
tert-Butyl Ethyl Ether	EPA 524.2	µg/L	3	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
tert-Butylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Tetrachloroethylene (PCE)	EPA 524.2	µg/L	0.5	5	0.8	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Toluene	EPA 524.2	µg/L	0.5	1000	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total 1,3-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total xylenes	EPA 524.2	µg/L	0.5	10000	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
trans-1,2-Dichloroethylene	EPA 524.2	µg/L	0.5	100	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
trans-1,3-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Trichloroethylene (TCE)	EPA 524.2	µg/L	0.5	5	3	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Trichlorofluoromethane	EPA 524.2	µg/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Trichlorotrifluoroethane (Freon)	EPA 524.2	µg/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Vinyl chloride (VC)	EPA 524.2	µg/L	0.3	2	0.02	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

(2) Established by the Washington State Department of Ecology in WAC 173-200-040

J = Value is detected and the result is estimated

J- = Value is detected and the result is estimated and biased low

J+ = Value is detected and the result is estimated and biased high

UJ = Result is a non-detect and the value is estimated

R = Result rejected

*Drinking water and groundwater quality standards are for total metals.

Appendix B - Water Quality Summary

February Monthly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std^1	Groundwater Quality Std^2	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25 ft		East B4 Lysimeter, 50 ft	
DATE						2/13/2018		2/13/2018		2/14/2018		2/13/2018						2/13/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																							
pH		units				--		--		--		6.98		7.1		7.38		7.28		7.3		7.97	
Temperature		˚C				--		--		--		10.4		11.1		9.6		12.8		12.4		12.4	
Conductivity		µS/cm				--		--		--		345		298.8		315.6		476.3		444.1		426.3	
Oxidation Reduction Potential (ORP)		mV				--		--		--		225.1		198		196.2		214.8		215		215.2	
Dissolved Oxygen		mg/L				--		--		--		7.16		7.24		6.28		5.92		6.98		9.14	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																							
Chloride	EPA 300.0	mg/L	1	250	250	52		52		54		49		42		48		52		52		50	
Biodegradable Dis. Org. Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	0.53		0.46		0.54		--		--		--		--		--		--	
Dissolved Organic Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	4.7	J+	5.3	J+	5.1	J+	--		--		--		--		--		--	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	5.8		5.9		5.4		3.7		2.3		2.3		5.1		1.8		2.1	
NUTRIENTS																							
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	*ND*		*ND*		0.054		*ND*		*ND*		0.059		0.43		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	0.2	N/A	N/A	0.69		0.64		0.7		0.42		*ND*		0.24		1.1		*ND*		0.2	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1	10	10	0.93		0.93		2.5		1.6		0.52		0.28		1.9		0.99		2	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Nitrate, Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	0.93		0.93		2.5		1.6		0.52		0.28		1.9		0.99		2	
Total Nitrogen (calc.)	calculated			N/A	N/A	1.62		1.57		3.2		2.02		0.52		0.52		3		0.99		2.2	
Orthophosphate as P	4500P-E/365.1	mg/L	0.05	N/A	N/A	1		1		1.5		1.6		2.6		0.066		2.5		0.052		0.005	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

(2) Established by the Washington State Department of Ecology in WAC 173-200-040

J = Value is detected and the result is estimated

J- = Value is detected and the result is estimated and biased low

J+ = Value is detected and the result is estimated and biased high

UJ = Result is a non-detect and the value is estimated

R = Result rejected

*Drinking water and groundwater quality standards are for total metals.

Appendix B - Water Quality Summary

February Monthly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3a		MW-5		MW-8		MW-9		MW-11		MW-14		MW-15		MW-16		MW-20		MW-25		MW-26		MW-27	
DATE						2/12/2018		2/12/2018		2/12/2018		2/12/2018		2/14/2018		2/13/2018		2/12/2018		2/13/2018		2/14/2018		2/14/2018		2/14/2018		2/14/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																													
pH		units				6.89		6.92		6.84		6.9		6.93		7.46		6.9		6.85		7.18		7.21		6.22		6.76	
Temperature		˚C				13.7		13.2		13.4		13.4		11.5		12.6		13.3		12.5		10.5		10.4		10.3		12.1	
Conductivity		µS/cm				442.5		462.5		425.8		406.7		327.7		205.9		316.8		312.9		149.9		184.7		134.3		274.3	
Oxidation Reduction Potential (ORP)		mV				203.1		226		185.2		220.9		200.3		185.3		252.3		201.1		85.8		248.8		258.4		243.4	
Dissolved Oxygen		mg/L				4.05		3.83		5.59		6.87		3.85		4.78		4.67		3.85		5.2		6.91		7.3		5.83	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																													
Chloride	EPA 300.0	mg/L	1	250	250	48		50		47		44		34		19		27		45		5.9		11		5.4		30	
Biodegradable Dis. Org. Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	--		--		--		--		--		--		--		--		--		--		--		--	
Dissolved Organic Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	--		--		--		--		--		--		--		--		--		--		--		--	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	3.2	J	2.9		1.4		1.6		1.1		0.42		2.4		1.1		0.43		*ND*		0.42		0.72	
NUTRIENTS																													
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	0.2	N/A	N/A	*ND*		0.36		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1	10	10	1.9		2.7		1.8		1.8		1.3		1.3		0.97		1.3		0.72		0.98		1.6		1.6	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Nitrate, Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	1.9		2.7		1.8		1.8		1.3		1.3		0.97		1.3		0.72		0.98		1.6		1.6	
Total Nitrogen (calc.)	calculated			N/A	N/A	1.9		3.06		1.8		1.8		1.3		1.3		0.97		1.3		0.72		0.98		1.6		1.6	
Orthophosphate as P	4500P-E/365.1	mg/L	0.05	N/A	N/A	0.63		2.5		0.12		0.19		0.023		0.033		0.43		0.076		0.012		0.017		0.016		0.017	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

(2) Established by the Washington State Department of Ecology in WAC 173-200-040

J = Value is detected and the result is estimated

J- = Value is detected and the result is estimated and biased low

J+ = Value is detected and the result is estimated and biased high

UJ = Result is a non-detect and the value is estimated

R = Result rejected

*Drinking water and groundwater quality standards are for total metals.

Appendix B - Water Quality Summary

March Monthly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	Reclaimed Water 1		Reclaimed Water 1- Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25 ft		East B4 Lysimeter, 50 ft	
DATE						3/13/2018		3/13/2018		3/15/2018		3/13/2018						3/13/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																							
pH		units				--		--		--		7.11		7.13		7.32		7.18		7.12		8.09	
Temperature		˚C				--		--		--		11.6		11.5		12.3		11.9		12.1		11.7	
Conductivity		µS/cm				--		--		--		441.3		442.6		427.2		457		434.2		417.6	
Oxidation Reduction Potential (ORP)		mV				--		--		--		156.8		204.4		203.7		173.7		174.9		157.1	
Dissolved Oxygen		mg/L				--		--		--		5.28		5.33		7.75		3.6		3.31		7.2	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																							
Chloride	EPA 300.0	mg/L	1	250	250	50		50		53		57		52		50		53		51		52	
Biodegradable Dis. Org. Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	*ND*		0.3		0.74		--		--		--		--		--		--	
Dissolved Organic Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	4.6	J+	4.8	J+	4.4	J+	--		--		--		--		--		--	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	6.9		5.8		5.7		3.9		3.9		2.4		4.4		2.6		2.5	
NUTRIENTS																							
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	0.25		0.24		0.29		*ND*		*ND*		0.082		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	0.2	N/A	N/A	0.96		0.98		1.3		0.58		0.44		0.34		0.6		0.24		0.24	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1	10	10	1		1		2.4		2.5		2.7		0.36		2.9		1.3		1.9	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Nitrate, Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	1		1		2.4		2.5		2.7		0.36		2.9		1.3		1.9	
Total Nitrogen (calc.)	calculated			N/A	N/A	1.96		1.98		3.7		3.08		3.14		0.7		3.5		1.54		2.14	
Orthophosphate as P	4500P-E/365.1	mg/L	0.01	N/A	N/A	0.26		0.26		0.74		1.2		2.3		0.088		2.5		0.092		0.39	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

(2) Established by the Washington State Department of Ecology in WAC 173-200-040
J = Value is detected and the result is estimated
J- = Value is detected and the result is estimated and biased low
J+ = Value is detected and the result is estimated and biased high
UJ = Result is a non-detect and the value is estimated
R = Result rejected
*Drinking water and groundwater quality standards are for total metals.

Appendix B - Water Quality Summary

March Monthly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3a		MW-5		MW-8		MW-9		MW-11		MW-14		MW-15		MW-16		MW-20		MW-25		MW-26		MW-27	
DATE						3/12/2018		3/13/2018		3/13/2018		3/13/2018		3/14/2018		3/14/2018		3/12/2018		3/12/2018		3/14/2018		3/12/2018		3/13/2018		3/12/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																													
pH		units				6.86		6.91		6.86		6.89		6.87		7.38		6.89		6.84		7.11		7.21		6.2		6.75	
Temperature		˚C				14		13.7		13.5		13.3		12		12.5		13.3		13.2		10.6		10.8		10.4		12.4	
Conductivity		µS/cm				570		466.5		414.6		401.7		355.7		260.2		343.5		502		154.7		244.2		134.3		364.2	
Oxidation Reduction Potential (ORP)		mV				148		189.7		151.6		154.3		151.2		164.3		148.5		155.3		74		123.6		206.2		124.7	
Dissolved Oxygen		mg/L				3.33		2.18		4.7		5.4		4.5		4.83		7.74		3.23		5.59		7.63		7.2		5.4	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																													
Chloride	EPA 300.0	mg/L	1	250	250	50		53		48		47		34		20		21		46		5.6		10		6.2		29	
Biodegradable Dis. Org. Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	--		--		--		--		--		--		--		--		--		--		--		--	
Dissolved Organic Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	--		--		--		--		--		--		--		--		--		--		--		--	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	1.5		3.6		2.1		2.7		0.62		0.36		0.6		0.96		0.32		*ND*		1.4		0.72	
NUTRIENTS																													
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	0.2	N/A	N/A	*ND*		0.36		0.31		0.21		0.32		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1	10	10	2.3		3		2.2		2.2		1.3		1.4		0.99		1.5		0.76		1		1.5		1.6	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Nitrate, Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	2.3		3		2.2		2.2		1.3		1.4		0.99		1.5		0.76		1		1.5		1.6	
Total Nitrogen (calc.)	calculated			N/A	N/A	2.3		3.36		2.51		2.41		1.62		1.4		0.99		1.5		0.76		1		1.5		1.6	
Orthophosphate as P	4500P-E/365.1	mg/L	0.01	N/A	N/A	0.78		2.3		0.12		0.25		0.02		0.029		0.34		0.075		0.01		0.017		0.014		0.017	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

(2) Established by the Washington State Department of Ecology in WAC 173-200-040

J = Value is detected and the result is estimated

J- = Value is detected and the result is estimated and biased low

J+ = Value is detected and the result is estimated and biased high

UJ = Result is a non-detect and the value is estimated

R = Result rejected

*Drinking water and groundwater quality standards are for total metals.

Appendix B - Water Quality Summary

April Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std^1	Groundwater Quality Std^2	Reclaimed Water 1		Reclaimed Water 1- Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						4/9/2018		4/9/2018		4/11/2018		4/9/2018 - 4/13/2018						4/9/2018 - 4/13/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifie	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																							
pH		units				--		--		--		--		--		--		--		--		--	
Temperature		˚C				--		--		--		--		--		--		--		--		--	
Conductivity		µS/cm				--		--		--		--		--		--		--		--		--	
Oxidation Reduction Potential (ORP)		mV				--		--		--		--		--		--		--		--		--	
Dissolved Oxygen		mg/L				--		--		--		--		--		--		--		--		--	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																							
Chloride	EPA 300.0	mg/L	1	250	250	52		52		52		53		53		--		54		54		53	
Sulfate	EPA 300.0	mg/L	0.5	250	250	27		27		29		28		29		--		28		29		28	
Biodegradable Dis. Org. Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	0.64		0.71		0.48		*ND*		0.42	J+	*ND*		0.6	J+	0.5	J+	*ND*	UJ
Dissolved Organic Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	4	J+	4.2	J+	5.1		5.1	J+	3.4	J+	4.2	J	3.7	J+	2.1	J+	2.6	J
Total Dissolved Solid (TDS)	E160.1/SM2540C	mg/L	10	500	500	340		330		340		310		330		--		320		310		300	J
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	4.9		4.9		5.2		3.7		3.4		2.5		0.65		2		1.7	
NUTRIENTS																							
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	0.49		0.5		0.056		*ND*		*ND*		0.14		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	0.2	N/A	N/A	1.3		1.2		0.7		0.54		0.45		0.46		0.65		0.25		0.32	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1	10	10	2.2		2.2		1.9		2		2.4		--		2.7		1.7		2.1	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		--		*ND*		*ND*		*ND*	
Total Nitrate + Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	2.2		2.2		1.9		2		2.4		--		2.7		1.7		2.1	
Total Nitrogen (calc.)	calculated	mg/L		N/A	N/A	3.5		3.4		2.6		2.54		2.85		--		3.35		1.95		2.42	
Phosphorus as P	SM4500-PE/EPA 365.1	mg/L	0.02	N/A	N/A	4.1		4		0.29		1.7		2.5		--		2.4		0.19		*ND*	
Orthophosphate as P	SM4500-PE/EPA 365.1	mg/L	0.01	N/A	N/A	3.8		3.7		2.7		1.7	J	2.3	J	--		2.2	J	0.19	J	*ND*	UJ
METALS (DISSOLVED)																							
Calcium	EPA 200.7	mg/L	1	N/A	N/A	34		35		34		32		36		34		36		28		33	
Dissolved Silica	EPA 200.7	mg/L	0.5	N/A	N/A	34		34		35		33		34		32		35		25		26	
Iron	EPA 200.7	mg/L	0.02	0.3	0.3	*ND*		*ND*		*ND*		3.1		0.031		0.13		0.022		0.024		1	
Magnesium	EPA 200.7	mg/L	0.1	N/A	N/A	9.3		9.4		9		9.5		10		11		10		10		9.4	
Potassium	EPA 200.7	mg/L	1	N/A	N/A	14		15		15		14		15		13		15		15		3.6	
Sodium	EPA 200.7	mg/L	1	N/A	N/A	53		54		54		51		54		54		54		52		54	
Arsenic	EPA 200.8	µg/L	1	10	0.05	*ND*		*ND*		*ND*		1		1.6		*ND*		1.1		*ND*		*ND*	
Cadmium	EPA 200.8	µg/L	0.5	5	10	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Chromium	EPA 200.8	µg/L	1	100	50	*ND*		*ND*		*ND*		630		*ND*		26		2		2.7		*ND*	
Copper	EPA 200.8	µg/L	2	1300	1000	3.4		3.4		4.2		8		14		5.2		8.6		6.3		6.2	
Lead	EPA 200.8	µg/L	0.5	15	50	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Manganese	EPA 200.8	µg/L	2	50	50	3.8		3.8		4.4		120		19		200		8.1		120		110	
Nickel	EPA 200.8	µg/L	5	100	N/A	*ND*		*ND*		*ND*		1300		24		170		28		25		24	
Selenium	EPA 200.8	µg/L	5	50	10	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		5.5		5.2	
Silver	EPA 200.8	µg/L	0.5	100	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Zinc	EPA 200.8	µg/L	20	5000	5000	76		76		81		*ND*		*ND*		*ND*		30		*ND*		*ND*	
Mercury	EPA 245.1	µg/L	0.2	2	2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
RESIDUAL CHEMICALS																							
1,4-Dioxane	EPA 522	µg/L	0.07	N/A	N/A	0.65		0.73		--		0.65		0.59		--		0.64		0.67		0.68	
1,7-Dimethylxanthine	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		22		45		31		--		10		41		11	
2,4-D	LC-MS-MS	ng/L	5	70	100	140		160		*ND*		13	J	*ND*		--		19		*ND*		*ND*	
4-nonylphenol - semi quantitative	LC-MS-MS	ng/L	100	N/A	N/A	290	J	490	J	3100	J	23000	J	20000	J	--		26000	J	17000	J	*ND*	UJ
4-tert-octylphenol	LC-MS-MS	ng/L	50	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		--		*ND*		*ND*		*ND*	
Acesulfame-K	LC-MS-MS	ng/L	20	N/A	N/A	130		120		350		79		100		--		98		180		200	
Acetaminophen	LC-MS-MS	ng/L	5	N/A	N/A	47	J	76	J	12		17		*ND*		--		16		9.5		39	
Albuterol	LC-MS-MS	ng/L	5	N/A	N/A	10		11		*ND*		*ND*		*ND*		--		*ND*		*ND*		*ND*	
Amoxicillin (semi-quantitative)	LC-MS-MS	ng/L	20	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	--		*ND*	UJ	*ND*	UJ	*ND*	UJ
Andorostenedione	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		--		*ND*		*ND*		*ND*	
Atenolol	LC-MS-MS	ng/L	5	N/A	N/A	220		210		170		130		43		--		120		*ND*		*ND*	
Atrazine	LC-MS-MS	ng/L	5	3000	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		--		*ND*		*ND*		*ND*	
Bendroflumethiazide	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		--		*ND*		*ND*		*ND*	

Appendix B - Water Quality Summary

April Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						4/9/2018		4/9/2018		4/11/2018		4/9/2018 - 4/13/2018						4/9/2018 - 4/13/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifie	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Bezafibrate	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
BPA	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Bromacil	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Butalbital	LC-MS-MS	ng/L	5	N/A	N/A	22		19		51		16	J	6.7		--		8.5		20		21	
Butylparben	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Caffeine	LC-MS-MS	ng/L	5	N/A	N/A	19		18		ND		30		ND		--		36		38		ND	
Carbadox	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Carbamazepine	LC-MS-MS	ng/L	5	N/A	N/A	410	J	320	J	160		830		850		--		810		520		610	
Carisoprodol	LC-MS-MS	ng/L	5	N/A	N/A	16		18		37		22		24		--		17		24		ND	
Chloramphenicol	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Chloridazon	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		5		ND		62	
Chlorotoluron	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Cimetidine	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	--		ND	UJ	ND	UJ	ND	UJ
Clofibric Acid	LC-MS-MS	ng/L	5	N/A	N/A	120		110		50		ND		ND		--		ND		ND		ND	
Cotinine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Cyanazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
DACT	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
DEA	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
DEET	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		12		ND		ND		--		ND		ND		ND	
Dehydronifedipine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
DIA	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Diazepam	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		5.4		ND		ND		--		ND		ND		ND	
Diclofenac	LC-MS-MS	ng/L	5	N/A	N/A	240		260		ND		ND		79		--		55		ND		ND	
Dilantin	LC-MS-MS	ng/L	20	N/A	N/A	84		74		70		36		34		--		ND		ND		ND	
Diltiazem	LC-MS-MS	ng/L	5	N/A	N/A	20		21		ND		ND		ND		--		ND		ND		ND	
Diuron	LC-MS-MS	ng/L	5	N/A	N/A	34		32		30		25		25		--		18		5.5		ND	
Erythromycin	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		19		48		--		10		18		ND	
Estradiol	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Estriol	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Estrone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Ethinyl Estradiol - 17 alpha	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Ethylparaben	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Flumeqine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		54	
Fluoxetine	LC-MS-MS	ng/L	10	N/A	N/A	210		210		210		ND		ND		--		ND		ND		ND	
Gemfibrozil	LC-MS-MS	ng/L	5	N/A	N/A	38		38		ND		ND		ND		--		10		ND		ND	
Ibuprofen	LC-MS-MS	ng/L	10	N/A	N/A	180		170		310		ND		ND		--		ND		ND		ND	
Iohexal	LC-MS-MS	ng/L	10	N/A	N/A	1500	J	990	J	180		340		200		--		500		ND		ND	
Iopromide	LC-MS-MS	ng/L	5	N/A	N/A	5.6		6.6		280		15		16		--		ND		ND		5.1	
Isobutylparaben	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Isoproturon	LC-MS-MS	ng/L	100	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Ketoprofen	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Ketorolac	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Lidocaine	LC-MS-MS	ng/L	5	N/A	N/A	540		550		ND		ND		92		--		ND		ND		ND	
Lincomycin	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Linuron	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Lopressor	LC-MS-MS	ng/L	20	N/A	N/A	730		720		ND		510		110		--		ND		ND		ND	
Meclofenamic Acid	LC-MS-MS	ng/L	5	N/A	N/A	300		290		ND		46		130		--		ND		ND		ND	
Meprobamate	LC-MS-MS	ng/L	5	N/A	N/A	91		83		390		56		26		--		ND		ND		ND	
Metazachlor	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Metformin	LC-MS-MS	ng/L	5	N/A	N/A	86		73		34		ND		ND		--		ND		ND		ND	
Methylparaben	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Metolachlor	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Naproxen	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Nifedipine	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	--		ND	UJ	ND	UJ	ND	UJ
N-Nitroso dimethylamine (NDMA)	LC-MS-MS	ng/L	2	N/A	N/A	5.1	J	7.3	J	4.4		4.7		3		--		3.4		2.5		ND	

Appendix B - Water Quality Summary

April Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std^1	Groundwater Quality Std^2	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						4/9/2018		4/9/2018		4/11/2018		4/9/2018 - 4/13/2018						4/9/2018 - 4/13/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifie	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Norethisterone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		5.9		ND		ND		--		ND		ND		ND	
OUST (Sulfameturon,methyl)	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Oxolinic acid	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Pentoxifylline	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		6.2		ND		ND		--		ND		ND		ND	
Phenazone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Primidone	LC-MS-MS	ng/L	5	N/A	N/A	270	J	340	J	120		ND		ND		--		ND		ND		ND	
Progesterone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Propazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Propylparaben	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Quinoline	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Salicylic Acid	LC-MS-MS	ng/L	100	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Simazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Sucralose	LC-MS-MS	ng/L	100	N/A	N/A	21000		20000		9400		12000		16000		--		21000		21000		18000	
Sulfachloropyridazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Sulfadiazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Sulfadimethoxine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Sulfamerazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Sulfamethazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Sulfamethizole	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Sulfamethoxazole	LC-MS-MS	ng/L	5	N/A	N/A	470		520		ND		370		610		--		500		660		620	
Sulfathiazole	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
TCEP	LC-MS-MS	ng/L	10	N/A	N/A	120		120		130		190		160		--		140		190		110	
TCPP	LC-MS-MS	ng/L	100	N/A	N/A	360		310		330		120		ND		--		ND		110		ND	
TDCPP	LC-MS-MS	ng/L	100	N/A	N/A	180		180		260		100		ND		--		ND		ND		ND	
Testosterone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		31	
Theobromine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		62		170		65		--		490		28		ND	
Theophylline	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	120	J	43	J	160	J	60	J	--		110	J	ND	UJ	ND	UJ
Thiabendazole	LC-MS-MS	ng/L	5	N/A	N/A	43		41		89		9.1		ND		--		8.8		ND		ND	
Triclocarban	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Triclosan	LC-MS-MS	ng/L	10	N/A	N/A	12	J	ND	UJ	ND		43		45		--		130		30		33	
Trimethoprim	LC-MS-MS	ng/L	5	N/A	N/A	57	J	46	J	ND		ND		ND		--		ND		ND		ND	
Warfarin	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
PFAS																							
Perfluoro butanoic acid- PFBA	MWH PFC	ng/L	10	N/A	N/A	ND	UJ	ND	UJ	ND		ND	UJ	ND	UJ	ND		10	J	ND	UJ	ND	
Perfluoro octanesulfonate-PFOS	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Perfluoro octanesulfonic acid - PFOS	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND	UJ	ND	UJ	ND		ND		ND		ND		ND	
Perfluoro octanoic acid - PFOA	MWH PFC	ng/L	5	N/A	N/A	20	J	18	J	19		18	J	15		17		15		31		14	
Perfluoro-1-butanesulfonate	MWH PFC	ng/L	5	N/A	N/A	8.3		9.2		8.8		15		14		18		12		13		16	
Perfluoro-1-butanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	7		9.6		8.3		14	J	13		16		11		12		15	
Perfluoro-1-hexanesulfonate	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro-1-hexanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND	UJ	ND		ND		ND		ND		ND	
Perfluoro-n-decanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND		ND	UJ	ND	UJ	ND	
Perfluoro-n-heptanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro-n-hexanoic acid	MWH PFC	ng/L	5	N/A	N/A	32		39		67		60		70		65		58		72		55	
Perfluoro-n-nonanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND		ND	UJ	ND		ND		ND	UJ	ND	
Perfluoropentanoic acid	MWH PFC	ng/L	5	N/A	N/A	50		59		130		71		96		84		76		85		83	
DBPs																							
Bromodichloromethane	EPA 524.2	µg/L	0.5	N/A	N/A	1.3		1.3		6.6		5.9		1.4		--		6.1		ND		ND	
Bromoform	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Chlorodibromomethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		0.58		ND		ND		--		ND		ND		ND	
Chloroform (Trichloromethane)	EPA 524.2	µg/L	0.5	N/A	N/A	8.4		8.2		33		35		16		--		35		8		21	
Total THM	EPA 524.2	µg/L	0.5	N/A	N/A	9.7		9.5		40		41		17		--		41		8		21	
Bromochloroacetic acid	SM 6251B	µg/L	1	N/A	N/A	1		1		2.4		ND		ND		--		ND		ND		ND	
Dibromoacetic acid	SM 6251B	µg/L	1	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Dichloroacetic acid	SM 6251B	µg/L	1	N/A	N/A	14		14		19		1.2		ND		--		ND		ND		ND	

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April Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std^1	Groundwater Quality Std^2	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						4/9/2018		4/9/2018		4/11/2018		4/9/2018 - 4/13/2018						4/9/2018 - 4/13/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifie	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Monobromoacetic acid	SM 6251B	µg/L	1	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Monochloroacetic acid	SM 6251B	µg/L	2	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Trichloroacetic acid	SM 6251B	µg/L	1	N/A	N/A	6.7		6.9		25		1.2		ND		--		ND		ND		ND	
Total Haloacetic Acids (HAA5)	SM 6251B	µg/L	2	N/A	N/A	21		21		46		2.4		ND		--		ND		ND		ND	
Bacteria																							
E. Coli Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	A		A		A		A		A		A		A		A		A	
E. Coli Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total Coliform Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	P		P		P		P		A		A		P		A		A	
Total Coliform Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	1.0		1.0		5.3		1.0		ND		ND		1.0		ND		ND	
VOCs																							
1,1,1,2-Tetrachloroethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
1,1,1-Trichloroethane	EPA 524.2	µg/L	0.5	200	0.2	ND		ND		ND		ND		ND		--		ND		ND		ND	
1,1,2,2-Tetrachloroethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
1,1,2-Trichloroethane	EPA 524.2	µg/L	0.5	5	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
1,1-Dichloroethane	EPA 524.2	µg/L	0.5	N/A	1	ND		ND		ND		ND		ND		--		ND		ND		ND	
1,1-Dichloroethylene	EPA 524.2	µg/L	0.5	7	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
1,1-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
1,2,3-Trichlorobenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
1,2,3-Trichloropropane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
1,2,4-Trichlorobenzene	EPA 524.2	µg/L	0.5	70	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
1,2,4-Trimethylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
1,2-Dichloroethane	EPA 524.2	µg/L	0.5	5	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
1,2-Dichloropropane	EPA 524.2	µg/L	0.5	5	0.6	ND		ND		ND		ND		ND		--		ND		ND		ND	
1,3,5-Trimethylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
1,3-Dichloropropane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
2,2-Dichloropropane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
2-Butanone (MEK)	EPA 524.2	µg/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
2-Hexanone	EPA 524.2	µg/L	10	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
4-Methyl-2-Pentanone (MIBK)	EPA 524.2	µg/L	5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Benzene	EPA 524.2	µg/L	0.5	5	1	ND		ND		ND		ND		ND		--		ND		ND		ND	
Bromobenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Bromochloromethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Bromoethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Bromomethane (Methyl Bromide)	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Carbon disulfide	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Carbon Tetrachloride	EPA 524.2	µg/L	0.5	5	0.3	ND		ND		ND		ND		ND		--		ND		ND		ND	
Chlorobenzene	EPA 524.2	µg/L	0.5	100	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Chloroethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Chloromethane (Methyl Chloride)	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
cis-1,2-Dichloroethylene	EPA 524.2	µg/L	0.5	70	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
cis-1,3-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Dibromomethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Dichlorodifluoromethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Dichloromethane	EPA 524.2	µg/L	0.5	5	5	ND		ND		ND		ND		ND		--		ND		ND		ND	
Di-isopropyl ether	EPA 524.2	µg/L	3	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Ethyl benzene	EPA 524.2	µg/L	0.5	700	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Hexachlorobutadiene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Isopropylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
m,p-Xylenes	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
m-Dichlorobenzene (1,3-DCB)	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Methyl Tert-butyl ether (MTBE)	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Naphthalene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
n-Butylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
n-Propylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
o-Chlorotoluene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	

Appendix B - Water Quality Summary

April Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std^1	Groundwater Quality Std^2	Reclaimed Water 1		Reclaimed Water 1- Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						4/9/2018		4/9/2018		4/11/2018		4/9/2018 - 4/13/2018						4/9/2018 - 4/13/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifie	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
o-Dichlorobenzene (1,2-DCB)	EPA 524.2	µg/L	0.5	600	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
o-Xylene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
p-Chlorotoluene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
p-Dichlorobenzene (1,4-DCB)	EPA 524.2	µg/L	0.5	75	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
p-Isopropyltoluene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
sec-Butylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Styrene	EPA 524.2	µg/L	0.5	100	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
tert-amyl Methyl Ether	EPA 524.2	µg/L	3	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
tert-Butyl Ethyl Ether	EPA 524.2	µg/L	3	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
tert-Butylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Tetrachloroethylene (PCE)	EPA 524.2	µg/L	0.5	5	0.8	ND		ND		ND		ND		ND		--		ND		ND		ND	
Toluene	EPA 524.2	µg/L	0.5	1000	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Total 1,3-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Total xylenes	EPA 524.2	µg/L	0.5	10000	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
trans-1,2-Dichloroethylene	EPA 524.2	µg/L	0.5	100	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
trans-1,3-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Trichloroethylene (TCE)	EPA 524.2	µg/L	0.5	5	3	ND		ND		ND		ND		ND		--		ND		ND		ND	
Trichlorofluoromethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Trichlorotrifluoroethane (Freon)	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		--		ND		ND		ND	
Vinyl chloride (VC)	EPA 524.2	µg/L	0.3	2	0.02	ND		ND		ND		ND		ND		--		ND		ND		ND	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

(2) Established by the Washington State Department of Ecology in WAC 173-200-040

J = Value is detected and the result is estimated

J- = Value is detected and the result is estimated and biased low

J+ = Value is detected and the result is estimated and biased high

UJ = Result is a non-detect and the value is estimated

R = Result rejected

*Drinking water and groundwater quality standards are for total metals.

*Missing MW-5 field parameters

Appendix B - Water Quality Summary

April Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std^1	Groundwater Quality Std^2	MW-3A		MW-5		MW-8		MW-9		MW-14		MW-16		MW-20		MW-23		MW-25		MW-26		MW-27		MW-28	
DATE						4/9/2018		4/12/2018		4/12/2018		4/10/2018		4/11/2018		4/9/2018		4/10/2018		4/11/2018		4/9/2018		4/10/2018		4/11/2018		4/11/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																													
pH		units				6.91				6.81		6.86		7.43		6.89		7.21		7.31		7.28		6.28		6.77		7.04	
Temperature		˚C				13.8				13.3		13.1		12.7		13		11.2		10.3		10.6		10.5		12.2		11.6	
Conductivity		µS/cm				459.4				480.2		399		253.3		402		159.2		212.6		183.4		138.9		278.1		132.9	
Oxidation Reduction Potential (ORP)		mV				116.9				137.8		167.8		156		150.6		76.2		144.2		110.7		183.9		161.0		138.5	
Dissolved Oxygen		mg/L				3.95				4.7		5.45		5.08		4.81		7.33		6.20		8.49		7.40		6.01		6.11	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																													
Chloride	EPA 300.0	mg/L	1	250	250	53		51		49		47		21		47		6.4		15		9.7		5.5		29		5.7	
Sulfate	EPA 300.0	mg/L	0.5	250	250	28		29		26		25		11		24		4.4		9.8		9.7		7.5		17		5	
Biodegradable Dis. Org. Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	0.41		1.1	J+	0.5	J+	0.37		0.36		0.33		*ND*		0.37		*ND*		*ND*		*ND*		0.42	
Dissolved Organic Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	1.5	J+	1.9	J+	1.1	J+	1.3	J+	0.48	J+	0.99	J+	0.5	J+	0.32	J+	0.86	J+	0.54	J+	0.84	J+	0.36	J+
Total Dissolved Solid (TDS)	E160.1/SM2540C	mg/L	10	500	500	310		320		290		290		180		290		140		150		170		120		220		100	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	1.6		3.6		2.2		1.4		0.32		1		*ND*		*ND*		0.34		0.34		0.72		0.35	
NUTRIENTS																													
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		0.062		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	0.2	N/A	N/A	0.21		0.33		*ND*		0.21		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1	10	10	2.4		2.9		2.4		2.4		1.4		1.7		0.86		1.3		1		1.2		1.7		0.69	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Nitrate + Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	2.4		2.9		2.4		2.4		1.4		1.7		0.86		1.3		1		1.2		1.7		0.69	
Total Nitrogen (calc.)	calculated	mg/L		N/A	N/A	2.61		3.23		2.4		2.61		1.4		1.7		0.86		1.3		1		1.2		1.7		0.69	
Phosphorus as P	SM4500-PE/EPA 365.1	mg/L	0.02	N/A	N/A	0.99		0.43		0.13		0.32		0.027		0.058		*ND*		0.024		0.044		0.029		*ND*		*ND*	
Orthophosphate as P	SM4500-PE/EPA 365.1	mg/L	0.01	N/A	N/A	0.88		2.3		0.13		0.3		0.029		0.052		0.011		0.02		0.017		0.015		0.018		0.02	
METALS (DISSOLVED)																													
Calcium	EPA 200.7	mg/L	1	N/A	N/A	32		34		30		34		24		29		18		22		17		20		25		14	
Dissolved Silica	EPA 200.7	mg/L	0.5	N/A	N/A	29		32		26		27		31		24		25		27		29		20		25		22	
Iron	EPA 200.7	mg/L	0.02	0.3	0.3	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		0.026		*ND*		*ND*		*ND*	
Magnesium	EPA 200.7	mg/L	0.1	N/A	N/A	10		9.6		10		11		16		8.6		10		13		12		5.6		9.1		6.9	
Potassium	EPA 200.7	mg/L	1	N/A	N/A	5.2		9.8		3.1		2.9		3.1		2.9		1.7		2.4		2.5		*ND*		1.8		1.3	
Sodium	EPA 200.7	mg/L	1	N/A	N/A	52		51		47		45		9.3		47		7.4		8.3		8.1		6.7		25		6.1	
Arsenic	EPA 200.8	µg/L	1	10	0.05	3.5		2.6		1		1.8		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Cadmium	EPA 200.8	µg/L	0.5	5	10	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Chromium	EPA 200.8	µg/L	1	100	50	*ND*		*ND*		*ND*		*ND*		1.4		*ND*		*ND*		1		1.4		*ND*		*ND*		*ND*	
Copper	EPA 200.8	µg/L	2	1300	1000	8.1		14		6.5		5.9		*ND*		3.8		*ND*		*ND*		*ND*		*ND*		2.3		*ND*	
Lead	EPA 200.8	µg/L	0.5	15	50	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Manganese	EPA 200.8	µg/L	2	50	50	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		2.6		3.4		4.8		*ND*		*ND*	
Nickel	EPA 200.8	µg/L	5	100	N/A	5.4		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Selenium	EPA 200.8	µg/L	5	50	10	5.8		*ND*		*ND*		5.8		*ND*		7.6		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Silver	EPA 200.8	µg/L	0.5	100	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Zinc	EPA 200.8	µg/L	20	5000	5000	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Mercury	EPA 245.1	µg/L	0.2	2	2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
RESIDUAL CHEMICALS																													
1,4-Dioxane	EPA 522	µg/L	0.07	N/A	N/A	0.61		--		--		--		--		0.47		--		--		--		--		--		--	
1,7-Dimethylxanthine	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		17		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
2,4-D	LC-MS-MS	ng/L	5	70	100	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
4-nonylphenol - semi quantitative	LC-MS-MS	ng/L	100	N/A	N/A	320	J	550	J	*ND*	UJ	*ND*	R	3100	J	430	J	*ND*	R	120	J	260	J	*ND*	R	120	J	*ND*	UJ
4-tert-octylphenol	LC-MS-MS	ng/L	50	N/A	N/A	*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*		*ND*	UJ	*ND*		150		*ND*	UJ	*ND*		81	
Acesulfame-K	LC-MS-MS	ng/L	20	N/A	N/A	160		110		340		*ND*		640		260		*ND*		310		71		*ND*		380		47	
Acetaminophen	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		6.7		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		5.2		*ND*	
Albuterol	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Amoxicillin (semi-quantitative)	LC-MS-MS	ng/L	20	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ
Andorostenedione	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Atenolol	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Atrazine	LC-MS-MS	ng/L	5	3000	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*				*ND*		*ND*		*ND*		*ND*	
Bendroflumethiazide	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Bezafibrate	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
BPA	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Bromacil	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Butalbital	LC-MS-MS	ng/L	5	N/A	N/A	23		23		23		23		*ND*		16		*ND*		*ND*		*ND*		*ND*		15		*ND*	
Butylparben	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Caffeine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Carbadox	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Carbamazepine	LC-MS-MS	ng/L	5	N/A	N/A	500		640		450		*ND*		*ND*		270		*ND*		*ND*		*ND*		*ND*		150		*ND*	
Carisoprodol	LC-MS-MS	ng/L	5	N/A	N/A	8		16		5.6		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Chloramphenicol	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	

Appendix B - Water Quality Summary

April Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3A		MW-5		MW-8		MW-9		MW-14		MW-16		MW-20		MW-23		MW-25		MW-26		MW-27		MW-28	
DATE						4/9/2018		4/12/2018		4/12/2018		4/10/2018		4/11/2018		4/9/2018		4/10/2018		4/11/2018		4/9/2018		4/10/2018		4/11/2018		4/11/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Chloridazon	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chlorotoluron	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cimetidine	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Clofibric Acid	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cotinine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cyanazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DACT	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DEA	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DEET	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dehydronifedipine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DIA	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diazepam	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diclofenac	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dilantin	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diltiazem	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diuron	LC-MS-MS	ng/L	5	N/A	N/A	8.5		21		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Erythromycin	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		22		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estradiol	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estriol	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estrone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethinyl Estradiol - 17 alpha	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethylparaben	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Flumeqine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Fluoxetine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Gemfibrozil	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ibuprofen	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Iohexal	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Iopromide	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		5.9		ND		ND		7.8		ND		ND		ND		ND		ND		ND	
Isobutylparaben	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isoproturon	LC-MS-MS	ng/L	100	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketoprofen	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketorolac	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Lidocaine	LC-MS-MS	ng/L	5	N/A	N/A	23		ND		5.7		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Lincomycin	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Linuron	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Lopressor	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Meclofenamic Acid	LC-MS-MS	ng/L	5	N/A	N/A	ND		10		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Meprobamate	LC-MS-MS	ng/L	5	N/A	N/A	17		18		15		ND		ND		ND		ND		ND		ND		ND		5.6		ND	
Metazachlor	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Metformin	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Methylparaben	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Metolachlor	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Naproxen	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Nifedipine	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
N-Nitroso dimethylamine (NDMA)	LC-MS-MS	ng/L	2	N/A	N/A	ND		ND		3		ND		3.4		ND		2.1		6.4		ND		5		4.9		ND	
Norethisterone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
OUST (Sulfameturon,methyl)	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Oxolinic acid	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Pentoxifylline	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Phenazone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Primidone	LC-MS-MS	ng/L	5	N/A	N/A	52		ND		ND		ND	UJ	41		ND		ND		ND		ND		ND	UJ	20		ND	
Progesterone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Propazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Propylparaben	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Quinoline	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Salicylic Acid	LC-MS-MS	ng/L	100	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Simazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		9.4		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sucralose	LC-MS-MS	ng/L	100	N/A	N/A	16000		14000		21000		38000		1800		22000		ND		1100		4900		160		15000		ND	
Sulfachloropyridazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfadiazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfadimethoxine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		5.5		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamerazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethizole	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethoxazole	LC-MS-MS	ng/L	5	N/A	N/A	710		810		510		ND		37		380		ND		ND		6.7		ND		120		ND	

Appendix B - Water Quality Summary

April Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3A		MW-5		MW-8		MW-9		MW-14		MW-16		MW-20		MW-23		MW-25		MW-26		MW-27		MW-28	
DATE						4/9/2018		4/12/2018		4/12/2018		4/10/2018		4/11/2018		4/9/2018		4/10/2018		4/11/2018		4/9/2018		4/10/2018		4/11/2018		4/11/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Sulfathiazole	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TCEP	LC-MS-MS	ng/L	10	N/A	N/A	120		170		130		ND		ND		35		ND		ND		ND		ND		48		ND	
TCPP	LC-MS-MS	ng/L	100	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TDCPP	LC-MS-MS	ng/L	100	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Testosterone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Theobromine	LC-MS-MS	ng/L	10	N/A	N/A	ND		18		16		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Theophylline	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	68	J	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Thiabendazole	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Triclocarban	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Triclosan	LC-MS-MS	ng/L	10	N/A	N/A	ND		57		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trimethoprim	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Warfarin	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
PFAS																													
Perfluoro butanoic acid- PFBA	MWH PFC	ng/L	10	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND		ND		ND	UJ	ND		ND		ND	UJ	ND		ND	UJ	ND	
Perfluoro octanesulfonate-PFOS	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro octanesulfonic acid - PFOS	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND	UJ	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro octanoic acid - PFOA	MWH PFC	ng/L	5	N/A	N/A	17	J	14		16		17		17		21		ND		7.8		ND		ND		11		ND	
Perfluoro-1-butanesulfonate	MWH PFC	ng/L	5	N/A	N/A	15		17		14		15		7.6		17		ND		5.2		ND		ND		10		ND	
Perfluoro-1-butanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	13		16		13		13		7.8		16		ND		5.7		ND		ND		9.9		ND	
Perfluoro-1-hexanesulfonate	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro-1-hexanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	UJ	ND	
Perfluoro-n-decanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND		ND	UJ	ND	UJ	ND	UJ	ND		ND	UJ	ND		ND	UJ	ND	
Perfluoro-n-heptanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro-n-hexanoic acid	MWH PFC	ng/L	5	N/A	N/A	62		61		60		56		20		62		ND		14		ND		ND		35		ND	
Perfluoro-n-nonanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND	UJ	ND		ND	UJ	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoropentanoic acid	MWH PFC	ng/L	5	N/A	N/A	72		94		87		87		28		68		ND		22		9.6		ND		46		ND	
DBPs																													
Bromodichloromethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromoform	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chlorodibromomethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloroform (Trichloromethane)	EPA 524.2	µg/L	0.5	N/A	N/A	20		34		20		23		0.8		8.8		ND		0.54		ND		ND		8.2		ND	
Total THM	EPA 524.2	µg/L	0.5	N/A	N/A	20		34		20		23		0.8		8.8		ND		0.54		ND		ND		8.2		ND	
Bromochloroacetic acid	SM 6251B	µg/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dibromoacetic acid	SM 6251B	µg/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dichloroacetic acid	SM 6251B	µg/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Monobromoacetic acid	SM 6251B	µg/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Monochloroacetic acid	SM 6251B	µg/L	2	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trichloroacetic acid	SM 6251B	µg/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total Haloacetic Acids (HAA5)	SM 6251B	µg/L	2	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bacteria																													
E. Coli Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	A		A		A		A		A		A		A		A		A		A		A		A	
E. Coli Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total Coliform Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	A		A		A		A		P		A		A		A		A		P		A		A	
Total Coliform Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	ND		ND		ND		ND		1.0		ND		ND		ND		ND		1.0		ND		ND	
VOCs																													
1,1,1,2-Tetrachloroethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,1-Trichloroethane	EPA 524.2	µg/L	0.5	200	0.2	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,2,2-Tetrachloroethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,2-Trichloroethane	EPA 524.2	µg/L	0.5	5	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloroethane	EPA 524.2	µg/L	0.5	N/A	1	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloroethylene	EPA 524.2	µg/L	0.5	7	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3-Trichlorobenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3-Trichloropropane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,4-Trichlorobenzene	EPA 524.2	µg/L	0.5	70	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,4-Trimethylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2-Dichloroethane	EPA 524.2	µg/L	0.5	5	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2-Dichloropropane	EPA 524.2	µg/L	0.5	5	0.6	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,3,5-Trimethylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,3-Dichloropropane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2,2-Dichloropropane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2-Butanone (MEK)	EPA 524.2	µg/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2-Hexanone	EPA 524.2	µg/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
4-Methyl-2-Pentanone (MIBK)	EPA 524.2	µg/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Benzene	EPA 524.2	µg/L	0.5	5	1	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

Appendix B - Water Quality Summary

April Quarterly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	UNITS	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3A		MW-5		MW-8		MW-9		MW-14		MW-16		MW-20		MW-23		MW-25		MW-26		MW-27		MW-28	
DATE						4/9/2018		4/12/2018		4/12/2018		4/10/2018		4/11/2018		4/9/2018		4/10/2018		4/11/2018		4/9/2018		4/10/2018		4/11/2018		4/11/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Bromobenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromochloromethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromoethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromomethane (Methyl Bromide)	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbon disulfide	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbon Tetrachloride	EPA 524.2	µg/L	0.5	5	0.3	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chlorobenzene	EPA 524.2	µg/L	0.5	100	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloroethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloromethane (Methyl Chloride)	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
cis-1,2-Dichloroethylene	EPA 524.2	µg/L	0.5	70	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
cis-1,3-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dibromomethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dichlorodifluoromethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dichloromethane	EPA 524.2	µg/L	0.5	5	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Di-isopropyl ether	EPA 524.2	µg/L	3	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethyl benzene	EPA 524.2	µg/L	0.5	700	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Hexachlorobutadiene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isopropylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
m,p-Xylenes	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
m-Dichlorobenzene (1,3-DCB)	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Methyl Tert-butyl ether (MTBE)	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Naphthalene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
n-Butylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
n-Propylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
o-Chlorotoluene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
o-Dichlorobenzene (1,2-DCB)	EPA 524.2	µg/L	0.5	600	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
o-Xylene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
p-Chlorotoluene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
p-Dichlorobenzene (1,4-DCB)	EPA 524.2	µg/L	0.5	75	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
p-Isopropyltoluene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
sec-Butylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Styrene	EPA 524.2	µg/L	0.5	100	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
tert-amyl Methyl Ether	EPA 524.2	µg/L	3	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
tert-Butyl Ethyl Ether	EPA 524.2	µg/L	3	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
tert-Butylbenzene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Tetrachloroethylene (PCE)	EPA 524.2	µg/L	0.5	5	0.8	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Toluene	EPA 524.2	µg/L	0.5	1000	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total 1,3-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total xylenes	EPA 524.2	µg/L	0.5	10000	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
trans-1,2-Dichloroethylene	EPA 524.2	µg/L	0.5	100	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
trans-1,3-Dichloropropene	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trichloroethylene (TCE)	EPA 524.2	µg/L	0.5	5	3	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trichlorofluoromethane	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trichlorotrifluoroethane (Freon)	EPA 524.2	µg/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Vinyl chloride (VC)	EPA 524.2	µg/L	0.3	2	0.02	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter;
mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent
(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)
(2) Established by the Washington State Department of Ecology in WAC 173-200-040
J = Value is detected and the result is estimated
J- = Value is detected and the result is estimated and biased low
J+ = Value is detected and the result is estimated and biased high
UJ = Result is a non-detect and the value is estimated
R = Result rejected
*Drinking water and groundwater quality standards are for total metals.
Missing MW-5 field parameters

Appendix B - Water Quality Summary

May Monthly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std^1	Groundwater Quality Std^2	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25 ft		East B4 Lysimeter, 50 ft	
DATE						5/7/2018		5/7/2018		5/9/2018		5/7/2018 - 5/9/2018						5/7/2018 - 5/8/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																							
pH		units				--		--		--		--		--		--		--		--		--	
Temperature		˚C				--		--		--		--		--		--		--		--		--	
Conductivity		µS/cm				--		--		--		--		--		--		--		--		--	
Oxidation Reduction Potential (ORP)		mV				--		--		--		--		--		--		--		--		--	
Dissolved Oxygen		mg/L				--		--		--		--		--		--		--		--		--	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																							
Chloride	EPA 300.0	mg/L	1	250	250	50		50		57		54		53		52		50		54		52	
Biodegradable Dis. Org. Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	0.98		1		0.62		--		--		--		--		--		--	
Dissolved Organic Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	3.6	J+	3.5		4.4		--		--		--		--		--		--	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	6.1		6.2		6.1		3.8		3.9		3.1		5.4		2.1		1.7	
NUTRIENTS																							
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	3		2.9		0.074		0.05		*ND*		0.12		1.3		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	0.2	N/A	N/A	3.7		3.8		0.7		0.57		0.46		0.38		2		*ND*		0.33	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1	10	10	0.59		0.59		0.83		2.6		2.9		1.3		1.2		1.8		2.1	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05	1	N/A	*ND*		*ND*		*ND*		0.16		0.25		*ND*		0.53		0.059		*ND*	
Total Nitrate, Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	0.59		0.59		0.83		2.8		3.2		1.3		1.7		1.8		2.1	
Total Nitrogen (calc.)	calculated			N/A	N/A	4.29		4.39		1.53		3.17		3.36		1.68		3.2		1.8		2.43	
Orthophosphate as P	4500P-E/365.1	mg/L	0.01	N/A	N/A	0.29		0.3		0.19		1.7		2.6		0.43		2.2		0.2		0.001	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

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*Drinking water and groundwater quality standards are for total metals.

Appendix B - Water Quality Summary

May Monthly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3a		MW-5		MW-8		MW-9		MW-14		MW-16		MW-20		MW-23		MW-25		MW-26		MW-27		MW-28	
DATE						5/8/2018		5/8/2018		5/8/2018		5/8/2018		5/8/2018		5/7/2018		5/7/2018		5/9/2018		5/7/2018		5/8/2018		5/7/2018		5/7/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																													
pH		units				6.82		6.81		6.81		6.79		7.3		6.76		7.14		7.21		7.19		6.15		6.7		7	
Temperature		˚C				14.5		14.8		14.1		13.6		13.5		13.2		11.2		11.4		10.9		11		12.6		11.9	
Conductivity		µS/cm				436.7		464.2		402.7		388		262.8		385.3		158.9		206.9		166.1		126.7		260.9		125.5	
Oxidation Reduction Potential (ORP		mV				65.7		124.8		49.6		107.5		88.2		132.2		37.2		62.5		75.8		156.9		111.2		98.1	
Dissolved Oxygen		mg/L				4.07		3.89		4.73		5.38		5.06		5.1		6.36		6.14		8.36		8.1		5.99		6.5	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																													
Chloride	EPA 300.0	mg/L	1	250	250	52		53		47		45		22		48		6.2		15		8.9		5.5		27		5.8	
Biodegradable Dis. Org. Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	--		--		--		--		--		--		--		--		--		--		--		--	
Dissolved Organic Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	--		--		--		--		--		--		--		--		--		--		--		--	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	1.7		2.5		1.3		1.4		0.34		1.1		0.3		0.38		0.3		0.32		0.67		0.36	
NUTRIENTS																													
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	0.2	N/A	N/A	0.22		0.35		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1	10	10	2.3		3.1		2.2		2.2		1.4		1.8		0.84		1.2		0.96		1.3		1.6		0.63	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Nitrate, Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	2.3		3.1		2.2		2.2		1.4		1.8		0.84		1.2		0.96		1.3		1.6		0.63	
Total Nitrogen (calc.)	calculated			N/A	N/A	2.52		3.45		2.2		2.2		1.4		1.8		0.84		1.2		0.96		1.3		1.6		0.63	
Orthophosphate as P	4500P-E/365.1	mg/L	0.01	N/A	N/A	0.94		2.3		0.14		0.34		0.025		0.058		0.01		0.018		0.018		0.014		0.021		0.016	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm) µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(

(2) Established by the Washington State Department of Ecology in WAC 173-200-04

J = Value is detected and the result is estimated

J- = Value is detected and the result is estimated and biased lo

J+ = Value is detected and the result is estimated and biased hig

UJ = Result is a non-detect and the value is estimated

R = Result rejected

*Drinking water and groundwater quality standards are for total metal

Appendix B - Water Quality Summary

June Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						6/11/2018		6/11/2018		6/13/018		6/11/2018 - 6/15/2018						6/11/2018 - 6/14/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																							
pH		units				--		--		--		--		--		--		--		--		--	
Temperature		˚C				--		--		--		--		--		--		--		--		--	
Conductivity		µS/cm				--		--		--		--		--		--		--		--		--	
Oxidation Redution Potential (ORP)		mV				--		--		--		--		--		--		--		--		--	
Dissolved Oxygen		mg/L				--		--		--		--		--		--		--		--		--	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																							
Chloride	EPA 300.0	mg/L	0.5	250	250	57		56		57		57		58		58		47		58		55	
Sulfate	EPA 300.0	mg/L	0.5	250	250	31		30		29		29		29		30		27		30		28	
Biodegradable Dis. Org. Carbon	Allgeiere 1996	mg/L	0.3	N/A	N/A	0.93		0.85		1.2		*ND*		*ND*		*ND*		*ND*		0.38		*ND*	
Dissolved Organic Carbon	Allgeiere 1996	mg/L	0.3	N/A	N/A	3.6	J+	3.8	J+	3.4	J+	5.3		3.7	J+	4.4	J+	4	J+	2.4	J+	2.5	J+
Total Dissolved Solid (TDS)	E160.1/SM2540C	mg/L	10	500	500	350		350		330		350		360		--		360		330		310	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	--		5.8		7.3		5.6		4.6		3.6		3.1		2.9		2.8	
NUTRIENTS																							
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	0.056		0.057		0.071		*ND*		0.13		0.11		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	0.2	N/A	N/A	0.73	J	0.96	J	0.74		0.54		0.59		0.44		*ND*		0.35		0.22	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1	10	10	1.2		1.2		0.76		2.9		2.8		2.1		14		2.2		2	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Nitrate, Nitrite-N, (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	1.2		1.2		0.76		2.9		2.8		2.1		14		2.2		2	
Total Nitrogen (calc.)	calculated			N/A	N/A	1.93		2.16		1.5		3.44		3.39		2.54		14		2.55		2.22	
Phosphorus as P	SM4500-PE/EPA 365.1	mg/L	0.02	N/A	N/A	2.6		2.6		2		2.4		3.4		--		1		0.24		*ND*	
Orthophosphate as P	SM4500-PE/EPA 365.1	mg/L	0	N/A	N/A	2		2.1		2.1		2.6		3.8		--		1.1		0.26		0.01	
METALS (DISSOLVED)																							
Calcium	EPA 200.7	mg/L	1	N/A	N/A	35		35		35		33		34		--		32		28		34	
Silica	EPA 200.7	mg/L	0.5	N/A	N/A	38		37		34		35		37		--		32		29		27	
Iron	EPA 200.7	mg/L	0.02	0.3	0.3	*ND*		*ND*		0.025		1.1		0.33		--		0.031		0.024		*ND*	
Magnesium	EPA 200.7	mg/L	0.1	N/A	N/A	9.6		9.5		9.3		9.5		9.8		--		9.2		10		9.8	
Potassium	EPA 200.7	mg/L	1	N/A	N/A	16		16		15		16		17		--		13		16		4.3	
Sodium	EPA 200.7	mg/L	1	N/A	N/A	56		55		55		55		57		--		60		55		57	
Arsenic	EPA 200.8	ug/L	1	10	0.05	*ND*		*ND*		*ND*		2		2.4		--		2		*ND*		*ND*	
Cadmium	EPA 200.8	ug/L	0.5	5	10	*ND*		*ND*		*ND*		*ND*		*ND*		--		--		*ND*		*ND*	
Chromium	EPA 200.8	ug/L	1	100	50	*ND*		*ND*		*ND*		190		8.1		--		*ND*		*ND*		*ND*	
Copper	EPA 200.8	ug/L	2	1300	1000	4.2		4.4		3.4		9.2		18		--		8.4		27		10	
Lead	EPA 200.8	ug/L	0.5	15	50	*ND*		*ND*		*ND*		*ND*		*ND*		--		*ND*		*ND*		*ND*	
Manganese	EPA 200.8	ug/L	2	50	50	2		2		6.1		61		26		--		5.3		52		93	
Nickel	EPA 200.8	ug/L	5	100	N/A	*ND*		*ND*		*ND*		350		25		--		14		15		14	
Selenium	EPA 200.8	ug/L	5	50	10	*ND*		*ND*		*ND*		*ND*		*ND*		--		*ND*		*ND*		*ND*	
Silver	EPA 200.8	ug/L	0.5	100	N/A	*ND*		*ND*		*ND*		0.53		0.92		--		*ND*		*ND*		0.69	
Zinc	EPA 200.8	ug/L	20	5000	5000	88		87		90		24		*ND*		--		*ND*		*ND*		*ND*	
Mercury	EPA 245.1	ug/L	0.2	2	2	*ND*		*ND*		*ND*		*ND*		*ND*		--		*ND*		*ND*		*ND*	
RESIDUAL CHEMICALS																							
1,4-Dioxane	EPA 522	ug/L	0.07	N/A	N/A	0.76		0.85		0.76		0.75		0.65		0.56		0.45		0.61		0.6	
1,7-Dimethylxanthine	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
2,4-D	LC-MS-MS	ng/L	5	70	100	29		42		27		12		14		20		*ND*		17		9.5	
4-nonylphenol - semi quantitative	LC-MS-MS	ng/L	100	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*	UJ	4800	UJ	4800	UJ	6700	UJ	6900	UJ	3600	UJ	4000	UJ
4-tert-octylphenol	LC-MS-MS	ng/L	50	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Acesulfame-K	LC-MS-MS	ng/L	20	N/A	N/A	180		180		150		*ND*		*ND*		33		*ND*		*ND*		31	
Acetaminophen	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		11		*ND*		*ND*		9.4		8.9		*ND*	
Albuterol	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		5.9	J	5	J	*ND*		7.1	J	*ND*		*ND*	
Amoxicillin (semi-quantitative)	LC-MS-MS	ng/L	80	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ
Andorostenedione	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Atenolol	LC-MS-MS	ng/L	5	N/A	N/A	160		180		100		97		72		5.5		30	J	*ND*		*ND*	
Atrazine	LC-MS-MS	ng/L	5	3000	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Bendroflumethiazide	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	

Appendix B - Water Quality Summary

June Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						6/11/2018		6/11/2018		6/13/018		6/11/2018 - 6/15/2018						6/11/2018 - 6/14/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Bezafibrate	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
BPA	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		25		*ND*		28		21	
Bromacil	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Butalbital	LC-MS-MS	ng/L	5	N/A	N/A	41		41		39		27		29		36		36		35		40	
Butylparben	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Caffeine	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Carbadox	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Carbamazepine	LC-MS-MS	ng/L	5	N/A	N/A	580		600		530		650		600		570		550	J	630		530	
Carisoprodol	LC-MS-MS	ng/L	5	N/A	N/A	8.5	J	15	J	18		15		21		35		28		23		30	
Chloramphenicol	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*	
Chloridazon	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Chlorotoluron	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Cimetidine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ
Clofibric Acid	LC-MS-MS	ng/L	5	N/A	N/A	35		32		33		*ND*		20		27		5.9		30		18	
Cotinine	LC-MS-MS	ng/L	10	N/A	N/A	16		20		17		12	J	*ND*		*ND*		12	J	*ND*		*ND*	
Cyanazine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
DACT	LC-MS-MS	ng/L	50	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
DEA	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
DEET	LC-MS-MS	ng/L	10	N/A	N/A	55		58		48		76		67		94		130	J	25		19	
Dehydronifedipine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		5.7	J	*ND*		*ND*	
DIA	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Diazepam	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Diclofenac	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		5.7		81		63		54		*ND*		19		7.4	
Dilantin	LC-MS-MS	ng/L	20	N/A	N/A	89		85		95		62		47		31		20		55		*ND*	
Diltiazem	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Diuron	LC-MS-MS	ng/L	5	N/A	N/A	54		46		49		73		90		*ND*		*ND*		*ND*		*ND*	
Erythromycin	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Estradiol	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		34		14		*ND*		*ND*		35		21	
Estriol	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Estrone	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Ethinyl Estradiol - 17 alpha	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	UJ	7.3		*ND*	
Ethylparaben	LC-MS-MS	ng/L	20	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Flumeqine	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Fluoxetine	LC-MS-MS	ng/L	10	N/A	N/A	150		160		130		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Gemfibrozil	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Ibuprofen	LC-MS-MS	ng/L	10	N/A	N/A	220		220		320		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Iohexal	LC-MS-MS	ng/L	100	N/A	N/A	530		550		760		400		520		320		*ND*		200		*ND*	
Iopromide	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		36		37		19		*ND*		*ND*		*ND*	
Isobutylparaben	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*	
Isoproturon	LC-MS-MS	ng/L	100	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Ketoprofen	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Ketorolac	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Lidocaine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		14		78	J	57	J	43	J	120	J-	11	J	7.1	J
Lincomycin	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Linuron	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Lopressor	LC-MS-MS	ng/L	20	N/A	N/A	480		500		480		300		180		20		340		*ND*		*ND*	
Meclofenamic Acid	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		5.7		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Meprobamate	LC-MS-MS	ng/L	5	N/A	N/A	8.1		9		9.7		5.9		*ND*		*ND*		*ND*	UJ	5		*ND*	
Metazachlor	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Metformin	LC-MS-MS	ng/L	5	N/A	N/A	18		15		7.3		*ND*		*ND*		*ND*		11	J-	*ND*		*ND*	
Methylparaben	LC-MS-MS	ng/L	20	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		48	J-	*ND*		*ND*	
Metolachlor	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Naproxen	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nifedipine	LC-MS-MS	ng/L	20	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ
N-Nitroso dimethylamine (NDMA)	LC-MS-MS	ng/L	2	N/A	N/A	*ND*		*ND*		*ND*		3.7		*ND*	UJ	3		*ND*		2.3		*ND*	

Appendix B - Water Quality Summary

June Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						6/11/2018		6/11/2018		6/13/018		6/11/2018 - 6/15/2018						6/11/2018 - 6/14/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Norethisterone	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
OUST (Sulfameturon,methyl)	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Oxolinic acid	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*	
Pentoxifylline	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*	
Phenazone	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Primidone	LC-MS-MS	ng/L	10	N/A	N/A	490		500		470		120		160		240		210		310		150	
Progesterone	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Propazine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Propylparaben	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Quinoline	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Salicylic Acid	LC-MS-MS	ng/L	100	N/A	N/A	130	J	*ND*	UJ	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Simazine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sucralose	LC-MS-MS	ng/L	100	N/A	N/A	70000		84000		53000		71000		92000		66000		56000		72000		64000	
Sulfachloropyridazine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*	
Sulfadiazine	LC-MS-MS	ng/L	20	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*	
Sulfadimethoxine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sulfamerazine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sulfamethazine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sulfamethizole	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*	
Sulfamethoxazole	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		100		57		100		110	J-	60		120	
Sulfathiazole	LC-MS-MS	ng/L	20	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*	
TCEP	LC-MS-MS	ng/L	10	N/A	N/A	120	J	170	J	74		140		120		130		180		160		140	
TCPP	LC-MS-MS	ng/L	100	N/A	N/A	750		770		550		240		170		180		350		170		110	
TDCPP	LC-MS-MS	ng/L	100	N/A	N/A	270		280		270		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*	
Testosterone	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Theobromine	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Theophylline	LC-MS-MS	ng/L	20	N/A	N/A	43	J	53	J	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ
Thiabendazole	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Triclocarban	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Triclosan	LC-MS-MS	ng/L	10	N/A	N/A	80	J	130	J	81		*ND*		24		*ND*		*ND*		*ND*		14	
Trimethoprim	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		13		*ND*		*ND*	
Warfarin	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
PFAS																							
Perfluoro butanoic acid- PFBA	MWH PFC	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*	UJ	*ND*	UJ	*ND*		*ND*	UJ	*ND*	UJ	*ND*	UJ
Perfluoro octanesulfonate-PFOS	MWH PFC	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Perfluoro octanesulfonic acid - PFOS	MWH PFC	ng/L	5	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*		*ND*		*ND*		*ND*	UJ	*ND*	UJ	*ND*		*ND*	
Perfluoro octanoic acid - PFOA	MWH PFC	ng/L	5	N/A	N/A	13		13		11		15	J	16	J	12		7.2		17		19	
Perfluoro-1-butanesulfonate	MWH PFC	ng/L	5	N/A	N/A	9.1		9.5		9.1		12		14		16		21		13		18	
Perfluoro-1-butanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	8.4		8.2		8.3		10		11		14		20		12		15	
Perfluoro-1-hexanesulfonate	MWH PFC	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Perfluoro-1-hexanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	UJ
Perfluoro-n-decanoic acid	MWH PFC	ng/L	5	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*		*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ
Perfluoro-n-heptanoic acid	MWH PFC	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Perfluoro-n-hexanoic acid	MWH PFC	ng/L	5	N/A	N/A	26		28		47		50		36		46		56		46		60	
Perfluoro-n-nonanoic acid	MWH PFC	ng/L	5	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*		*ND*	UJ	*ND*	UJ	*ND*		*ND*	UJ	*ND*		*ND*	UJ
Perfluoropentanoic acid	MWH PFC	ng/L	5	N/A	N/A	52		52		96		100		63		84		83		83		89	
DBPs																							
Bromodichloromethane	EPA 524.2	ug/L	0.5	N/A	N/A	8.5		8.7		11		5.9		6.4		*ND*		2.4		*ND*		*ND*	
Bromoform	EPA 524.2	ug/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Chlorodibromomethane	EPA 524.2	ug/L	0.5	N/A	N/A	0.78		0.83		1.1		0.64		0.65		*ND*		*ND*		*ND*		*ND*	
Chloroform (Trichloromethane)	EPA 524.2	ug/L	0.5	N/A	N/A	43		44		53		30		37		11		22		11		14	
Total THM	EPA 524.2	ug/L	0.5	N/A	N/A	52		54		65		36		44		11		24		11		14	
Bromochloroacetic acid	SM 6251B	ug/L	1	N/A	N/A	3		2.9		2.7		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Dibromoacetic acid	SM 6251B	ug/L	1	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Dichloroacetic acid	SM 6251B	ug/L	1	N/A	N/A	22		22		24		1.8		1		*ND*		*ND*		*ND*		*ND*	

Appendix B - Water Quality Summary

June Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						6/11/2018		6/11/2018		6/13/018		6/11/2018 - 6/15/2018						6/11/2018 - 6/14/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Monobromoacetic acid	SM 6251B	ug/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Monochloroacetic acid	SM 6251B	ug/L	2	N/A	N/A	3.7		3.8		3		ND		ND		ND		ND		ND		ND	
Trichloroacetic acid	SM 6251B	ug/L	1	N/A	N/A	33		33		44		2.2		ND		ND		ND		ND		ND	
Total Haloacetic Acids (HAA5)	SM 6251B	ug/L	2	N/A	N/A	59		59		71		4		ND		ND		ND		ND		ND	
Bacteria																							
E. Coli Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	A		A		P		A		A		--		A		A		A	
E. Coli Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	ND		ND		2		ND		ND		--		ND		ND		ND	
Total Coliform Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	P		P		P		A		A		--		A		A		A	
Total Coliform Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	200.5		109.1		>200.5		ND		ND		--		ND		ND		ND	
VOCs																							
1,1,1,2-Tetrachloroethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND	UJ	ND		ND		ND		ND	UJ	ND	UJ
1,1,1-Trichloroethane	EPA 524.2	ug/L	0.5	200	0.2	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,2,2-Tetrachloroethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,2-Trichloroethane	EPA 524.2	ug/L	0.5	5	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloroethane	EPA 524.2	ug/L	0.5	N/A	1	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloroethylene	EPA 524.2	ug/L	0.5	7	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3-Trichlorobenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3-Trichloropropane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,4-Trichlorobenzene	EPA 524.2	ug/L	0.5	70	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,4-Trimethylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2-Dichloroethane	EPA 524.2	ug/L	0.5	5	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2-Dichloropropane	EPA 524.2	ug/L	0.5	5	0.6	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,3,5-Trimethylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,3-Dichloropropane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
2,2-Dichloropropane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
2-Butanone (MEK)	EPA 524.2	ug/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
2-Hexanone	EPA 524.2	ug/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
4-Methyl-2-Pentanone (MIBK)	EPA 524.2	ug/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Benzene	EPA 524.2	ug/L	0.5	5	1	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromobenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromochloromethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromoethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromomethane (Methyl Bromide)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbon disulfide	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbon Tetrachloride	EPA 524.2	ug/L	0.5	5	0.3	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chlorobenzene	EPA 524.2	ug/L	0.5	100	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloroethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloromethane(Methyl Chloride)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
cis-1,2-Dichloroethylene	EPA 524.2	ug/L	0.5	70	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
cis-1,3-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dibromomethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dichlorodifluoromethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dichloromethane	EPA 524.2	ug/L	0.5	5	5	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Di-isopropyl ether	EPA 524.2	ug/L	3	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethyl benzene	EPA 524.2	ug/L	0.5	700	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Hexachlorobutadiene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isopropylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
m,p-Xylenes	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
m-Dichlorobenzene (1,3-DCB)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Methyl Tert-butyl ether (MTBE)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Naphthalene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
n-Butylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
n-Propylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
o-Chlorotoluene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	

Appendix B - Water Quality Summary

June Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						6/11/2018		6/11/2018		6/13/018		6/11/2018 - 6/15/2018						6/11/2018 - 6/14/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
o-Dichlorobenzene (1,2-DCB)	EPA 524.2	ug/L	0.5	600	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
o-Xylene	EPA 524.2	ug/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
p-Chlorotoluene	EPA 524.2	ug/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
p-Dichlorobenzene (1,4-DCB)	EPA 524.2	ug/L	0.5	75	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
p-Isopropyltoluene	EPA 524.2	ug/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
sec-Butylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Styrene	EPA 524.2	ug/L	0.5	100	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
tert-amyl Methyl Ether	EPA 524.2	ug/L	3	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
tert-Butyl Ethyl Ether	EPA 524.2	ug/L	3	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
tert-Butylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Tetrachloroethylene (PCE)	EPA 524.2	ug/L	0.5	5	0.8	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Toluene	EPA 524.2	ug/L	0.5	1000	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total 1,3-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	*ND*		*ND*		0.52		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total xylenes	EPA 524.2	ug/L	0.5	10000	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
trans-1,2-Dichloroethylene	EPA 524.2	ug/L	0.5	100	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
trans-1,3-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	*ND*		*ND*		0.52		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Trichloroethylene (TCE)	EPA 524.2	ug/L	0.5	5	3	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Trichlorofluoromethane	EPA 524.2	ug/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Trichlorotrifluoroethane(Freon	EPA 524.2	ug/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Vinyl chloride (VC)	EPA 524.2	ug/L	0.3	2	0.02	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

(2) Established by the Washington State Department of Ecology in WAC 173-200-040

J = Value is detected and the result is estimated
J- = Value is detected and the result is estimated and biased low
J+ = Value is detected and the result is estimated and biased high
UJ = Result is a non-detect and the value is estimated
R = Result rejected
*Drinking water and groundwater quality standards are for total metals.

Appendix B - Water Quality Summary

June Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3A		MW-5		MW-8		MW-9		MW-14		MW-16		MW-20		MW-23		MW-25		MW-26		MW-27		MW-28	
	DATE					6/13/2018		6/14/2018		6/14/2018		6/14/2018		6/12/2018		6/13/2018		6/12/2018		6/14/2018		6/12/2018		6/11/2018		6/11/2018		6/12/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																													
pH		units				6.85		6.85		6.82		6.85		7.40		6.80		7.20		7.25		7.24		6.22		6.75		7.07	
Temperature		°C				14.7		16.6		13.6		13.5		14.1		13.2		11.1		10.8		10.7		11.0		12.5		12.0	
Conductivity		µS/cm				476.2		523.0		429.7		404.8		274.4		408.2		166.9		218.7		181.7		133.8		288.1		130.9	
Oxidation Redution Potential (ORP)		mV				99.5		154.2		101.3		125.8		123.6		123.8		64.4		87.1		71.2		176.8		122.9		73.4	
Dissolved Oxygen		mg/L				4.86		2.10		4.61		5.22		5.16		4.92		7.07		7.06		8.98		8.14		6.12		6.28	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																													
Chloride	EPA 300.0	mg/L	0.5	250	250	56		59		50		46		24		51		5.9		15		10		5.2		30		6.1	
Sulfate	EPA 300.0	mg/L	0.5	250	250	30		31		27		24		12		26		5.3		9.4		9.6		7.3		17		3.9	
Biodegradable Dis. Org. Carbon	Allgeiere 1996	mg/L	0.3	N/A	N/A	0.54		0.47		ND		0.41		0.37		0.39		0.42		0.38		0.41		0.34		0.42		0.35	
Dissolved Organic Carbon	Allgeiere 1996	mg/L	0.3	N/A	N/A	1.6	J+	2.3	J+	2.7	J+	1.1	J+	0.4	J+	0.9	J+	ND		0.37	J+	ND		0.47	J+	0.73	J+	0.32	J+
Total Dissolved Solid (TDS)	E160.1/SM2540C	mg/L	10	500	500	290		350		290		290		110		260		140		170		150		110		210		200	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	3.4		3.6		2.6		2.4		ND		1.9		ND		0.85		0.3		0.34		0.75		0.36	
NUTRIENTS																													
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Kjeldahl Nitrogen	EPA 351.2	mg/L	0.2	N/A	N/A	0.25		0.33		--		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1	10	10	2.7		3.6		2.5		2.5		1.5		2		0.92		1.4		1		1.2		1.9		0.65	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05	1	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total Nitrate, Nitrite-N, (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	2.7		3.6		2.5		2.5		1.5		2		0.92		1.4		1		1.2		1.9		0.65	
Total Nitrogen (calc.)	calculated			N/A	N/A	2.95		3.93		2.5		2.5		1.5		2		0.92		1.4		1		1.2		1.9		0.65	
Phosphorus as P	SM4500-PE/EPA 365.1	mg/L	0.02	N/A	N/A	1.1		2.4		0.14		0.34		ND		ND		ND		ND		ND		0.028		0.028		ND	
Orthophosphate as P	SM4500-PE/EPA 365.1	mg/L	0	N/A	N/A	1.1		2.4		0.17		0.37		0.025		0.013		0.012		0.02		0.014		0.014		0.02		0.016	
METALS (DISSOLVED)																													
Calcium	EPA 200.7	mg/L	1	N/A	N/A	32		36		32		32		25		30		18		23		17		18		27		14	
Silica	EPA 200.7	mg/L	0.5	N/A	N/A	28		35		27		27		30		24		25		28		30		19		25		21	
Iron	EPA 200.7	mg/L	0.02	0.3	0.3	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Magnesium	EPA 200.7	mg/L	0.1	N/A	N/A	10		10		11		11		16		9.1		10		14		12		5		9.6		6.7	
Potassium	EPA 200.7	mg/L	1	N/A	N/A	6		12		3.3		3.2		3.1		3.1		1.8		2.4		2.6		ND		1.9		1.2	
Sodium	EPA 200.7	mg/L	1	N/A	N/A	55		56		49		42		9.3		48		7.6		8.2		8.3		6.5		25		6	
Arsenic	EPA 200.8	ug/L	1	10	0.05	3.9		3.7		1.8		2.2		ND		ND		ND		ND		ND		ND		ND		ND	
Cadmium	EPA 200.8	ug/L	0.5	5	10	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chromium	EPA 200.8	ug/L	1	100	50	ND		ND		ND		ND		1.4		ND		ND		ND		1.5		ND		ND		ND	
Copper	EPA 200.8	ug/L	2	1300	1000	16		20		8.2		8.1		ND		4.2		ND		ND		ND		ND		ND		ND	
Lead	EPA 200.8	ug/L	0.5	15	50	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		3.1		ND	
Manganese	EPA 200.8	ug/L	2	50	50	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Nickel	EPA 200.8	ug/L	5	100	N/A	7.9		7		5.3		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Selenium	EPA 200.8	ug/L	5	50	10	ND		ND		ND		ND		ND		5.2		ND		ND		ND		ND		ND		ND	
Silver	EPA 200.8	ug/L	0.5	100	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Zinc	EPA 200.8	ug/L	20	5000	5000	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Mercury	EPA 245.1	ug/L	0.2	2	2	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
RESIDUAL CHEMICALS																													
1,4-Dioxane	EPA 522	ug/L	0.07	N/A	N/A	0.67		0.69		0.59		0.49		0.15		0.49		ND		0.12		ND		ND		0.29		ND	
1,7-Dimethylxanthine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2,4-D	LC-MS-MS	ng/L	5	70	100	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
4-nonylphenol - semi quantitative	LC-MS-MS	ng/L	100	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
4-tert-octylphenol	LC-MS-MS	ng/L	50	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Acesulfame-K	LC-MS-MS	ng/L	20	N/A	N/A	200		ND		60		180		120		280		ND		ND		49		ND		170		ND	
Acetaminophen	LC-MS-MS	ng/L	5	N/A	N/A	16		6.5		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Albuterol	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Amoxicillin (semi-quantitative)	LC-MS-MS	ng/L	80	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Andorostenedione	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Atenolol	LC-MS-MS	ng/L	5	N/A	N/A	ND		6.3		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Atrazine	LC-MS-MS	ng/L	5	3000	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bendroflumethiazide	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bezafibrate	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
BPA	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromacil	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Butalbital	LC-MS-MS	ng/L	5	N/A	N/A	48		33		36		24		ND		27		ND		ND		ND		ND		18		ND	
Butylparben	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Caffeine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		89		ND		ND		ND		ND		16	
Carbadox	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbamazepine	LC-MS-MS	ng/L	5	N/A	N/A	690		760		500		410		ND		360		ND		ND		ND		ND		220		ND	
Carisoprodol	LC-MS-MS	ng/L	5	N/A	N/A	13		22		12		12		ND		ND		ND		ND		ND		ND		ND		ND	
Chloramphenicol	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloridazon	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

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June Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3A		MW-5		MW-8		MW-9		MW-14		MW-16		MW-20		MW-23		MW-25		MW-26		MW-27		MW-28	
DATE						6/13/2018		6/14/2018		6/14/2018		6/14/2018		6/12/2018		6/13/2018		6/12/2018		6/14/2018		6/12/2018		6/11/2018		6/11/2018		6/12/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Chlorotoluron	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cimetidine	LC-MS-MS	ng/L	5	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Clofibric Acid	LC-MS-MS	ng/L	5	N/A	N/A	6		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cotinine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cyanazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DACT	LC-MS-MS	ng/L	50	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DEA	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DEET	LC-MS-MS	ng/L	10	N/A	N/A	23		30		ND		11		ND		ND		ND		ND		ND		ND		ND		ND	
Dehydronifedipine	LC-MS-MS	ng/L	5	N/A	N/A	ND		5.8		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DIA	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diazepam	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diclofenac	LC-MS-MS	ng/L	5	N/A	N/A	6.9		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dilantin	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diltiazem	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diuron	LC-MS-MS	ng/L	5	N/A	N/A	ND		56		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Erythromycin	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estradiol	LC-MS-MS	ng/L	5	N/A	N/A	ND		14		9.9		7		ND		ND		ND		ND		ND		ND		ND		ND	
Estriol	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estrone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethinyl Estradiol - 17 alpha	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethylparaben	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Flumeqine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Fluoxetine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Gemfibrozil	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ibuprofen	LC-MS-MS	ng/L	10	N/A	N/A	19		ND		ND		ND		ND		ND		ND		--		ND		ND		ND		ND	
Iohexal	LC-MS-MS	ng/L	100	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Iopromide	LC-MS-MS	ng/L	5	N/A	N/A	ND		6.7		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isobutylparaben	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isoproturon	LC-MS-MS	ng/L	100	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketoprofen	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketorolac	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Lidocaine	LC-MS-MS	ng/L	5	N/A	N/A	20		70	J	ND		5.5	J	ND		ND		ND		ND		ND		ND		ND		ND	
Lincomycin	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Linuron	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Lopressor	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Meclofenamic Acid	LC-MS-MS	ng/L	5	N/A	N/A	6.9		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Meprobamate	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Metazachlor	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Metformin	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Methylparaben	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Metolachlor	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Naproxen	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Nifedipine	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
N-Nitroso dimethylamine (NDMA)	LC-MS-MS	ng/L	2	N/A	N/A	ND		ND		ND		ND		2.2		ND		ND		ND		ND		ND		ND		ND	
Norethisterone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
OUST (Sulfameturon,methyl)	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Oxolinic acid	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Pentoxifylline	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Phenazone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Primidone	LC-MS-MS	ng/L	10	N/A	N/A	120		100		80		79		35		46		ND		11		ND		ND		24		ND	
Progesterone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Propazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Propylparaben	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Quinoline	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Salicylic Acid	LC-MS-MS	ng/L	100	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Simazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sucralose	LC-MS-MS	ng/L	100	N/A	N/A	69000		74000		61000		49000		2900		43000		ND		1800		5000		ND		27000		ND	
Sulfachloropyridazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfadiazine	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfadimethoxine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamerazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethizole	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethoxazole	LC-MS-MS	ng/L	5	N/A	N/A	160		130		90		140		ND		400		ND		ND		ND		ND		250		ND	
Sulfathiazole	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TCEP	LC-MS-MS	ng/L	10	N/A	N/A	ND		130		88		96		ND		20		ND		ND		ND		ND		22		ND	
TCPP	LC-MS-MS	ng/L	100	N/A	N/A	170		160		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

Appendix B - Water Quality Summary

June Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3A		MW-5		MW-8		MW-9		MW-14		MW-16		MW-20		MW-23		MW-25		MW-26		MW-27		MW-28	
DATE						6/13/2018		6/14/2018		6/14/2018		6/14/2018		6/12/2018		6/13/2018		6/12/2018		6/14/2018		6/12/2018		6/11/2018		6/11/2018		6/12/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
TDCPP	LC-MS-MS	ng/L	100	N/A	N/A	110		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Testosterone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Theobromine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Theophylline	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Thiabendazole	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Triclocarban	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Triclosan	LC-MS-MS	ng/L	10	N/A	N/A	ND		43		11		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trimethoprim	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Warfarin	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
PFAS																													
Perfluoro butanoic acid- PFBA	MWH PFC	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro octanesulfonate-PFOS	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro octanesulfonic acid - PFOS	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND	UJ	ND	UJ	ND		ND		ND		ND		ND	UJ	ND		ND	UJ
Perfluoro octanoic acid - PFOA	MWH PFC	ng/L	5	N/A	N/A	18		14		18		11		16		19	J	ND		9.7		ND		ND		11		ND	
Perfluoro-1-butanesulfonate	MWH PFC	ng/L	5	N/A	N/A	17		20		17		15		7.1		18		ND		5.5		ND		ND		9.5		ND	
Perfluoro-1-butanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	15		18		13		12		7.4		15		ND		ND		ND		ND		8		ND	
Perfluoro-1-hexanesulfonate	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro-1-hexanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro-n-decanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND		ND	UJ	ND		ND		ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Perfluoro-n-heptanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		5		ND		ND		ND		ND		ND		ND		ND	
Perfluoro-n-hexanoic acid	MWH PFC	ng/L	5	N/A	N/A	50		49		47		42		20		56		ND		16		5.6		ND		27		ND	
Perfluoro-n-nonanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND	UJ	7.8	J	ND		ND		ND		ND	UJ	ND	UJ	ND	UJ
Perfluoropentanoic acid	MWH PFC	ng/L	5	N/A	N/A	93		92		80		61		27		69		ND		19		9.3		ND		46		ND	
DBPs																													
Bromodichloromethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromoform	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chlorodibromomethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloroform (Trichloromethane)	EPA 524.2	ug/L	0.5	N/A	N/A	21		36		16		14		0.83		7.2		ND		ND		ND		ND		6.6		ND	
Total THM	EPA 524.2	ug/L	0.5	N/A	N/A	21		36		16		14		0.83		7.2		ND		ND		ND		ND		6.6		ND	
Bromochloroacetic acid	SM 6251B	ug/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dibromoacetic acid	SM 6251B	ug/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dichloroacetic acid	SM 6251B	ug/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Monobromoacetic acid	SM 6251B	ug/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Monochloroacetic acid	SM 6251B	ug/L	2	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trichloroacetic acid	SM 6251B	ug/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total Haloacetic Acids (HAA5)	SM 6251B	ug/L	2	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bacteria																													
E. Coli Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	A		A		A		A		A		A		A		A		A		A		A		A	
E. Coli Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total Coliform Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	A		A		A		A		A		A		A		A		A		A		A		A	
Total Coliform Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
VOCs																													
1,1,1,2-Tetrachloroethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND	UJ	ND		ND	UJ	ND		ND		ND	
1,1,1-Trichloroethane	EPA 524.2	ug/L	0.5	200	0.2	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,2,2-Tetrachloroethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,2-Trichloroethane	EPA 524.2	ug/L	0.5	5	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloroethane	EPA 524.2	ug/L	0.5	N/A	1	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloroethylene	EPA 524.2	ug/L	0.5	7	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3-Trichlorobenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3-Trichloropropane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,4-Trichlorobenzene	EPA 524.2	ug/L	0.5	70	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,4-Trimethylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2-Dichloroethane	EPA 524.2	ug/L	0.5	5	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2-Dichloropropane	EPA 524.2	ug/L	0.5	5	0.6	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,3,5-Trimethylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,3-Dichloropropane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2,2-Dichloropropane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2-Butanone (MEK)	EPA 524.2	ug/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2-Hexanone	EPA 524.2	ug/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
4-Methyl-2-Pentanone (MIBK)	EPA 524.2	ug/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Benzene	EPA 524.2	ug/L	0.5	5	1	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromobenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromochloromethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromoethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromomethane (Methyl Bromide)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbon disulfide	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

Appendix B - Water Quality Summary

June Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3A		MW-5		MW-8		MW-9		MW-14		MW-16		MW-20		MW-23		MW-25		MW-26		MW-27		MW-28	
DATE						6/13/2018		6/14/2018		6/14/2018		6/14/2018		6/12/2018		6/13/2018		6/12/2018		6/14/2018		6/12/2018		6/11/2018		6/11/2018		6/12/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Carbon Tetrachloride	EPA 524.2	ug/L	0.5	5	0.3	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chlorobenzene	EPA 524.2	ug/L	0.5	100	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloroethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloromethane(Methyl Chloride)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
cis-1,2-Dichloroethylene	EPA 524.2	ug/L	0.5	70	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
cis-1,3-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dibromomethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dichlorodifluoromethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		0.69	J	ND		0.5	J	ND		0.63	J	ND		ND		ND	
Dichloromethane	EPA 524.2	ug/L	0.5	5	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Di-isopropyl ether	EPA 524.2	ug/L	3	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethyl benzene	EPA 524.2	ug/L	0.5	700	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Hexachlorobutadiene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isopropylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
m,p-Xylenes	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
m-Dichlorobenzene (1,3-DCB)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Methyl Tert-butyl ether (MTBE)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Naphthalene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
n-Butylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
n-Propylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
o-Chlorotoluene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
o-Dichlorobenzene (1,2-DCB)	EPA 524.2	ug/L	0.5	600	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
o-Xylene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
p-Chlorotoluene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
p-Dichlorobenzene (1,4-DCB)	EPA 524.2	ug/L	0.5	75	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
p-Isopropyltoluene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
sec-Butylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Styrene	EPA 524.2	ug/L	0.5	100	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
tert-amyl Methyl Ether	EPA 524.2	ug/L	3	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
tert-Butyl Ethyl Ether	EPA 524.2	ug/L	3	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
tert-Butylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Tetrachloroethylene (PCE)	EPA 524.2	ug/L	0.5	5	0.8	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Toluene	EPA 524.2	ug/L	0.5	1000	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total 1,3-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total xylenes	EPA 524.2	ug/L	0.5	10000	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
trans-1,2-Dichloroethylene	EPA 524.2	ug/L	0.5	100	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
trans-1,3-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trichloroethylene (TCE)	EPA 524.2	ug/L	0.5	5	3	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trichlorofluoromethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trichlorotrifluoroethane(Freon	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Vinyl chloride (VC)	EPA 524.2	ug/L	0.3	2	0.02	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

Notes:

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(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

(2) Established by the Washington State Department of Ecology in WAC 173-200-040

J = Value is detected and the result is estimated
J- = Value is detected and the result is estimated and biased low
J+ = Value is detected and the result is estimated and biased high
UJ = Result is a non-detect and the value is estimated
R = Result rejected
*Drinking water and groundwater quality standards are for total metals.

Appendix B - Water Quality Summary

July Monthly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std^1	Groundwater Quality Std^2	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25 ft		East B4 Lysimeter, 50 ft	
DATE						7/9/2018		7/9/2018		7/12/2018		7/10/2018						7/10/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																							
pH		units				--		--		--		--		--		--		--		--		--	
Temperature		˚C				--		--		--		--		--		--		--		--		--	
Conductivity		µS/cm				--		--		--		--		--		--		--		--		--	
Oxidation Reduction Potential (ORP)		mV				--		--		--		--		--		--		--		--		--	
Dissolved Oxygen		mg/L				--		--		--		--		--		--		--		--		--	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																							
Chloride	EPA 300.0	mg/L	0.5-1	250	250	63		64		64		74		63		53		62		57		55	
Biodegradable Dis. Org. Carbon	Allgeier, 1996	mg/L	0.2-0.3	N/A	N/A	0.79		0.8		0.42		--	--	--	--	--	--	--	--	--	--	--	--
Dissolved Organic Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	4.6	J+	4.5	J+	5	J+	--	--	--	--	--	--	--	--	--	--	--	--
Total Organic Carbon	SM5310C/E415.3	mg/L	0.2-0.6	N/A	N/A	5.9		5.8		5.8		3.2		4		3		5		3		1.9	
NUTRIENTS																							
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	*ND*		*ND*		*ND*		*ND*		0.075		*ND*		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	1	N/A	N/A	*ND*		*ND*		1.1		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1-0.2	10	10	1.6		1.6		2.3		3.6		3.4		2.5		2.6		2.3		1.3	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05-0.1	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		0.16		*ND*	
Total Nitrate, Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	1.6		1.6		2.3		3.6		3.4		2.5		2.6		2.5		1.3	
Total Nitrogen (calc.)	calculated			N/A	N/A	1.6		1.6		3.4		3.6		3.4		2.5		2.6		2.46		1.3	
Orthophosphate as P	4500P-E/365.1	mg/L	0.01-0.2	N/A	N/A	2.8		2.9		5.9		0.82		2.7		1.5		3.3		0.18		*ND*	

Notes:

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Appendix B - Water Quality Summary

July Monthly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3a		MW-5		MW-8		MW-9		MW-14		MW-16		MW-20		MW-23		MW-25		MW-26		MW-27		MW-28	
DATE						7/9/2018		7/12/2018		7/12/2018		7/12/2018		7/9/2018		7/9/2018		7/10/2018		7/12/2018		7/9/2018		7/9/2018		7/9/2018		7/10/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																													
pH		units				6.90		6.71		7.11		6.94		7.45		6.80		7.18		7.80		7.25		6.24		6.74		7.08	
Temperature		˚C				15.5		17.3		14		13.8		14.2		13.7		11.4		11.4		10.9		10.9		12.6		12.0	
Conductivity		µS/cm				438.1		521		413.4		366.6		253.6		387.4		154.5		213.6		167.0		133.4		247.8		117.1	
Oxidation Reduction Potential (ORP)		mV				125.2		-9.5		-45.1		-15.8		106.9		149.8		122.5		-58.7		145.6		197.7		167.8		88.5	
Dissolved Oxygen		mg/L				6.75		3.49		4.50		4.36		5.64		5.06		6.96		6.65		8.44		7.18		6.17		6.23	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																													
Chloride	EPA 300.0	mg/L	0.5-1	250	250	57		58		50		41		24		53		5.9		15		9.7		5		26		6.2	
Biodegradable Dis. Org. Carbon	Allgeier, 1996	mg/L	0.2-0.3	N/A	N/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dissolved Organic Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Organic Carbon	SM5310C/E415.3	mg/L	0.2-0.6	N/A	N/A	3		2		1.3		1.1		0.38		1.2		0.27		1.3		*ND*		*ND*		0.63		0.37	
NUTRIENTS																													
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	1	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1-0.2	10	10	2.6		4.1		2.5		2.3		1.5		2.3		0.92		1.3		1		1.2		1.8		0.59	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05-0.1	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Nitrate, Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	2.6		4.1		2.5		2.3		1.5		2.3		0.92		1.3		1		1.2		1.8		0.59	
Total Nitrogen (calc.)	calculated			N/A	N/A	2.6		4.1		2.5		2.3		1.5		2.3		0.92		1.3		1		1.2		1.8		0.59	
Orthophosphate as P	4500P-E/365.1	mg/L	0.01-0.2	N/A	N/A	1.1		2.3		0.17		0.38		0.025		0.017		0.013		0.017		0.019		0.016		0.023		0.027	

Notes:

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(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

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Appendix B - Water Quality Summary

August Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	Reclaimed Water 1		Reclaimed Water 1- Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						8/6/2018		8/6/2018		8/8/2018		8/6/2018 - 8/9/2018						8/6/2018 - 8/9/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																							
pH		units				7.17		--		7.28		7.06		7.23		7.30		7.17		7.18		7.22	
Temperature		˚C				23.5		--		23.6		22.4		22.9		22.0		23.4		23.7		23.5	
Conductivity		µS/cm				550.0		--		606.0		555.0		565.0		542.0		565.0		558.0		524.0	
Oxidation Redution Potential (ORP)		mV				296.4		--		322.6		214.1		201.8		186.6		192.4		185.1		178.8	
Dissolved Oxygen		mg/L				4.99		--		4.97		3.43		2.60		4.30		4.83		2.36		3.18	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																							
Chloride	EPA 300.0	mg/L	0.5-2.5	250	250	53		54		60		56		55		57		58		58		58	
Sulfate	EPA 300.0	mg/L	0.5-2.5	250	250	28		28		29		27		27		28		30		28		28	
Biodegradable Dis. Org. Carbon	Allgeiere 1996	mg/L	0.3	N/A	N/A	0.89		0.88		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Dissolved Organic Carbon	Allgeiere 1996	mg/L	0.3	N/A	N/A	4.4	J+	4.5	J+	0.63	J+	5.6	J+	5.5		5		4.8	J+	4.8	J+	3.1	J+
Total Dissolved Solid (TDS)	E160.1/SM2540C	mg/L	10	500	500	340		350		370		330		340		330		360		330		310	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.2-0.3	N/A	N/A	5.5		5.3		5.4		3.7		4.5		3.1		3.7		3.6		2.2	
NUTRIENTS																							
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	0.056		*ND*		*ND*		*ND*		0.07		*ND*		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	1	N/A	N/A	*ND*		1.2		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1-0.5	10	10	2.6		2.6		1.6		2.8		2.2		2.5		7.7		2.4		1.8	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05-0.25	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*		*ND*		*ND*	
Total Nitrate, Nitrite-N, (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	2.6		2.6		1.6		2.8		2.2		2.5		7.7		2.4		1.8	
Total Nitrogen (calc.)	calculated			N/A	N/A	2.6		3.8		1.6		2.8		2.2		2.5		7.7		2.4		1.8	
Phosphorus as P	SM4500-PE/EPA 365.1	mg/L	0.02-0.5	N/A	N/A	2.5		2.6		5.3		2.1		3		2.5		0.86		0.66		*ND*	
Orthophosphate as P	SM4500-PE/EPA 365.1	mg/L	0.01-0.2	N/A	N/A	2.3		2.4		5.4		2.3		2.8		2.2		0.96		0.72		0.019	
METALS (DISSOLVED)																							
Calcium	EPA 200.7	mg/L	1	N/A	N/A	34		35		40		32		34		32		31		28		32	
Silica	EPA 200.7	mg/L	0.5	N/A	N/A	37		37		39		36		38		36		35		35		27	
Iron	EPA 200.7	mg/L	0.02	0.3	0.3	*ND*		*ND*		*ND*		**0.5**		0.13		*ND*		**0.4**		0.042		0.024	
Magnesium	EPA 200.7	mg/L	0.1	N/A	N/A	9.5		9.5		10		8.9		9.5		9.5		8.6		10		9.4	
Potassium	EPA 200.7	mg/L	1	N/A	N/A	15		15		17		16		17		15		15		18		5.1	
Sodium	EPA 200.7	mg/L	1	N/A	N/A	53		53		60		56		57		57		59		56		57	
Arsenic	EPA 200.8	ug/L	1-5	10	0.05	*ND*		*ND*		*ND*		**1.2**		**1.5**		**2.6**		**2.2**		**1.8**		*ND*	
Cadmium	EPA 200.8	ug/L	0.5-2.5	5	10	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Chromium	EPA 200.8	ug/L	1-5	100	50	*ND*		*ND*		*ND*		**74**		2.9		*ND*		**53**		*ND*		*ND*	
Copper	EPA 200.8	ug/L	2-10	1300	1000	3.4		3.5		4		7.1		20		20		8.7		22		15	
Lead	EPA 200.8	ug/L	0.5	15	50	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Manganese	EPA 200.8	ug/L	2-10	50	50	5.4		5.3		7.2		**110**		38		23		24		33		**89**	
Nickel	EPA 200.8	ug/L	5-25	100	N/A	*ND*		*ND*		*ND*		**660**		20		14		**380**		34		19	
Selenium	EPA 200.8	ug/L	5-25	50	10	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Silver	EPA 200.8	ug/L	0.5	100	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Zinc	EPA 200.8	ug/L	20-100	5000	5000	100		100		110		*ND*		31		*ND*		*ND*		*ND*		*ND*	
Mercury	EPA 245.1	ug/L	0.2	2	2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
RESIDUAL CHEMICALS																							
1,4-Dioxane	EPA 522	ug/L	0.07	N/A	N/A	0.74		0.71		0.65		0.63		0.69		0.66		0.34		0.61		0.55	
1,7-Dimethylxanthine	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
2,4-D	LC-MS-MS	ng/L	5-25	70	100	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
4-nonylphenol - semi quantitative	LC-MS-MS	ng/L	100-500	N/A	N/A	*ND*	UJ	220	J	170	J	9600	J	510000	J	57000	J	82000	J	31000	J	28000	J
4-tert-octylphenol	LC-MS-MS	ng/L	50	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Acesulfame-K	LC-MS-MS	ng/L	20-100	N/A	N/A	220		200		150		160		150		170		110		140		180	
Acetaminophen	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		46		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Albuterol	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Amoxicillin (semi-quantitative)	LC-MS-MS	ng/L	80	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ
Andorostenedione	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Atenolol	LC-MS-MS	ng/L	5	N/A	N/A	70		73		*ND*		*ND*		44		25		*ND*		*ND*		*ND*	
Atrazine	LC-MS-MS	ng/L	5	3000	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Bendroflumethiazide	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Bezafibrate	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
BPA	LC-MS-MS	ng/L	10-50	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Bromacil	LC-MS-MS	ng/L	5	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*		*ND*		*ND*	UJ	*ND*		*ND*		*ND*		*ND*	

Appendix B - Water Quality Summary

August Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	Reclaimed Water 1		Reclaimed Water 1- Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						8/6/2018		8/6/2018		8/8/2018		8/6/2018 - 8/9/2018						8/6/2018 - 8/9/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Butalbital	LC-MS-MS	ng/L	5-25	N/A	N/A	16		15		13		9.5		20		54		14		20		31	
Butylparben	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Caffeine	LC-MS-MS	ng/L	10-50	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Carbadox	LC-MS-MS	ng/L	5	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*		*ND*		*ND*	UJ	*ND*		*ND*		*ND*		*ND*	
Carbamazepine	LC-MS-MS	ng/L	5-25	N/A	N/A	730		720		680		360		540		610		470		750		480	
Carisoprodol	LC-MS-MS	ng/L	5	N/A	N/A	14		15		18		6.8		10	J-	15		8.1		14		13	
Chloramphenicol	LC-MS-MS	ng/L	10-50	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Chloridazon	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Chlorotoluron	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Cimetidine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ
Clofibric Acid	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Cotinine	LC-MS-MS	ng/L	10	N/A	N/A	27		34		28		*ND*		*ND*		*ND*		25		*ND*		*ND*	
Cyanazine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
DACT	LC-MS-MS	ng/L	50	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
DEA	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
DEET	LC-MS-MS	ng/L	10-50	N/A	N/A	100		100		48		50		120		160		500		97		63	
Dehydronifedipine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
DIA	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Diazepam	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Diclofenac	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		*ND*		32		58		38		*ND*		70		22	
Dilantin	LC-MS-MS	ng/L	20	N/A	N/A	43		47		48		*ND*		*ND*	UJ	*ND*		*ND*		*ND*		*ND*	
Diltiazem	LC-MS-MS	ng/L	5	N/A	N/A	5.1	J	5.1	J	*ND*		*ND*		5.3	J+	*ND*		*ND*		*ND*		*ND*	
Diuron	LC-MS-MS	ng/L	5	N/A	N/A	100		100		*ND*		23		47	J-	40		*ND*		24		*ND*	
Erythromycin	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Estradiol	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Estriol	LC-MS-MS	ng/L	10-50	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Estrone	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Ethinyl Estradiol - 17 alpha	LC-MS-MS	ng/L	5	N/A	N/A	64		56		37		49		27		33		18		32		31	
Ethylparaben	LC-MS-MS	ng/L	20-100	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Flumeqine	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Fluoxetine	LC-MS-MS	ng/L	10	N/A	N/A	180		200		190		*ND*		*ND*	UJ	*ND*		*ND*		*ND*		*ND*	
Gemfibrozil	LC-MS-MS	ng/L	5-25	N/A	N/A	6.1		5.3		*ND*		11		21		6.2		*ND*		30		12	
Ibuprofen	LC-MS-MS	ng/L	10	N/A	N/A	16		26		24		*ND*		12		*ND*		*ND*		*ND*		*ND*	
Iohexal	LC-MS-MS	ng/L	100	N/A	N/A	*ND*		110		1200		260		350		410		140		200		100	
Iopromide	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		5		*ND*		9.2		*ND*		17		*ND*	
Isobutylparaben	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Isoproturon	LC-MS-MS	ng/L	100	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Ketoprofen	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Ketorolac	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*		*ND*		*ND*	
Lidocaine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*	UJ	7.3	J	*ND*		320		240	J-	64		98		37		6.8	
Lincomycin	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Linuron	LC-MS-MS	ng/L	5	N/A	N/A	5.4		6.8		6.9		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Lopressor	LC-MS-MS	ng/L	20	N/A	N/A	540	J	750	J	900		220		240		130		110		*ND*		*ND*	
Meclofenamic Acid	LC-MS-MS	ng/L	5	N/A	N/A	8.6	J	*ND*	UJ	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Meprobamate	LC-MS-MS	ng/L	5	N/A	N/A	30	J	37	J	8.4		12		10		7.3		22		28		12	
Metazachlor	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Metformin	LC-MS-MS	ng/L	5	N/A	N/A	13		16		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Methylparaben	LC-MS-MS	ng/L	20-100	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Metolachlor	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Naproxen	LC-MS-MS	ng/L	10-50	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nifedipine	LC-MS-MS	ng/L	20-100	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ
N-Nitroso dimethylamine (NDMA)	LC-MS-MS	ng/L	2	N/A	N/A	2.7		2.8		3.4		4.4		8.2		4.6		*ND*		5		3.5	
Norethisterone	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
OUST (Sulfameturon,methyl)	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*		*ND*		*ND*	
Oxolinic acid	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Pentoxifylline	LC-MS-MS	ng/L	5	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*		*ND*		*ND*	UJ	*ND*		*ND*		*ND*		*ND*	
Phenazone	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Primidone	LC-MS-MS	ng/L	10-50	N/A	N/A	280		300		930		320		320		260		200		330		300	

Appendix B - Water Quality Summary

August Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						8/6/2018		8/6/2018		8/8/2018		8/6/2018 - 8/9/2018						8/6/2018 - 8/9/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Progesterone	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Propazine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Propylparaben	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Quinoline	LC-MS-MS	ng/L	5	N/A	N/A	14	J	20	J	*ND*		*ND*		*ND*	UJ	*ND*		*ND*		*ND*		*ND*	
Salicylic Acid	LC-MS-MS	ng/L	100-500	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Simazine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sucralose	LC-MS-MS	ng/L	100-500	N/A	N/A	90000		86000		83000		90000		470000		92000		66000		94000		80000	
Sulfachloropyridazine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*		*ND*		*ND*	
Sulfadiazine	LC-MS-MS	ng/L	20	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*		300		*ND*		*ND*		*ND*		*ND*		*ND*	
Sulfadimethoxine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sulfamerazine	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*		*ND*		*ND*	
Sulfamethazine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Sulfamethizole	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*		*ND*		*ND*	
Sulfamethoxazole	LC-MS-MS	ng/L	5-25	N/A	N/A	36		39		*ND*		380		390		700		310		700		680	
Sulfathiazole	LC-MS-MS	ng/L	20	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*		*ND*		*ND*	UJ	*ND*		*ND*		*ND*		*ND*	
TCEP	LC-MS-MS	ng/L	10	N/A	N/A	210		240		220		160		240	J-	150		130		190		140	
TCPP	LC-MS-MS	ng/L	100	N/A	N/A	1000		1100		1300		460		1100	J+	480		1000		1200		490	
TDCPP	LC-MS-MS	ng/L	100	N/A	N/A	450		470		490		150		170		140		*ND*		190		*ND*	
Testosterone	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Theobromine	LC-MS-MS	ng/L	10-50	N/A	N/A	*ND*		*ND*		*ND*		*ND*		34		37		34		*ND*		*ND*	
Theophylline	LC-MS-MS	ng/L	20	N/A	N/A	*ND*	UJ	*ND*	UJ	95		*ND*	UJ	130	J-	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ
Thiabendazole	LC-MS-MS	ng/L	5	N/A	N/A	16	J	50	J	17		*ND*		*ND*	UJ	*ND*		*ND*		*ND*		*ND*	
Triclocarban	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Triclosan	LC-MS-MS	ng/L	10	N/A	N/A	80	J	130	J	65		29		25		12		*ND*		35		12	
Trimethoprim	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		11		16		*ND*		17		*ND*		*ND*	
Warfarin	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
PFAS																							
Perfluoro butanoic acid- PFBA	MWH PFC	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		17		*ND*		*ND*	
Perfluoro octanesulfonate-PFOS	MWH PFC	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Perfluoro octanesulfonic acid - PFOS	MWH PFC	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Perfluoro octanoic acid - PFOA	MWH PFC	ng/L	5	N/A	N/A	13		12		16		15		17		13		*ND*		15		21	
Perfluoro-1-butanesulfonate	MWH PFC	ng/L	5	N/A	N/A	13		12		13		13		9.9		14		27		12		15	
Perfluoro-1-butanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	12		12		13		11		9		14		26		11		14	
Perfluoro-1-hexanesulfonate	MWH PFC	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Perfluoro-1-hexanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Perfluoro-n-decanoic acid	MWH PFC	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Perfluoro-n-heptanoic acid	MWH PFC	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Perfluoro-n-hexanoic acid	MWH PFC	ng/L	5	N/A	N/A	26		26		72		31		31		39		80		42		47	
Perfluoro-n-nonanoic acid	MWH PFC	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Perfluoropentanoic acid	MWH PFC	ng/L	5-25	N/A	N/A	53		48		150		60		54		77		120		76		77	
DBPs																							
Bromodichloromethane	EPA 524.2	ug/L	0.5	N/A	N/A	12		13		12		4.6		4.2		1.6		5.8		3.3		0.9	
Bromoform	EPA 524.2	ug/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Chlorodibromomethane	EPA 524.2	ug/L	0.5	N/A	N/A	1.3		1.4		1.8		*ND*		0.74		*ND*		*ND*		*ND*		*ND*	
Chloroform (Trichloromethane)	EPA 524.2	ug/L	0.5	N/A	N/A	45		45		39		26		31		21		38		24		11	
Total THM	EPA 524.2	ug/L	0.5	N/A	N/A	58		59		53		31		36		23		44		27		12	
Bromochloroacetic acid	SM 6251B	ug/L	1	N/A	N/A	2.4		2.3		3.7		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Dibromoacetic acid	SM 6251B	ug/L	1	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Dichloroacetic acid	SM 6251B	ug/L	1	N/A	N/A	21		21		22		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Monobromoacetic acid	SM 6251B	ug/L	1	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Monochloroacetic acid	SM 6251B	ug/L	2	N/A	N/A	2.7		2.8		2.8		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Trichloroacetic acid	SM 6251B	ug/L	1	N/A	N/A	26		26		30		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Haloacetic Acids (HAA5)	SM 6251B	ug/L	2	N/A	N/A	50		50		55		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Bacteria																							
E. Coli Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	A		A		A		A		A		A		A		A		A	
E. Coli Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Coliform Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	P		P		P		A		A		A		A		A		A	
Total Coliform Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	16.4		3.1		27.1		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	

Appendix B - Water Quality Summary

August Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	Reclaimed Water 1		Reclaimed Water 1- Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						8/6/2018		8/6/2018		8/8/2018		8/6/2018 - 8/9/2018						8/6/2018 - 8/9/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs																							
1,1,1,2-Tetrachloroethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,1-Trichloroethane	EPA 524.2	ug/L	0.5	200	0.2	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,2,2-Tetrachloroethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,2-Trichloroethane	EPA 524.2	ug/L	0.5	5	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloroethane	EPA 524.2	ug/L	0.5	N/A	1	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloroethylene	EPA 524.2	ug/L	0.5	7	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3-Trichlorobenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3-Trichloropropane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,4-Trichlorobenzene	EPA 524.2	ug/L	0.5	70	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,4-Trimethylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2-Dichloroethane	EPA 524.2	ug/L	0.5	5	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2-Dichloropropane	EPA 524.2	ug/L	0.5	5	0.6	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,3,5-Trimethylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,3-Dichloropropane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
2,2-Dichloropropane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
2-Butanone (MEK)	EPA 524.2	ug/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
2-Hexanone	EPA 524.2	ug/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
4-Methyl-2-Pentanone (MIBK)	EPA 524.2	ug/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Benzene	EPA 524.2	ug/L	0.5	5	1	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromobenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromochloromethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromoethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromomethane (Methyl Bromide)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbon disulfide	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbon Tetrachloride	EPA 524.2	ug/L	0.5	5	0.3	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chlorobenzene	EPA 524.2	ug/L	0.5	100	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloroethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloromethane(Methyl Chloride)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
cis-1,2-Dichloroethylene	EPA 524.2	ug/L	0.5	70	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
cis-1,3-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dibromomethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dichlorodifluoromethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dichloromethane	EPA 524.2	ug/L	0.5	5	5	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Di-isopropyl ether	EPA 524.2	ug/L	3	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethyl benzene	EPA 524.2	ug/L	0.5	700	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Hexachlorobutadiene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isopropylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
m,p-Xylenes	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
m-Dichlorobenzene (1,3-DCB)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Methyl Tert-butyl ether (MTBE)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Naphthalene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
n-Butylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
n-Propylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
o-Chlorotoluene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
o-Dichlorobenzene (1,2-DCB)	EPA 524.2	ug/L	0.5	600	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
o-Xylene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
p-Chlorotoluene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
p-Dichlorobenzene (1,4-DCB)	EPA 524.2	ug/L	0.5	75	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
p-Isopropyltoluene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
sec-Butylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Styrene	EPA 524.2	ug/L	0.5	100	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
tert-amyl Methyl Ether	EPA 524.2	ug/L	3	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
tert-Butyl Ethyl Ether	EPA 524.2	ug/L	3	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
tert-Butylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Tetrachloroethylene (PCE)	EPA 524.2	ug/L	0.5	5	0.8	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Toluene	EPA 524.2	ug/L	0.5	1000	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND	

Appendix B - Water Quality Summary

August Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25ft		East B4 Lysimeter, 50 ft	
DATE						8/6/2018		8/6/2018		8/8/2018		8/6/2018 - 8/9/2018						8/6/2018 - 8/9/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Total 1,3-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total xylenes	EPA 524.2	ug/L	0.5	10000	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
trans-1,2-Dichloroethylene	EPA 524.2	ug/L	0.5	100	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
trans-1,3-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Trichloroethylene (TCE)	EPA 524.2	ug/L	0.5	5	3	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Trichlorofluoromethane	EPA 524.2	ug/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Trichlorotrifluoroethane(Freon	EPA 524.2	ug/L	0.5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Vinyl chloride (VC)	EPA 524.2	ug/L	0.3	2	0.02	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

(2) Established by the Washington State Department of Ecology in WAC 173-200-040

J = Value is detected and the result is estimated
J- = Value is detected and the result is estimated and biased low
J+ = Value is detected and the result is estimated and biased high
UJ = Result is a non-detect and the value is estimated
R = Result rejected
*Drinking water and groundwater quality standards are for total metals.

Appendix B - Water Quality Summary

August Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std^1	Groundwater Quality Std^2	MW-3A		MW-5		MW-8		MW-9		MW-14		MW-16		MW-20		MW-23		MW-25		MW-26		MW-27		MW-28	
DATE						8/9/2018		8/9/2018		8/7/2018		8/7/2018		8/7/2018		8/6/2018		8/8/2018		8/6/2018		8/8/2018		8/6/2018		8/6/2018		8/7/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																													
pH		units				6.89		6.92		6.84		6.85		7.49		6.82		7.25		7.29		7.32		6.20		6.72		7.12	
Temperature		˚C				16.1		18.3		14.4		14.0		14.8		14.6		11.9		11.9		11.2		11.4		13.1		12.6	
Conductivity		µS/cm				426.3		497.3		418.8		364.3		256.6		411.2		155.0		202.9		161.2		156.5		273.9		122.2	
Oxidation Redution Potential (ORP)		mV				182.6		161.1		147.4		156.5		163.1		160.4		131.4		135.5		145.8		185.5		159.8		132.2	
Dissolved Oxygen		mg/L				4.99		3.03		4.27		4.24		4.77		6.09		6.71		6.24		7.92		6.67		5.81		5.54	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																													
Chloride	EPA 300.0	mg/L	0.5-2.5	250	250	52		58		54		44		24		56		5.9		16		9.6		5.8		31		5.8	
Sulfate	EPA 300.0	mg/L	0.5-2.5	250	250	27		29		28		24		12		29		5.8		9.9		9.6		5.7		18		3.4	
Biodegradable Dis. Org. Carbon	Allgeiere 1996	mg/L	0.3	N/A	N/A	*ND*		0.48		0.31		0.44		0.4		*ND*	UJ	*ND*		0.32	J-	0.64		0.35		*ND*		*ND*	
Dissolved Organic Carbon	Allgeiere 1996	mg/L	0.3	N/A	N/A	3.3		2.1		1.5		1.2		0.67	J+	2	J+	1.5	J+	0.77	J+	4.3	J+	0.8	J+	0.61	J+	0.43	J+
Total Dissolved Solid (TDS)	E160.1/SM2540C	mg/L	10	500	500	300		360		300		270		200		300		140		190		150		150		220		100	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.2-0.3	N/A	N/A	1.6		2.1		2.3		2.1		0.38		1.4		0.23		0.75		0.23		1.6		0.73		0.39	
NUTRIENTS																													
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	1	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1-0.5	10	10	2.6		3.3		2.8		2.4		1.5		2.6		0.86		1.4		1		2		2		0.57	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05-0.25	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Nitrate, Nitrite-N, (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	2.6		3.3		2.8		2.4		1.5		2.6		0.86		1.4		1		2		2		0.57	
Total Nitrogen (calc.)	calculated			N/A	N/A	2.6		3.3		2.8		2.4		1.5		2.6		0.86		1.4		1		2		2		0.57	
Phosphorus as P	SM4500-PE/EPA 365.1	mg/L	0.02-0.5	N/A	N/A	0.81		2.3		0.24		0.35		0.021	J+	0.041		*ND*		*ND*		0.021		*ND*		0.026		0.1	
Orthophosphate as P	SM4500-PE/EPA 365.1	mg/L	0.01-0.2	N/A	N/A	0.77		2.2		0.22		0.34		0.024		0.052		0.012		0.021		0.018		0.016		0.025		0.041	
METALS (DISSOLVED)																													
Calcium	EPA 200.7	mg/L	1	N/A	N/A	32		36		33		32		26		32		18		22		17		*ND*		*ND*		14	
Silica	EPA 200.7	mg/L	0.5	N/A	N/A	30		35		28		28		31		24		26		27		30		22		25		23	
Iron	EPA 200.7	mg/L	0.02	0.3	0.3	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Magnesium	EPA 200.7	mg/L	0.1	N/A	N/A	11		9.9		11		11		17		9.6		10		14		12		6.7		10		6.9	
Potassium	EPA 200.7	mg/L	1	N/A	N/A	5.2		12		3.6		3.6		3.1		3.2		1.7		2.4		2.4		*ND*		1.8		1.2	
Sodium	EPA 200.7	mg/L	1	N/A	N/A	51		57		51		41		9.2		52		7.2		8.1		7.7		7		24		5.9	
Arsenic	EPA 200.8	ug/L	1-5	10	0.05	**2.9**		**3.2**		**1.6**		**1.6**		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Cadmium	EPA 200.8	ug/L	0.5-2.5	5	10	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Chromium	EPA 200.8	ug/L	1-5	100	50	*ND*		*ND*		*ND*		*ND*		1.3		*ND*		*ND*		*ND*		1.8		*ND*		*ND*		*ND*	
Copper	EPA 200.8	ug/L	2-10	1300	1000	10		16		9.1		6.8		*ND*		8.3		*ND*		*ND*		*ND*		*ND*		2.6		*ND*	
Lead	EPA 200.8	ug/L	0.5	15	50	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Manganese	EPA 200.8	ug/L	2-10	50	50	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		2.7	
Nickel	EPA 200.8	ug/L	5-25	100	N/A	8.9		9.8		7.6		5.8		*ND*		6.9		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Selenium	EPA 200.8	ug/L	5-25	50	10	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Silver	EPA 200.8	ug/L	0.5	100	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Zinc	EPA 200.8	ug/L	20-100	5000	5000	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Mercury	EPA 245.1	ug/L	0.2	2	2	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
RESIDUAL CHEMICALS																													
1,4-Dioxane	EPA 522	ug/L	0.07	N/A	N/A	0.55		0.61		0.61		0.49		0.15		0.57		*ND*		0.097		*ND*		*ND*		0.3		*ND*	
1,7-Dimethylxanthine	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
2,4-D	LC-MS-MS	ng/L	5-25	70	100	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
4-nonylphenol - semi quantitative	LC-MS-MS	ng/L	100-500	N/A	N/A	200	J	*ND*	UJ	130	J	*ND*	UJ	320	J	270	J	270	J	320	J	880	J	140	J	170	J	460	J
4-tert-octylphenol	LC-MS-MS	ng/L	50	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Acesulfame-K	LC-MS-MS	ng/L	20-100	N/A	N/A	160		250		200		170		46		210		*ND*		49		64		*ND*		180		*ND*	
Acetaminophen	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Albuterol	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Amoxicillin (semi-quantitative)	LC-MS-MS	ng/L	80	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	140	J	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ
Andorostenedione	LC-MS-MS	ng/L	10	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Atenolol	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Atrazine	LC-MS-MS	ng/L	5	3000	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Bendroflumethiazide	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Bezafibrate	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
BPA	LC-MS-MS	ng/L	10-50	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Bromacil	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Butalbital	LC-MS-MS	ng/L	5-25	N/A	N/A	22		19		27		20		*ND*		25		*ND*		*ND*		*ND*		*ND*		13		*ND*	
Butylparben	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Caffeine	LC-MS-MS	ng/L	10-50	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Carbadox	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Carbamazepine	LC-MS-MS	ng/L	5-25	N/A	N/A	520		680		510		410		*ND*		450		*ND*		*ND*		*ND*		*ND*		220		7	
Carisoprodol	LC-MS-MS	ng/L	5	N/A	N/A	5.7		*ND*		7.7		*ND*		*ND*		9		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Chloramphenicol	LC-MS-MS	ng/L	10-50	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Chloridazon	LC-MS-MS	ng/L	5-25	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Chlorotoluron	LC-MS-MS	ng/L	5	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Cimetidine	LC-MS-MS	ng/L	5	N/A	N/A	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ	*ND*	UJ

Appendix B - Water Quality Summary

August Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3A		MW-5		MW-8		MW-9		MW-14		MW-16		MW-20		MW-23		MW-25		MW-26		MW-27		MW-28	
DATE						8/9/2018		8/9/2018		8/7/2018		8/7/2018		8/7/2018		8/6/2018		8/8/2018		8/6/2018		8/8/2018		8/6/2018		8/6/2018		8/7/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Clofibric Acid	LC-MS-MS	ng/L	5-25	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cotinine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cyanazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DACT	LC-MS-MS	ng/L	50	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DEA	LC-MS-MS	ng/L	5-25	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DEET	LC-MS-MS	ng/L	10-50	N/A	N/A	ND		10		ND		ND		ND		14		ND		ND		ND		ND		ND		ND	
Dehydronifedipine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
DIA	LC-MS-MS	ng/L	5-25	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diazepam	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diclofenac	LC-MS-MS	ng/L	5-25	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dilantin	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diltiazem	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Diuron	LC-MS-MS	ng/L	5	N/A	N/A	ND		23		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Erythromycin	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estradiol	LC-MS-MS	ng/L	5-25	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estriol	LC-MS-MS	ng/L	10-50	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Estrone	LC-MS-MS	ng/L	5-25	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethinyl Estradiol - 17 alpha	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethylparaben	LC-MS-MS	ng/L	20-100	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Flumeqine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Fluoxetine	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Gemfibrozil	LC-MS-MS	ng/L	5-25	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ibuprofen	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Iohexal	LC-MS-MS	ng/L	100	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Iopromide	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isobutylparaben	LC-MS-MS	ng/L	5-25	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isoproturon	LC-MS-MS	ng/L	100	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketoprofen	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ketorolac	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Lidocaine	LC-MS-MS	ng/L	5	N/A	N/A	18		68		6		ND		5.5		ND		ND		ND		ND		ND		ND		ND	
Lincomycin	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Linuron	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Lopressor	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Meclofenamic Acid	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Meprobamate	LC-MS-MS	ng/L	5	N/A	N/A	7.3		ND		5.8		ND		ND		7.2		ND		ND		ND		ND		ND		ND	
Metazachlor	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Metformin	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		9.6		10		7.7		11		9.5		5.2		ND		ND		ND		ND	
Methylparaben	LC-MS-MS	ng/L	20-100	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Metolachlor	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Naproxen	LC-MS-MS	ng/L	10-50	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Nifedipine	LC-MS-MS	ng/L	20-100	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
N-Nitroso dimethylamine (NDMA)	LC-MS-MS	ng/L	2	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Norethisterone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
OUST (Sulfameturon,methyl)	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Oxolinic acid	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Pentoxifylline	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Phenazone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Primidone	LC-MS-MS	ng/L	10-50	N/A	N/A	68		30		67		48		44		74		ND		19		ND		ND		ND		ND	
Progesterone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Propazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Propylparaben	LC-MS-MS	ng/L	5-25	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Quinoline	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		8.2		12		12		17		19		7.9		17		ND		ND		ND	
Salicylic Acid	LC-MS-MS	ng/L	100-500	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Simazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		8.6		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sucralose	LC-MS-MS	ng/L	100-500	N/A	N/A	61000		82000		72000		54000		5600		68000		ND		2900		5000		ND		32000		ND	
Sulfachloropyridazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfadiazine	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfadimethoxine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamerazine	LC-MS-MS	ng/L	5-25	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethazine	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethizole	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sulfamethoxazole	LC-MS-MS	ng/L	5-25	N/A	N/A	780		970		770		580		44		780		ND		31		5.6		ND		310		ND	
Sulfathiazole	LC-MS-MS	ng/L	20	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TCEP	LC-MS-MS	ng/L	10	N/A	N/A	100		120		98		76		ND		67		ND		ND		ND		ND		22		ND	
TCPP	LC-MS-MS	ng/L	100	N/A	N/A	260		280		110		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TDCPP	LC-MS-MS	ng/L	100	N/A	N/A	ND		120		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Testosterone	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Theobromine	LC-MS-MS	ng/L	10-50	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

Appendix B - Water Quality Summary

August Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3A		MW-5		MW-8		MW-9		MW-14		MW-16		MW-20		MW-23		MW-25		MW-26		MW-27		MW-28	
DATE						8/9/2018		8/9/2018		8/7/2018		8/7/2018		8/7/2018		8/6/2018		8/8/2018		8/6/2018		8/8/2018		8/6/2018		8/6/2018		8/7/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Theophylline	LC-MS-MS	ng/L	20	N/A	N/A	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ	ND	UJ
Thiabendazole	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Triclocarban	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Triclosan	LC-MS-MS	ng/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trimethoprim	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Warfarin	LC-MS-MS	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
PFAS																													
Perfluoro butanoic acid- PFBA	MWH PFC	ng/L	10	N/A	N/A	ND		ND		11		ND		ND		12		ND		ND		ND		ND		ND		ND	
Perfluoro octanesulfonate-PFOS	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro octanesulfonic acid - PFOS	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro octanoic acid - PFOA	MWH PFC	ng/L	5	N/A	N/A	14	J	15	J	14		13		18		18		ND		10		ND		ND		9.4		ND	
Perfluoro-1-butanesulfonate	MWH PFC	ng/L	5	N/A	N/A	18		23		19		16		8.2		20		ND		6.6		ND		ND		12		ND	
Perfluoro-1-butanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	16		22		18		15		7.7		19		ND		5.2		ND		ND		9.9		ND	
Perfluoro-1-hexanesulfonate	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro-1-hexanesulfonic acid	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro-n-decanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro-n-heptanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Perfluoro-n-hexanoic acid	MWH PFC	ng/L	5	N/A	N/A	43		48		45		37		26		49		ND		13		ND		ND		28		ND	
Perfluoro-n-nonanoic acid	MWH PFC	ng/L	5	N/A	N/A	ND		ND		ND		ND		ND		8.6		ND		ND		ND		ND		ND		ND	
Perfluoropentanoic acid	MWH PFC	ng/L	5-25	N/A	N/A	75		94		71		63		31		85		ND		14		5.9		ND		38		ND	
DBPs																													
Bromodichloromethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromoform	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chlorodibromomethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloroform (Trichloromethane)	EPA 524.2	ug/L	0.5	N/A	N/A	20	J	34	J	14		8.2		0.67		14		ND		0.51		ND		6.7		ND		ND	
Total THM	EPA 524.2	ug/L	0.5	N/A	N/A	20		34		14		8.2		0.67		14		ND		0.51		ND		6.7		ND		ND	
Bromochloroacetic acid	SM 6251B	ug/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dibromoacetic acid	SM 6251B	ug/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dichloroacetic acid	SM 6251B	ug/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Monobromoacetic acid	SM 6251B	ug/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Monochloroacetic acid	SM 6251B	ug/L	2	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trichloroacetic acid	SM 6251B	ug/L	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total Haloacetic Acids (HAA5)	SM 6251B	ug/L	2	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bacteria																													
E. Coli Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	A	UJ	A		A		A	UJ	A	UJ	A		A		A		A		A		A		A	
E. Coli Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total Coliform Bacteria (P/A)	SM 9223 B	P/A	1	N/A	N/A	A	UJ	A		A		A	UJ	A	UJ	A		A		A		A		A		A		P	
Total Coliform Bacteria	SM 9223 B	MPN/ 100 mL	1	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		13.7	
VOCs																													
1,1,1,2-Tetrachloroethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,1-Trichloroethane	EPA 524.2	ug/L	0.5	200	0.2	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,2,2-Tetrachloroethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1,2-Trichloroethane	EPA 524.2	ug/L	0.5	5	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloroethane	EPA 524.2	ug/L	0.5	N/A	1	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloroethylene	EPA 524.2	ug/L	0.5	7	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,1-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3-Trichlorobenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,3-Trichloropropane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,4-Trichlorobenzene	EPA 524.2	ug/L	0.5	70	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2,4-Trimethylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2-Dichloroethane	EPA 524.2	ug/L	0.5	5	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,2-Dichloropropane	EPA 524.2	ug/L	0.5	5	0.6	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,3,5-Trimethylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
1,3-Dichloropropane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2,2-Dichloropropane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2-Butanone (MEK)	EPA 524.2	ug/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2-Hexanone	EPA 524.2	ug/L	10	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
4-Methyl-2-Pentanone (MIBK)	EPA 524.2	ug/L	5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Benzene	EPA 524.2	ug/L	0.5	5	1	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromobenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromochloromethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromoethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromomethane (Methyl Bromide)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbon disulfide	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbon Tetrachloride	EPA 524.2	ug/L	0.5	5	0.3	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chlorobenzene	EPA 524.2	ug/L	0.5	100	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloroethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloromethane(Methyl Chloride)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

Appendix B - Water Quality Summary

August Quarterly Reclaimed Water, Vadose Zone and Groundwater Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3A		MW-5		MW-8		MW-9		MW-14		MW-16		MW-20		MW-23		MW-25		MW-26		MW-27		MW-28	
DATE						8/9/2018		8/9/2018		8/7/2018		8/7/2018		8/7/2018		8/6/2018		8/8/2018		8/6/2018		8/8/2018		8/6/2018		8/6/2018		8/7/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
cis-1,2-Dichloroethylene	EPA 524.2	ug/L	0.5	70	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
cis-1,3-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dibromomethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dichlorodifluoromethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Dichloromethane	EPA 524.2	ug/L	0.5	5	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Di-isopropyl ether	EPA 524.2	ug/L	3	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Ethyl benzene	EPA 524.2	ug/L	0.5	700	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Hexachlorobutadiene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isopropylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
m,p-Xylenes	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
m-Dichlorobenzene (1,3-DCB)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Methyl Tert-butyl ether (MTBE)	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Naphthalene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
n-Butylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
n-Propylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
o-Chlorotoluene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
o-Dichlorobenzene (1,2-DCB)	EPA 524.2	ug/L	0.5	600	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
o-Xylene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
p-Chlorotoluene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
p-Dichlorobenzene (1,4-DCB)	EPA 524.2	ug/L	0.5	75	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
p-Isopropyltoluene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
sec-Butylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Styrene	EPA 524.2	ug/L	0.5	100	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
tert-amyl Methyl Ether	EPA 524.2	ug/L	3	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
tert-Butyl Ethyl Ether	EPA 524.2	ug/L	3	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
tert-Butylbenzene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Tetrachloroethylene (PCE)	EPA 524.2	ug/L	0.5	5	0.8	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Toluene	EPA 524.2	ug/L	0.5	1000	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total 1,3-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total xylenes	EPA 524.2	ug/L	0.5	10000	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
trans-1,2-Dichloroethylene	EPA 524.2	ug/L	0.5	100	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
trans-1,3-Dichloropropene	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trichloroethylene (TCE)	EPA 524.2	ug/L	0.5	5	3	ND		ND		ND		ND		ND		ND		ND		0.53		ND		ND		ND		ND	
Trichlorofluoromethane	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Trichlorotrifluoroethane(Freon	EPA 524.2	ug/L	0.5	N/A	N/A	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Vinyl chloride (VC)	EPA 524.2	ug/L	0.3	2	0.02	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

(2) Established by the Washington State Department of Ecology in WAC 173-200-040

J = Value is detected and the result is estimated
J- = Value is detected and the result is estimated and biased low
J+ = Value is detected and the result is estimated and biased high
UJ = Result is a non-detect and the value is estimated
R = Result rejected
*Drinking water and groundwater quality standards are for total metals.
***Bold text indicates parameters that exceed the drinking or groundwater MCL**

Appendix B - Water Quality Summary

September Monthly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std^1	Groundwater Quality Std^2	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25 ft		East B4 Lysimeter, 50 ft	
DATE						9/10/2018		9/10/2018		9/12/2018		9/11/2018						9/11/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																							
pH		units				7.18		--		7.12		--		--		--		--		--		--	
Temperature		˚C				22.9		--		22.1		--		--		--		--		--		--	
Conductivity		µS/cm				554.0		--		567.0		--		--		--		--		--		--	
Oxidation Reduction Potential (ORP)		mV				363.0		--		273.2		--		--		--		--		--		--	
Dissolved Oxygen		mg/L				4.78		--		4.75		--		--		--		--		--		--	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																							
Chloride	EPA 300.0	mg/L	1-2.5	250	250	54		54		53		70		59		60		58		60		57	
Biodegradable Dis. Org. Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	0.64	J+	0.8	J+	*ND*		--		--		--		--		--		--	
Dissolved Organic Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	4.1	J+	4.1	J+	5		--		--		--		--		--		--	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	6.4		6.4		5.6		2.9		3.5		2.9		4.2		3.1		1.8	
NUTRIENTS																							
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	0.06		0.056		0.1		0.38		*ND*		*ND*		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	1	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.2-0.5	10	10	0.89		0.89		0.99		10		3		2.9		3.9		3.4		1.6	
Nitrite Nitrogen	EPA 300.0	mg/L	0.1-2.5	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Nitrate, Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	0.89		0.89		0.99		10		3		2.9		3.9		3.4		1.6	
Total Nitrogen (calc.)	calculated	mg/L		N/A	N/A	0.89		0.89		0.99		10		3		2.9		3.9		3.4		1.6	
Orthophosphate as P	4500P-E/365.1	mg/L	0.01-0.2	N/A	N/A	0.83		0.83		5		0.44		2.9		2.3		2.5		0.98		0.015	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm);µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

(2) Established by the Washington State Department of Ecology in WAC 173-200-040

J = Value is detected and the result is estimated
J- = Value is detected and the result is estimated and biased low
J+ = Value is detected and the result is estimated and biased high
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R = Result rejected
*Drinking water and groundwater quality standards are for total metals.

Appendix B - Water Quality Summary

September Monthly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	MW-3a		MW-5		MW-8		MW-9		MW-14		MW-16		MW-20		MW-23		MW-25		MW-26		MW-28	
DATE						9/11/2018		9/12/2018		9/12/2018		9/12/2018		9/11/2018		9/11/2018		9/11/2018		9/10/2018		9/10/2018		9/10/2018		9/10/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																											
pH		units				6.76		6.76		6.83		6.67		7.31		6.76		7.07		7.20		7.12		6.15		6.96	
Temperature		˚C				16.1		18.4		14.1		13.8		15.0		15.1		11.4		11.3		11.2		11.0		12.0	
Conductivity		µS/cm				426.5		520		430.0		373.9		271.9		423.7		156.7		207.8		173.7		161.5		126.0	
Oxidation Reduction Potential (ORP)		mV				229.6		185.1		185.2		190.8		209.1		233.8		192.7		201.8		231.8		190.5		172.2	
Dissolved Oxygen		mg/L				5.10		5.27		6.92		4.56		4.94		6.79		6.36		6.47		7.87		7.06		5.22	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																											
Chloride	EPA 300.0	mg/L	1-2.5	250	250	51		59		55		45		24		57		5.3		14		8.9		5.1		5.1	
Biodegradable Dis. Org. Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	--		--		--		--		--		--		--		--		--		--		--	
Dissolved Organic Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	--		--		--		--		--		--		--		--		--		--		--	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	1.3		1.8		1.3		1.1		0.33		1.3		*ND*		*ND*		0.65		*ND*		0.83	
NUTRIENTS																											
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	1	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	UJ	*ND*		*ND*	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.2-0.5	10	10	2.7		3.9		2.8		2.4		1.6		2.5		0.78		1.3		0.94		1.4		0.58	
Nitrite Nitrogen	EPA 300.0	mg/L	0.1-2.5	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Nitrate, Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	2.7		3.9		2.8		2.4		1.6		2.5		0.78		1.3		0.94		1.4		0.58	
Total Nitrogen (calc.)	calculated	mg/L		N/A	N/A	2.7		3.9		2.8		2.4		1.6		2.5		0.78		1.3		0.94		1.4		0.58	
Orthophosphate as P	4500P-E/365.1	mg/L	0.01-0.2	N/A	N/A	0.55		2		0.33		0.34		0.026		0.023		0.012		0.019		0.017		0.015		0.13	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

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J = Value is detected and the result is estimated

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*Drinking water and groundwater quality standards are for total metals.

Appendix B - Water Quality Summary

October Monthly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	METHOD	Units	MRL	Drinking Water Std[1]	Groundwater Quality Std[2]	Reclaimed Water 1		Reclaimed Water 1-Duplicate		Reclaimed Water 2		West B4 Lysimeter, 10 ft		West B4 Lysimeter, 25 ft		West B4 Lysimeter, 50 ft		East B4 Lysimeter, 10 ft		East B4 Lysimeter, 25 ft		East B4 Lysimeter, 50 ft	
DATE						10/1/2018		10/1/2018		10/3/2018		10/2/2018						10/2/2018					
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																							
pH		units				7.11		--		7.14		--		--		--		--		--		--	
Temperature		˚C				21.6		--		21.3		--		--		--		--		--		--	
Conductivity		µS/cm				593.0		--		622.0		--		--		--		--		--		--	
Oxidation Reduction Potential (ORP)		mV				358.4		--		263.1		--		--		--		--		--		--	
Dissolved Oxygen		mg/L				5.19		--		4.73		--		--		--		--		--		--	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																							
Chloride	EPA 300.0	mg/L	0.5-2.5	250	250	52		52		58		65		57		57		83		56		58	
Biodegradable Dis. Org. Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	0.93		1		1.1		--		--		--		--		--		--	
Dissolved Organic Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	5.2	J+	5.2	J+	5.6	J+	--		--		--		--		--		--	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	5.5		5.6		6		4		4.2		3.8		5.5		3.8		2.4	
NUTRIENTS																							
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	0.076		0.073		0.058		*ND*		0.057		*ND*		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	0.2	N/A	N/A	0.88		0.81		0.74		0.58		0.65		0.4		0.59		0.42		0.25	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1-0.5	10	10	1.4		1.4		1.6		3.4		2.8		2.6		9		2.6		2.4	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05-0.25	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Nitrate, Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	1.4		1.4		1.6		3.4		2.8		2.6		9		2.6		2.4	
Total Nitrogen (calc.)	calculated	mg/L		N/A	N/A	2.28		2.21		2.34		3.98		3.45		3		9.59		3.02		2.65	
Orthophosphate as P	4500P-E/365.1	mg/L	0.01-0.2	N/A	N/A	7.9		8		5.3		0.73		2.7		2.3		0.39		1.2		0.011	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm);µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

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J = Value is detected and the result is estimated
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*Drinking water and groundwater quality standards are for total metals.

Appendix B - Water Quality Summary

October Monthly Reclaimed Water, Vadose Zone and Groundwater Quality Monitoring Data.

ANALYTE	**METHOD**	**Units**	**MRL**	**Drinking Water Std^1**	**Groundwater Quality Std^2**	**MW-3a**		**MW-5**		**MW-8**		**MW-9**		**MW-14**		**MW-16**		**MW-20**		**MW-23**		**MW-25**		**MW-26**		**MW-28**	
DATE						10/2/2018		10/3/2018		10/3/2018		10/3/2018		10/2/2018		10/2/2018		10/2/2018		10/1/2018		10/1/2018		10/1/2018		10/1/2018	
						Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
FIELD PARAMETERS																											
pH		units				6.80		6.83		6.88		6.76		7.35		6.82		6.47		7.18		7.12		6.24		6.98	
Temperature		˚C				16.7		17.1		14.2		14.0		14.9		15.3		11.3		11.1		11.1		11		12.1	
Conductivity		µS/cm				488.7		528		459.7		431.6		288.9		457.5		161.9		218.0		184.5		171.6		137.1	
Oxidation Reduction Potential (ORP)		mV				166.0		174.2		164.1		165.6		157.5		184.5		149.4		168.4		222.8		192.8		170.3	
Dissolved Oxygen		mg/L				4.88		6.39		6.71		4.71		5.61		8.92		6.47		6.20		7.56		7.70		4.73	
CHLORIDE/SULFATE/TDS/ORGANIC CARBON																											
Chloride	EPA 300.0	mg/L	0.5-2.5	250	250	55		58		55		51		25		56		5.4		16		10		5.8		5.7	
Biodegradable Dis. Org. Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	--		--		--		--		--		--		--		--		--		--		--	
Dissolved Organic Carbon	Allgeier, 1996	mg/L	0.3	N/A	N/A	--		--		--		--		--		--		--		--		--		--		--	
Total Organic Carbon	SM5310C/E415.3	mg/L	0.3	N/A	N/A	1.6		1.9		1.3		1.2		0.33		1.4		*ND*		*ND*		*ND*		0.34		0.43	
NUTRIENTS																											
Ammonia Nitrogen	EPA 350.1	mg/L	0.05	N/A	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Kjeldahl Nitrogen	EPA 351.2	mg/L	0.2	N/A	N/A	*ND*		*ND*		0.21		*ND*		*ND*		0.24		*ND*		*ND*		*ND*		*ND*		*ND*	
Nitrate as Nitrogen	EPA 300.0	mg/L	0.1-0.5	10	10	2.8		3.4		2.8		2.7		1.6		2.4		0.73		1.3		1		1.2		0.63	
Nitrite Nitrogen	EPA 300.0	mg/L	0.05-0.25	1	N/A	*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*		*ND*	
Total Nitrate, Nitrite-N (calc.)	EPA 300.0	mg/L	0.1	N/A	N/A	2.8		3.4		2.8		2.7		1.6		2.4		0.73		1.3		1		1.2		0.63	
Total Nitrogen (calc.)	calculated	mg/L		N/A	N/A	2.8		3.4		3.01		2.7		1.6		2.64		0.73		1.3		1		1.2		0.63	
Orthophosphate as P	4500P-E/365.1	mg/L	0.01-0.2	N/A	N/A	0.77		2.2		0.39		0.38		0.02		0.03		*ND*		0.019		0.016		0.015		0.17	

Notes:

MRL = Minimum Reporting Level; -- = The analyte was not analyzed; N/A = not applicable (e.g., no standard for this parameter); ND = not detected above MRL; mg/L = milligrams per liter (ppm); µg/L = micrograms per liter (ppb); ng/L = nanograms per liter (ppt); µS/cm = microsiemens per centimeter; mV = millivolts; MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

MPN/100 mL = Most Probable Number (colony forming units) per 100 mL; PFC = Perfluorinated Compound; DBP = Disinfection Byproduct; VOC = Volitile Organic Compound; P = present; A = absent

(1) Established by the Washington State Department of Health in 246-290 WAC. Bacteria drinking water standards are listed in WAC 246-290-310(2)

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J = Value is detected and the result is estimated

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R = Result rejected

*Drinking water and groundwater quality standards are for total metals.

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Appendix C: Data Validation

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DATA VALIDATION REPORT

LOTT Wastewater and Reclaimed Water
January through May Bromide Tracer Sampling Events

Laboratory: Eurofins Eaton Analytical

Laboratory Report Numbers: 710736, 710917, 710953, 711079, 711084, 711402, 711812, 711866, 712002, 712005, 712351, 712396, 712405, 712554, 712558, 712969, 712987, 713324, 713670, 713786, 714267, 714796, 714801, 714809, 714815, 715302, 715558, 716410, 717301, 717826, 718243, 718706, 719129, 720279, 721886, 723218, 725157, 727878, 731675, 734631, and 737640

Dates of Sampling: 1/10/2018, 1/11/2018, 1/12/2018, 1/13/2018, 1/15/2018, 1/16/2018, 1/17/2018, 1/18/2018, 1/19/2018, 1/20/2018, 1/22/2018, 1/23/2018, 1/24/2018, 1/25/2018, 1/26/2018, 1/29/2018, 1/30/2018, 1/31/2018, 2/1/2018, 2/2/2018, 2/5/2018, 2/6/2018, 2/7/2018, 2/8/2018, 2/9/2018, 2/12/2018, 2/13/2018, 2/14/2018, 2/15/2018, 2/16/2018, 2/21/2018, 2/22/2018, 2/26/2018, 2/27/2018, 2/28/2018, 3/1/2018, 3/2/2018, 3/7/2018, 3/12/2018, 3/13/2018, 3/14/2018, 3/15/2018, 3/26/2018, 3/27/2018, 3/28/2018, 4/9/2018, 4/10/2018, 4/11/2018, 4/12/2018, 4/13/2018, 4/23/2018, 4/24/2018, 4/25/2018, 4/26/2018, 5/7/2018, 5/8/2018, and 5/9/2018

INTRODUCTION

This report presents the results of laboratory data validation for the bromide tracer test groundwater samples collected from January through May, 2018 for the Reclaimed Water Infiltration Study. These samples were collected in accordance with the procedures and protocols specified in the *Tracer Testing and Water Quality Monitoring of Treatment Effectiveness (Task 2.1.3) Work Plan*. The laboratory data report and Quality Assurance and Quality Control (QA/QC) data are included in this data validation report. Verification and validation steps addressed in this report are:

- Sampling Procedures
- Holding Times
- Quantitation Limits
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries and Relative Percent Differences
- Laboratory Control Sample Recoveries
- Method Blank
- Laboratory Duplicate Relative Percent Differences (RPD)

SAMPLING PROCEDURES, CHAIN OF CUSTODY, AND HOLDING TIMES

Bromide grab samples were collected from groundwater monitoring wells and vadose zone lysimeters. Sampling locations and sampling procedures are described below.

- Groundwater monitoring wells (MW-1, MW-2, MW-3A, MW-5, MW-6, MW-7, MW-8, MW-9, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16, MW-20, MW-23, MW-24, MW-25, MW-26, and MW-27, MW-28, Lacey MW-11, Thurston County Landfill MW-1, Thurston County Landfill MW-10S):
    - Each monitoring well is equipped with a dedicated bladder pump with an intake set within the well screen interval. The bladder pumps are PFC-free pumps by Geotech Environmental, Inc., incorporating polyethylene bladders and stainless steel construction. Each well was purged at a rate of approximately 500 milliliters/minute while recording stabilization parameters with a YSI Professional Plus water quality meter and flow-through cell. Once stabilization was achieved, the flow-through cell was disconnected from the sample tubing and the sample containers were filled directly.
- Vadose zone lysimeters (West B4 Lysimeter 10ft, 25ft, and 50ft, and East B4 Lysimeter 10ft, 25ft, and 50ft):
    - Each stainless steel lysimeter was purged empty before drawing fresh vadose zone water into the lysimeter for sampling. Purging was completed by applying pressure using a pump until the lysimeter was completely evacuated. Vacuum was then applied to the lysimeter over a period of several hours in order to draw in fresh water. Sample containers were filled directly from the sample tubing by again applying pressure to the lysimeter using a pump. Lysimeters were completely emptied after the sample containers were filled so that no stagnant water remains within the lysimeter.

Bromide sample containers were labeled, sealed, placed in a cooler packed with ice, and shipped under chain of custody to Eurofins Eaton Analytical in Monrovia, California. Bromide sample characteristics are shown in Table 1.

Table 1. Quarterly Water Quality Monitoring Analytical Parameters

Parameter	Method	Hold Time Analysis	QC Conducted by Laboratory
Bromide	EPA 300.0	28 days	LCS, Method Blank, MRL Check, MS/MSD

Copies of the completed chain-of-custody (COC) forms are included in the data packages for all bromide batches. The forms were properly filled out and include relinquished and received signatures. Shipments were received by the laboratory on the day following sampling. The cooler temperatures ranged from 0.2 ^{o} C to 5.5^{o} C. Compliance is 4^{o} C plus or minus 2^{o} C; therefore, no samples were qualified based on cooler temperature.

The maximum holding time for bromide is 28 days, as described in Table 1. All samples were extracted and analyzed within the holding times.

DETECTION LIMIT

Detection limits are specified by the analytical methods. For samples that were diluted by the laboratory, the MRL was raised by the factor of the dilution (e.g., for an MRL of 0.1 mg/L and dilution factor of 2, the diluted MRL is calculated to be 0.2 mg/L). No qualifications were made to the data due to dilutions. Analytes with results below the MRL or the diluted MRL are defined as "ND" (Not Detected).

MINIMUM REPORTING LEVEL CHECK

A reporting level standard is included with every batch/analytical run to confirm the instrument response with the given batch. In instances where the method reporting level check was higher than QC limits, but the sample was non-detect, no qualifications were made. No qualifications were made for data exceeding MRL recoveries QC limits.

LABORATORY MATRIX SPIKES AND SPIKE DUPLICATES

To assess potential matrix effects, an environmental sample and a duplicate are spiked with known concentrations of target analytes. The percent recovery of the target analytes is compared to statistical control limits.

Analytes that failed both MS and MSD are qualified as estimated. Analytes with MS/MSD recoveries below 10 percent were rejected. Analytes that failed on only the MS or the MSD are considered acceptable and the data are not qualified for these analytes. Sample concentrations that exceed the spike added concentrations by more than a factor of four are not flagged. All MS and MSD recoveries were within the QC limits. Samples spiked for MS/MSD from non-LOTT projects were not evaluated.

LABORATORY CONTROL SAMPLES

Laboratory Control Samples (LCS) are samples of known concentration that are carried through the extraction and analysis process. The percent recovery is the percentage of the theoretical concentration, and has statistical control limits indicating that the analytical process is "in control." An LCS sample was run in duplicate with the work order samples. LCS recoveries were all within the QC limits.

LABORATORY METHOD BLANK

An aliquot of reagent water was carried through the entire analytical process. The method blank results indicate any possible contamination exposure during the sample handling, digestion, or extraction process and analysis. In all instances, compounds were not detected at or above the method reporting limits.

DUPLICATE FIELD SAMPLE

In order to assess field precision, a duplicate sample was collected for for MW-16 and MW-3A (MW-16 -Duplicate and MW-3A Duplicate). Original and duplicate sample values with a RPD exceeding 20% are qualified as estimated. However, if either the original or duplicate result is less than 5 times the analyte’s MRL, their difference is used to qualify the results. If the difference is greater than the relative MRL the sample is flagged. All duplicate samples were within relative control limits.

DATA VALIDATION REPORT

LOTT Wastewater and Reclaimed Water
June through October Bromide Tracer Sampling Events

Laboratory: Eurofins Eaton Analytical

Laboratory Report Numbers: 744725, 749773, 755363, 762342, 766324

Dates of Sampling: 6/11/2018, 6/12/2018, 6/13/2018, 6/14/2018, 6/15/2018, 7/9/2018, 7/10/2018, 7/11/2018, 7/12/2018, 8/6/2018, 8/7/2018, 8/8/2018, 8/9/2018, 8/10/2018, 9/10/2018, 9/11/2018, 9/12/2018, 9/13/2018, 10/1/2018, 10/2/2018, 10/3/2018, and 10/4/2018

INTRODUCTION

This report presents the results of laboratory data validation for the bromide tracer test groundwater samples collected from June through October 2018 for the Reclaimed Water Infiltration Study. These samples were collected in accordance with the procedures and protocols specified in the *Tracer Testing and Water Quality Monitoring of Treatment Effectiveness (Task 2.1.3) Work Plan*. The laboratory data report and Quality Assurance and Quality Control (QA/QC) data are included in this data validation report. Verification and validation steps addressed in this report are:

- Sampling Procedures
- Holding Times
- Quantitation Limits
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries and Relative Percent Differences
- Laboratory Control Sample Recoveries
- Method Blank

SAMPLING PROCEDURES, CHAIN OF CUSTODY, AND HOLDING TIMES

Bromide grab samples were collected from groundwater monitoring wells and vadose zone lysimeters. Sampling locations and sampling procedures are described below.

- Groundwater monitoring wells (MW-1, MW-2, MW-3A, MW-5, MW-6, MW-7, MW-8, MW-9, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16, MW-20, MW-23, MW-24, MW-25, MW-26, and MW-27, MW-28, Lacey MW-11, Thurston County Landfill MW-1, Thurston County Landfill MW-10S):
    - Each monitoring well is equipped with a dedicated bladder pump with an intake set within the well screen interval. The bladder pumps are PFC-free pumps by Geotech Environmental, Inc., incorporating polyethylene bladders and stainless steel construction. Each well was purged at a rate of approximately 500 milliliters/minute while recording stabilization parameters with a YSI Professional Plus water quality meter and flow-through cell. Once stabilization was achieved, the flow-through cell was disconnected from the sample tubing and the sample containers were filled directly.
- Vadose zone lysimeters (West B4 Lysimeter 10ft, 25ft, and 50ft, and East B4 Lysimeter 10ft, 25ft, and 50ft):
    - Each stainless steel lysimeter was purged empty before drawing fresh vadose zone water into the lysimeter for sampling. Purging was completed by applying pressure using a pump until the lysimeter was completely evacuated. Vacuum was then applied to the lysimeter over a period of several hours in order to draw in fresh water. Sample containers were filled directly from the sample tubing by again applying pressure to the lysimeter using a pump. Lysimeters were completely emptied after the sample containers were filled so that no stagnant water remains within the lysimeter.

Bromide sample containers were labeled, sealed, placed in a cooler packed with ice, and shipped under chain of custody to Eurofins Eaton Analytical in Monrovia, California. Bromide sample characteristics are shown in Table 1.

Table 1. Quarterly Water Quality Monitoring Analytical Parameters

Parameter	Method	Hold Time Analysis	QC Conducted by Laboratory
Bromide	EPA 300.0	28 days	LCS, Method Blank, MRL Check, MS/MSD

Copies of the completed chain-of-custody (COC) forms are included in the data packages for all bromide batches. The forms were properly filled out and include relinquished and received signatures. The cooler temperatures ranged from 1.6 ° C to 4.1° C. Compliance is 4° C plus or minus 2° C; therefore, no samples were qualified based on cooler temperature.

The maximum holding time for bromide is 28 days, as described in Table 1. All samples were extracted and analyzed within the holding times.

DETECTION LIMIT

Detection limits are specified by the analytical methods. For samples that were diluted by the laboratory, the MRL was raised by the factor of the dilution (e.g., for an MRL of 0.1 mg/L and dilution factor of 2, the diluted MRL is calculated to be 0.2 mg/L). No qualifications were made to the data due to dilutions. Analytes with results below the MRL or the diluted MRL are defined as "ND" (Not Detected).

MINIMUM REPORTING LEVEL CHECK

A reporting level standard is included with every batch/analytical run to confirm the instrument response with the given batch. In instances where the method reporting level check was higher than QC limits, but the sample was non-detect, no qualifications were made. No qualifications were made for data exceeding MRL recoveries QC limits.

LABORATORY MATRIX SPIKES AND SPIKE DUPLICATES

To assess potential matrix effects, an environmental sample and a duplicate are spiked with known concentrations of target analytes. The percent recovery of the target analytes is compared to statistical control limits.

Analytes that failed both MS and MSD are qualified as estimated. Analytes with MS/MSD recoveries below 10 percent were rejected. Analytes that failed on only the MS or the MSD are considered acceptable and the data are not qualified for these analytes. Sample concentrations that exceed the spike added concentrations by more than a factor of four are not flagged. All MS and MSD recoveries were within the QC limits. Samples spiked for MS/MSD from non-LOTT projects were not evaluated.

LABORATORY CONTROL SAMPLES

Laboratory Control Samples (LCS) are samples of known concentration that are carried through the extraction and analysis process. The percent recovery is the percentage of the theoretical concentration, and has statistical control limits indicating that the analytical process is "in control." An LCS sample was run in duplicate with the work order samples. LCS recoveries were all within the QC limits.

LABORATORY METHOD BLANK

An aliquot of reagent water was carried through the entire analytical process. The method blank results indicate any possible contamination exposure during the sample handling, digestion, or extraction process and analysis. In all instances, compounds were not detected at or above the method reporting limits.

DATA VALIDATION REPORT

LOTT Wastewater and Reclaimed Water
January Water Quality Characterization Sampling Events

Laboratory: Eurofins Eaton Analytical

Laboratory Report Numbers: 710736, 710917, 710953, 711079, 711084, 711375, 711388, 711402, 711812, 711866, 712005, 712396, 712405, 712558

Dates of Sampling: 1/10/2018, 1/11/2018, 1/12/2018, 1/13/2018, 1/15/2018, 1/16/2018, 1/17/2018, 1/18/2018, and 1/19/2018

INTRODUCTION

This report presents data validation for the wastewater and reclaimed water quality characterization sampling events collected for the Reclaimed Water Infiltration Study. These samples were collected in accordance with the procedures and protocols specified in the *Tracer Testing and Water Quality Monitoring of Treatment Effectiveness (Task 2.1.3) Work Plan*. The laboratory data report and Quality Assurance and Quality Control (QA/QC) data are included in this data validation report. Verification and validation steps addressed in this report are:

- Sampling Procedures
- Holding Times
- Quantitation Limits
- Surrogate Recoveries
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries and Relative Percent Differences
- Laboratory Control Sample Recoveries
- Method Blank
- Laboratory and Field Replicate and Duplicate Relative Percent Differences.

SAMPLING PROCEDURES, CHAIN OF CUSTODY, AND HOLDING TIMES

Grab samples were collected from groundwater monitoring wells, vadose zone lysimeters, and the reclaimed water discharge pipe at LOTT Hawks Prairie recharge Basin #4. Sampling locations and sampling procedures are described below.

- Groundwater monitoring wells (MW-3A, MW-5, MW-8, MW-9, MW-11, MW-14, MW-15, MW-16, MW-20, MW-25, MW-26, and MW-27):
    - Each monitoring well is equipped with a dedicated bladder pump with an intake set within the well screen interval. The bladder pumps are PFC-free pumps by Geotech, incorporating polyethylene bladders and stainless steel construction. Each well was purged at a rate of approximately 500 milliliters/minute while recording stabilization

    parameters with a YSI Professional Plus water quality meter and flow-through cell. Once stabilization was achieved, the flow-through cell was disconnected from the sample tubing and the sample containers were filled directly. Field filtering of analytes that require field filtering was accomplished using a new inline 0.45-micron disposable filter by Geotech.

- Vadose zone lysimeters (West B4 Lysimeter 10ft, 25ft, and 50ft, and East B4 Lysimeter 10 ft, 25 ft, and 50 ft):
    - Each stainless steel lysimeter was purged empty before drawing fresh vadose zone water into the lysimeter for sampling. Purging was completed by applying pressure using a pump until the lysimeter was completely evacuated. Vacuum was then applied to the lysimeter over a period of several hours in order to draw in fresh water. Sample containers were filled directly from the sample tubing by again applying pressure to the lysimeter using a pump. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary. Lysimeters were completely emptied after the sample containers were filled so that no stagnant water remains within the lysimeter.
- Reclaimed water samples at Basin #4 (Reclaimed Water 1, Reclaimed Water 1-Duplicate, and Reclaimed Water 2):
    - Reclaimed water samples were collected at outlets in the black plastic discharge piping at Basin #4. Outlets exhibiting the highest flow were selected for sample collection. Sample containers were filled directly by holding the container under the flow. Sample collection was achieved without the sample water contacting the outside of the black plastic discharge piping. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary.

Sample containers were labeled, sealed, placed in a cooler packed with ice, and shipped under chain of custody to Eurofins Eaton Analytical in Monrovia, California. Sample analytes are shown in Table 1.

Table 1. Quarterly Water Quality Monitoring Analytical Parameters

Parameter	Method	Hold Time Extraction	Hold Time Analysis	QC Conducted by Laboratory
Residual Chemicals, including metformin and thiabendazole	EEA's PPCP LC/MS/MS Method	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Trihalomethanes/VOCs	EPA 524.2	----	14 Days	LCS, Method Blank, MRL Check, MS/MSD

Parameter	Method	Hold Time Extraction	Hold Time Analysis	QC Conducted by Laboratory
HAA5	SM 6251B	14 days	14 days	LCS, Method Blank, MRL Check, MS/MSD
PFOS/PFOA + Other PFCs	EEA's MWH PFC Method	14 days	14 days	LCS, Method Blank, MRL Check, MS/MSD
NDMA	EPA 521	14 days	28 days	LCS, Method Blank, MRL Check, MS/MSD
1,4-Dioxane	EPA 522	28 days	28 days	LCS, Method Blank, MRL Check, MS/MSD
TKN, ammonia	EPA 300. 351.1, 351.2	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Nitrate, nitrite,	EPA 300.0, 353.2	----	48 hours	LCS, Method Blank, MRL Check, MS/MSD
Total phosphorous,	SM4500P-E	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Ortho-phosphorous	SM4500P-E		48 hours	LCS, Method Blank, MRL Check, MS/MSD
Total organic carbon	SM 5310C	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Biodegradable organic carbon	Allgeier, 1996	48 hours	NA hours	LCS, Method Blank, MRL Check, MS/MSD
Metals (Ag, As, Ca, Cd, Cr, Cu, Fe, Hg, Pb, Mg, Mn, Na, Pb, Ni, Se, Si, Zn)	EPA 200 series	----	180 days	LCS, Method Blank, MRL Check, MS/MSD
Sulfate, chloride	EPA 300	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Total dissolved solids	EPA SM2540C	----	7 days	LCS, Method Blank, MRL Check, MS/MSD

A copy of the completed chain-of-custody (COC) forms is included in the data packages for all batches analyzed for the sampling event. The forms were properly filled out and include relinquished and received signatures. Shipments were received by the laboratory on the day following sampling.

The cooler temperatures ranged from 2.3 °C to 11.4° C. Samples for lab report 711375 associated with the cooler temperature of 11.4° C were qualified as estimated and given a J flag (or a UJ flag if non-detect).

The maximum holding times for the various analyses are included in Table 1. Samples were extracted and analyzed within the holding times with the following exceptions:

- Samples analyzed for Dissolved Organic Carbon – Final exceeded hold times for lab report 711079 and 711866. The samples were qualified as J.
- Samples analyzed for Dissolved Organic Carbon – Initial exceeded hold times for lab reports 711812 and 711866. The samples were qualified as J.
- Samples analyzed for Biodegradable Dis. Org. Carbon exceeded hold times for lab report 711866. The samples were qualified as J.
- Sample analysis for East B4 Lysimeter 25ft exceeded hold time for metformin and salicylic acid in lab report 711866. The sample results for these analytes were qualified as UJ for non-detections or J for detections.
- All samples analyzed for Metolachlor and Metazachlor exceeded hold times. The samples were qualified as R.
- Per the hold time study conducted by Eurofins in 2016, four compounds (amoxicillin, azithromycin, cimetidine, and nonyl-phenol) show analytical variability on individual days and between days. Therefore, the results for these compounds are considered semi quantitative (i.e., concentration results are estimates). "J" data quality flags are assigned for all of the results for these compounds (non-detects are assigned a "UJ" flag).

DETECTION LIMIT

Detection limits are specified by the analytical methods. For samples that were diluted by the laboratory, the MRL was raised by the factor of the dilution (e.g., for an MRL of 0.1 mg/L and dilution factor of 2, the diluted MRL is calculated to be 0.2 mg/L). No qualifications were made to the data due to dilutions. Analytes with results below the MRL or the diluted MRL are defined as "ND" (Not Detected).

MINIMUM REPORTING LEVEL CHECK

A reporting level standard is included with every batch/analytical run to confirm the instrument response with the given batch. In instances where the method reporting level check was higher than QC limits, but the sample was non-detect, no qualifications were made. No qualifications were made for data exceeding MRL recoveries QC limits.

SURROGATE SPIKE RECOVERIES

Surrogates are organic compounds that are similar in chemical composition, extraction, and chromatography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analysis. Surrogate recoveries were within control limits. No qualifications to the data were made.

LABORATORY MATRIX SPIKES AND SPIKE DUPLICATES

To assess potential matrix effects, an environmental sample and a duplicate are spiked with known concentrations of target analytes. The percent recovery of the target analytes is compared to statistical control limits.

Analytes that failed both MS and MSD are qualified as estimated. Analytes with MS/MSD recoveries below 10 percent were rejected. Analytes that failed on only the MS or the MSD are considered acceptable and the data are not qualified for these analytes. Sample concentrations that exceed the spike added concentrations by more than a factor of four are not flagged.

MS and MSD recoveries were all within the QC limits with the following exceptions noted in Table 2. In addition, in instances where the spike recovery is high, but the result is ND, there is no impact on the data since ND with high recovery is still ND. Samples spiked for MS/MSD from non-LOTT projects were not evaluated.

Table 2. Laboratory Matrix Spikes and Spike Duplicates Exceeding QC Limits

Lab Report	Sample ID	Analyte	Sample Result	MS % Yield	MSD % Yield	RPD	QC Limits (%)	Qualifier
710736	MW-27	Carbadox	5.2 ng/L	83	36	74	60-140, 40%	J
		Sulfachloropyridazine	ND	53	58	8.1	60-140, 40%	UJ
		Sulfadimethoxine	19 ng/L	175	185	7	60-140, 40%	J+
		TCEP	ND	249	55	130	60-140, 40%	UJ
		TCPP	ND	26	33	25	40-160, 60%	UJ

LABORATORY CONTROL SAMPLES

Laboratory Control Samples (LCS) are samples of known concentration that are carried through the extraction and analysis process. The percent recovery is the percentage of the theoretical concentration, and has statistical control limits indicating that the analytical process is "in control."

An LCS sample was run in duplicate with the work order samples. LCS recoveries were all within the QC limits with the exceptions noted in Table 3. In addition, in instances where the LCS recovery is high, but the sample result is ND, there is no impact on the data since ND with high recovery is still ND. The RPD for the LCS samples were within acceptable laboratory tolerances, with the exceptions listed in Table 3.

Table 3. Laboratory Control Spikes Exceeding QC Limits

Lab Report	Sample ID	Analyte	Sample Result	LCS Yield (%)	LCSD Yield (%)	RPD (%)	QC Limits (%)	Qualifier
710736	MW-27	Carbadox	5.2 ng/L	89	124	33	60-140, 30%	J
710953	MW-5	TCEP	170 ng/L	136	99	32	60-140, 30%	J

712005	East B4 Lysimeter, 50 ft	TDCPP	ND	27	27	0	40-160, 30%	R

Per the hold time study conducted by Eurofins in 2016, two compounds (nifedipine and theophyline) show concentrations consistently under or over the LCS limits, but show no evidence of inconsistent variability or degradation. This appears to be the result of a sample matrix effect or calibration artifact for this sample. "J" data quality flags are assigned for all of the results for these compounds (non-detects are assigned a "UJ" flag).

LABORATORY METHOD BLANK

An aliquot of reagent water was carried through the entire analytical process. The method blank results indicate any possible contamination exposure during the sample handling, digestion, or extraction process and analysis. In most instances, compounds were not detected at or above the method reporting limits. If the target analyte was detected in the method blank, but the sample was ND, no qualification was made. If the sample result was less than 10 times the result of the method blank, the sample was qualified as an estimate biased high. The qualifications made based on this criterion are shown in Table 4.

Table 4. Method Blanks Results

Lab Report	Sample ID	Analyte	Sample Result	Blank Result	Qualifier
710736	MW-20	Dissolved Organic Carbon - Final	0.84 mg/L	0.464	J+
		Dissolved Organic Carbon - Initial	0.67 mg/L	0.681	J+
	MW-27	Dissolved Organic Carbon - Final	0.85 mg/L	0.464	J+
		Dissolved Organic Carbon - Initial	1.1 mg/L	0.681	J+
710917	MW-8	Dissolved Organic Carbon - Final	1.31 mg/L	0.464	J+
		Dissolved Organic Carbon - Initial	1.71 mg/L	0.681	J+
	MW-11	Dissolved Organic Carbon - Final	1.04 mg/L	0.464	J+
		Dissolved Organic Carbon - Initial	1.1 mg/L	0.681	J+
710953	MW-5	Dissolved Organic Carbon - Final	2.6 mg/L	0.464	J+
		Dissolved Organic Carbon - Initial	3 mg/L	0.681	J+
	MW-9	Dissolved Organic Carbon - Final	1.4 mg/L	0.464	J+
		Dissolved Organic Carbon - Initial	1.7 mg/L	0.681	J+
711079	MW-26	Dissolved Organic Carbon - Final	1 mg/L	0.464	J+
		Dissolved Organic Carbon - Initial	1.3 mg/L	0.681	J+
	MW-25	Dissolved Organic Carbon - Final	1.3 mg/L	0.464	J+
		Dissolved Organic Carbon - Initial	0.6 mg/L	0.681	J+
711084	MW-14	Dissolved Organic Carbon - Final	0.8 mg/L	0.464	J+
		Dissolved Organic Carbon - Initial	0.79 mg/L	0.681	J+
	MW-15	Dissolved Organic Carbon - Final	3.3 mg/L	0.495	J+
		Dissolved Organic Carbon - Initial	2 mg/L	0.672	J+
711375	Reclaimed Water 1	Dissolved Organic Carbon - Initial	4.8 mg/L	0.600	J+
	Reclaimed Water 1-Duplicate	Dissolved Organic Carbon - Initial	4.9 mg/L	0.600	J+
711388	East B4 Lysimeter, 10 ft	Dissolved Organic Carbon - Final	3.2 mg/L	0.396	J+
		Dissolved Organic Carbon - Initial	3.6 mg/L	0.396	J+
711402	MW-16	Dissolved Organic Carbon - Final	2.4 mg/L	0.396	J+

		Dissolved Organic Carbon - Initial	1.4 mg/L	0.600	J+
	Reclaimed Water 2	Dissolved Organic Carbon - Initial	5 mg/L	0.600	J+
711812	West B4 Lysimeter, 10 ft	Dissolved Organic Carbon - Initial	3.8 mg/L	0.600	J+
711866	MW-3A	Biodegradable Dis. Org. Carbon	0.62 mg/L	0.326	J+
		Dissolved Organic Carbon - Final	1.6 mg/L	0.496	J+
		Dissolved Organic Carbon - Initial	2.2 mg/L	0.822	J+
	East B4 Lysimeter, 25ft	Biodegradable Dis. Org. Carbon	0.4 mg/L	0.326	J+
		Dissolved Organic Carbon - Final	1.6 mg/L	0.496	J+
		Dissolved Organic Carbon - Initial	2 mg/L	0.822	J+
	East B4 Lysimeter, 50ft	Dissolved Organic Carbon - Final	2.1 mg/L	0.496	J+
		Dissolved Organic Carbon - Initial	1.9 mg/L	0.822	J+
712396	West B4 Lysimeter, 25 ft	Dissolved Organic Carbon - Final	3.2 mg/L	0.488	J+
		Dissolved Organic Carbon - Initial	3.6 mg/L	0.734	J+
	West B4 Lysimeter, 50 ft	Dissolved Organic Carbon - Final	3.5 mg/L	0.488	J+
		Dissolved Organic Carbon - Initial	2.6 mg/L	0.734	J+

DUPLICATE FIELD SAMPLE

A duplicate sample was secured for Reclaimed Water 1 (Reclaimed Water 1-Duplicate). A control limit of 20% for the RPD was used for original and duplicate sample values greater than or equal to 5 times the MRL. A control limit of the MRL was used if either the sample or duplicate value was less than 5 times the MRL. Results exceeding RPD or MRL control were qualified as estimated as shown in Table 5.

Table 5. Relative Percent Difference (RPD) Exceeding 20% for Duplicate Sample from Reclaimed Water 1

Analyte	Reclaimed Water 1	Reclaimed Water 1-Duplicate	RPD (%)	MRL	Qualifier (original/duplicate)
Acesulfame-K	ND	810	NA	20	UJ/J
Acetaminophen	15	5.4	NA	5	J/J
Atenolol	52	41	23	NA	J/J
D/DBP Haloacetic Acids (HAA5)	20	37	59.6	NA	J/J
Dichloroacetic acid	11	19	53	NA	J/J
OUST (Sulfameturon,methyl)	ND	11	NA	5	UJ/J
Primidone	81	58	33.1	NA	J/J
Quinoline	7.2	ND	NA	5	J/UJ
Sucralose	50,000	28,000	56.4	NA	J/J
Sulfadimethoxine	17	ND	NA	5	J/UJ
TCEP	94	14	NA	10	J/J
Trichloroacetic acid	9.4	18	62.3	NA	J/J

RPD = [(Parent Sample) – (Duplicate)]/[mean(Parent Sample, Duplicate)] x 100

DATA VALIDATION REPORT

LOTT Tracer Test and Water Quality Monitoring
February Monthly Water Quality Sampling Event

Laboratory: Eurofins Eaton Analytical

Laboratory Report Numbers: 717824, 718247, and 718702

Dates of Sampling: 2/12/2018, 2/13/2018, and 2/14/2018

INTRODUCTION

This report presents data validation for the February, 2018 monthly water quality monitoring event collected for the Reclaimed Water Infiltration Study. These samples were collected in accordance with the procedures and protocols specified in the *Tracer Testing and Water Quality Monitoring of Treatment Effectiveness (Task 2.1.3) Work Plan*. The laboratory data report and Quality Assurance and Quality Control (QA/QC) data are included in this data validation report. Verification and validation steps addressed in this report are:

- Sampling Procedures
- Holding Times
- Quantitation Limits
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries and Relative Percent Differences
- Laboratory Control Sample Recoveries
- Method Blank
- Laboratory and Field Replicate and Duplicate Relative Percent Differences.

SAMPLING PROCEDURES, CHAIN OF CUSTODY, AND HOLDING TIMES

Grab samples were collected from groundwater monitoring wells, vadose zone lysimeters, and the reclaimed water discharge pipe at LOTT Hawks Prairie recharge Basin #4. Sampling locations and procedures are described below.

- Groundwater monitoring wells (MW-3A, MW-5, MW-8, MW-9, MW-11, MW-14, MW-15, MW-16, MW-20, MW-25, MW-26, and MW-27):
    - Each monitoring well is equipped with a dedicated bladder pump with an intake set within the well screen interval. The bladder pumps are PFC-free pumps by Geotech Environmental, Inc., incorporating polyethylene bladders and stainless steel construction. Each well was purged at a rate of approximately 500 milliliters/minute while recording stabilization parameters with a YSI Professional Plus water quality meter and flow-through cell. Once stabilization was achieved, the flow-through cell was disconnected from the sample tubing and the sample containers were filled

directly. Field filtering of analytes that require field filtering was accomplished using a new inline 0.45-micron disposable filter by Geotech.

- Vadose zone lysimeters (West B4 Lysimeter 10ft, 25 ft, and 50 ft, and East B4 Lysimeter 10 ft, 25 ft, and 50 ft):
    - Each stainless steel lysimeter was purged empty before drawing fresh vadose zone water into the lysimeter for sampling. Purging was completed by applying pressure using a pump until the lysimeter was completely evacuated. Vacuum was then applied to the lysimeter over a period of several hours in order to draw in fresh water. Sample containers were filled directly from the sample tubing by again applying pressure to the lysimeter using a pump. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary. Lysimeters were completely emptied after the sample containers were filled so that no stagnant water remains within the lysimeter.
- Reclaimed water samples at Basin #4 (Reclaimed Water 1, Reclaimed Water 1-Duplicate, and Reclaimed Water 2):
    - Reclaimed water samples were collected at outlets in the black plastic discharge piping at Basin #4. Outlets exhibiting the highest flow were selected for sample collection. Sample containers were filled directly by holding the container under the flow. Sample collection was achieved without the sample water contacting the outside of the black plastic discharge piping. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary.

Sample containers were labeled, sealed, placed in a cooler packed with ice, and shipped under chain of custody to Eurofins Eaton Analytical in Monrovia, California. Sample analytes are shown in Table 1.

Table 1. Monthly Water Quality Monitoring Analytical Parameters

Parameter	Method	Hold Time Analysis	QC Conducted by Laboratory
TKN, ammonia	EPA 350.1, 351.2	28 days	LCS, Method Blank, MRL Check, MS/MSD
Nitrate, nitrite	EPA 300.0	28 days	LCS, Method Blank, MRL Check, MS/MSD
Ortho-phosphate as P	SM4500P-E/ 365.1	48 hours	LCS, Method Blank, MRL Check, MS/MSD

Parameter	Method	Hold Time Analysis	QC Conducted by Laboratory
Total organic carbon	SM 5310C/ E415.3	28 days	LCS, Method Blank, MRL Check, MS/MSD
Biodegradable organic carbon	Allgeier, 1996	48 hours	LCS, Method Blank, MRL Check, MS/MSD
Chloride	EPA 300.0	28 days	LCS, Method Blank, MRL Check, MS/MSD

A copy of the completed chain-of-custody (COC) form is included in the data packages for all batches analyzed for the sampling event. The forms were properly filled out and include relinquished and received signatures. Shipments were received by the laboratory on the day following sampling. The cooler temperatures ranged from 1.5° C to 4.5° C. Compliance is 4° C plus or minus 2° C, therefore samples for the lab report 717824 associated with the cooler temperature of 4.5° C were not qualified.

The maximum holding times for the various analyses are included in Table 1. All samples were extracted and analyzed within the holding times.

DETECTION LIMIT

Detection limits are specified by the analytical methods. For samples that were diluted by the laboratory, the MRL was raised by the factor of the dilution (e.g., for an MRL of 0.1 mg/L and dilution factor of 2, the diluted MRL is calculated to be 0.2 mg/L). No qualifications were made to the data due to dilutions. Analytes with results below the MRL or the diluted MRL are defined as “ND” (Not Detected).

MINIMUM REPORTING LEVEL CHECK

A reporting level standard is included with every batch/analytical run to confirm the instrument response with the given batch. In instances where the method reporting level check was higher than QC limits, but the sample was non-detect, no qualifications were made. No qualifications were made for data exceeding MRL recoveries QC limits.

LABORATORY MATRIX SPIKES AND SPIKE DUPLICATES

To assess potential matrix effects, an environmental sample and a duplicate are spiked with known concentrations of target analytes. The percent recovery of the target analytes is compared to statistical control limits.

Analytes that failed both MS and MSD are qualified as estimated. Analytes with MS/MSD recoveries below 10 percent were rejected. Analytes that failed on only the MS or the MSD are considered acceptable and the data are not qualified for these analytes. Sample concentrations that exceed the spike added concentrations by more than a factor of four are not flagged.

MS and MSD recoveries were all within the QC limits with the following exception noted in Table 2. In addition, in instances where the spike recovery is high, but the result is ND, there is no impact on the data since ND with high recovery is still ND. Samples spiked for MS/MSD from non-LOTT projects were not evaluated.

Table 2. Laboratory Matrix Spikes and Spike Duplicates Exceeding QC Limits

Lab Report	Sample ID	Analyte	Sample Result	MS % Yield	MSD % Yield	RPD	QC Limits (%)	Qualifier
717824	MW-3A	Total Organic Carbon	4.75	78	123	0.35	80-120, 20%	J

LABORATORY CONTROL SAMPLES

Laboratory Control Samples (LCS) are samples of known concentration that are carried through the extraction and analysis process. The percent recovery is the percentage of the theoretical concentration, and has statistical control limits indicating that the analytical process is "in control." An LCS sample was run in duplicate with the work order samples. LCS recoveries were all within the QC limits.

LABORATORY METHOD BLANK

An aliquot of reagent water was carried through the entire analytical process. The method blank results indicate any possible contamination exposure during the sample handling, digestion, or extraction process and analysis. In most instances, compounds were not detected at or above the method reporting limits. If the target analyte was detected in the method blank, but the sample was ND, no qualification was made. If the sample result was less than 10 times the result of the method blank, the sample was qualified as an estimate biased high. The qualifications made based on this criterion are shown in Table 3.

Table 3. Method Blank Results

Lab Report	Sample ID	Analyte	Sample Result	Blank Result	Qualifier
718702	Reclaimed Water 2	Dissolved Organic Carbon - Final	5.1 mg/L	0.411	J+
		Dissolved Organic Carbon - Initial	5.6 mg/L	0.657	J+
718247	Reclaimed Water 1	Dissolved Organic Carbon - Final	4.7 mg/L	0.411	J+
		Dissolved Organic Carbon - Initial	5.2 mg/L	0.657	J+
	Reclaimed Water 1-Duplicate	Dissolved Organic Carbon - Final	5.3 mg/L	0.411	J+
		Dissolved Organic Carbon - Initial	5.8 mg/L	0.657	J+

DUPLICATE FIELD SAMPLE

In order to assess field precision, a duplicate sample was collected for Reclaimed Water 1 (Reclaimed Water 1-Duplicate). Original and duplicate sample values with a RPD exceeding 20% were qualified as estimated. However, if either result was less than 5 times the analyte's MRL, the difference between the original and duplicate sample values was instead used to qualify the data.

A difference exceeding the respective MRL flags the sample as estimated. All duplicate samples were within relative control limits.

DATA VALIDATION REPORT

LOTT Tracer Test and Water Quality Monitoring
March Monthly Water Quality Sampling Event

Laboratory: Eurofins Eaton Analytical

Laboratory Report Numbers: 723946, 724410, 724781 and 725038

Dates of Sampling: 3/12/2018, 3/13/2018, 3/14/2018, and 3/15/2018

INTRODUCTION

This report presents data validation for the March, 2018- monthly tracer test and water quality monitoring event collected for the Reclaimed Water Infiltration Study. These samples were collected in accordance with the procedures and protocols specified in the *Tracer Testing and Water Quality Monitoring of Treatment Effectiveness (Task 2.1.3) Work Plan*. The laboratory data report and Quality Assurance and Quality Control (QA/QC) data are included in this data validation report. Verification and validation steps addressed in this report are:

- Sampling Procedures
- Holding Times
- Quantitation Limits
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries and Relative Percent Differences
- Laboratory Control Sample Recoveries
- Method Blank
- Laboratory and Field Replicate and Duplicate Relative Percent Differences.

SAMPLING PROCEDURES, CHAIN OF CUSTODY, AND HOLDING TIMES

Grab samples were collected from groundwater monitoring wells, vadose zone lysimeters, and the reclaimed water discharge pipe at LOTT Hawks Prairie recharge Basin #4. Sampling locations and procedures are described below.

- Groundwater monitoring wells (MW-3A, MW-5, MW-8, MW-9, MW-11, MW-14, MW-15, MW-16, MW-20, MW-25, MW-26, and MW-27):
    - Each monitoring well is equipped with a dedicated bladder pump with an intake set within the well screen interval. The bladder pumps are PFC-free pumps by Geotech Environmental, Inc., incorporating polyethylene bladders and stainless steel construction. Each well was purged at a rate of approximately 500 milliliters/minute while recording stabilization parameters with a YSI Professional Plus water quality meter and flow-through cell. Once stabilization was achieved, the flow-through cell was disconnected from the sample tubing and the sample containers were filled

directly. Field filtering of analytes that require field filtering was accomplished using a new inline 0.45-micron disposable filter by Geotech.

- Vadose zone lysimeters (West B4 Lysimeter 10 ft, 25 ft, and 50 ft, and East B4 Lysimeter 10 ft, 25 ft, and 50 ft):
    - Each stainless steel lysimeter was purged empty before drawing fresh vadose zone water into the lysimeter for sampling. Purging was completed by applying pressure using a pump until the lysimeter was completely evacuated. Vacuum was then applied to the lysimeter over a period of several hours in order to draw in fresh water. Sample containers were filled directly from the sample tubing by again applying pressure to the lysimeter using a pump. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary. Lysimeters were completely emptied after the sample containers were filled so that no stagnant water remains within the lysimeter.
- Reclaimed water samples at Basin #4 (Reclaimed Water 1, Reclaimed Water 1-Duplicate, and Reclaimed Water 2):
    - Reclaimed water samples were collected at outlets in the black plastic discharge piping at Basin #4. Outlets exhibiting the highest flow were selected for sample collection. Sample containers were filled directly by holding the container under the flow. Sample collection was achieved without the sample water contacting the outside of the black plastic discharge piping. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary.

Sample containers were labeled, sealed, placed in a cooler packed with ice, and shipped under chain of custody to Eurofins Eaton Analytical in Monrovia, California. Sample analytes are shown in Table 1.

Table 1. Monthly Water Quality Monitoring Analytical Parameters

Parameter	Method	Hold Time Analysis	QC Conducted by Laboratory
TKN, ammonia	EPA 350.1, 351.2	28 days	LCS, Method Blank, MRL Check, MS/MSD
Nitrate, nitrite	EPA 300.0	28 days	LCS, Method Blank, MRL Check, MS/MSD
Ortho-phosphate as P	SM4500P-E/ 365.1	48 hours	LCS, Method Blank, MRL Check, MS/MSD

Parameter	Method	Hold Time Analysis	QC Conducted by Laboratory
Total organic carbon	SM 5310C/ E415.3	28 days	LCS, Method Blank, MRL Check, MS/MSD
Biodegradable organic carbon	Allgeier, 1996	48 hours	LCS, Method Blank, MRL Check, MS/MSD
Chloride	EPA 300.0	28 days	LCS, Method Blank, MRL Check, MS/MSD

A copy of the completed chain-of-custody (COC) form is included in the data packages for all batches analyzed for the sampling event. The forms were properly filled out and include relinquished and received signatures. Shipments were received by the laboratory on the day following sampling. The cooler temperatures ranged from 0.7^{o} C to 3.2^{o} C. Compliance is 4^{o} C plus or minus 2^{o} C, therefore no qualifications were made on the basis of cooler temperature.

The maximum holding times for the various analyses are included in Table 1. All samples were extracted and analyzed within the holding times.

DETECTION LIMIT

Detection limits are specified by the analytical methods. For samples that were diluted by the laboratory, the MRL was raised by the factor of the dilution (e.g., for an MRL of 0.1 mg/L and dilution factor of 2, the diluted MRL is calculated to be 0.2 mg/L). No qualifications were made to the data due to dilutions. Analytes with results below the MRL or the diluted MRL are defined as “ND” (Not Detected).

MINIMUM REPORTING LEVEL CHECK

A reporting level standard is included with every batch/analytical run to confirm the instrument response with the given batch. In instances where the method reporting level check was higher than QC limits, but the sample was non-detect, no qualifications were made. No qualifications were made for data exceeding MRL recoveries QC limits.

LABORATORY MATRIX SPIKES AND SPIKE DUPLICATES

To assess potential matrix effects, an environmental sample and a duplicate are spiked with known concentrations of target analytes. The percent recovery of the target analytes is compared to statistical control limits.

Analytes that failed both MS and MSD are qualified as estimated. Analytes with MS/MSD recoveries below 10 percent were rejected. Analytes that failed on only the MS or the MSD are considered acceptable and the data are not qualified for these analytes. Sample concentrations that exceed the spike added concentrations by more than a factor of four are not flagged.

MS and MSD recoveries were all within the QC limits. In instances where the spike recovery is high, but the result is ND, there is no impact on the data since ND with high recovery is still ND. Samples spiked for MS/MSD from non-LOTT projects were not evaluated.

LABORATORY CONTROL SAMPLES

Laboratory Control Samples (LCS) are samples of known concentration that are carried through the extraction and analysis process. The percent recovery is the percentage of the theoretical concentration, and has statistical control limits indicating that the analytical process is "in control." An LCS sample was run in duplicate with the work order samples. LCS recoveries were all within the QC limits.

LABORATORY METHOD BLANK

An aliquot of reagent water was carried through the entire analytical process. The method blank results indicate any possible contamination exposure during the sample handling, digestion, or extraction process and analysis. . In most instances, compounds were not detected at or above the method reporting limits. If the target analyte was detected in the method blank, but the sample was ND, no qualification was made. If the sample result was less than 10 times the result of the method blank, the sample was qualified as an estimate biased high. The qualifications made based on this criterion are shown in Table 2.

Table 2. Method Blank Results

Lab Report	Sample ID	Analyte	Sample Result	Blank Result	Qualifier
724410	Reclaimed Water 1	Dissolved Organic Carbon - Final	4.6 mg/L	0.548	J+
		Dissolved Organic Carbon - Initial	4.8 mg/L	0.706	J+
	Reclaimed Water 1-Duplicate	Dissolved Organic Carbon - Final	4.8 mg/L	0.548	J+
		Dissolved Organic Carbon - Initial	5 mg/L	0.706	J+
725038	Reclaimed Water 2	Dissolved Organic Carbon - Final	4.4 mg/L	0.472	J+
		Dissolved Organic Carbon - Initial	5.2 mg/L	0.689	J+

DUPLICATE FIELD SAMPLE

In order to assess field precision, a duplicate sample was collected for Reclaimed Water 1 (Reclaimed Water 1-Duplicate). Original and duplicate sample values with a RPD exceeding 20% are flagged as estimated. However, if either the original or duplicate sample result is less than 5 times the analyte's MRL, their difference is used to qualify the results. If the difference is greater than the relative MRL the sample is flagged. All duplicate samples were within relative control limits.

DATA VALIDATION REPORT

LOTT Wastewater and Reclaimed Water
April Water Quality Characterization Sampling Events

Laboratory: Eurofins Eaton Analytical

Laboratory Report Numbers: 730308, 730807, 731322, 731520, 731662, and 731744

Dates of Sampling: 4/9/2018, 4/10/2018, 4/11/2018, 4/12/2018, and 4/13/2018

INTRODUCTION

This report presents data validation for the wastewater and reclaimed water quality characterization sampling events collected for the Reclaimed Water Infiltration Study. These samples were collected in accordance with the procedures and protocols specified in the *Tracer Testing and Water Quality Monitoring of Treatment Effectiveness (Task 2.1.3) Work Plan*. The laboratory data report and Quality Assurance and Quality Control (QA/QC) data are included in this data validation report. Verification and validation steps addressed in this report are:

- Sampling Procedures
- Holding Times
- Quantitation Limits
- Surrogate Recoveries
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries and Relative Percent Differences
- Laboratory Control Sample Recoveries
- Method Blank
- Laboratory and Field Replicate and Duplicate Relative Percent Differences.

SAMPLING PROCEDURES, CHAIN OF CUSTODY, AND HOLDING TIMES

Grab samples were collected from groundwater monitoring wells, vadose zone lysimeters, and the reclaimed water discharge pipe at LOTT Hawks Prairie recharge Basin #4. Sampling locations and sampling procedures are described below.

- Groundwater monitoring wells (MW-3A, MW-5, MW-8, MW-9, MW-14, MW-16, MW-20, MW-23, MW-25, MW-26, MW-27, and MW-28):
    - Each monitoring well is equipped with a dedicated bladder pump with an intake set within the well screen interval. The bladder pumps are PFC-free pumps by Geotech, incorporating polyethylene bladders and stainless steel construction. Each well was purged at a rate of approximately 500 milliliters/minute while recording stabilization parameters with a YSI Professional Plus water quality meter and flow-through cell. Once stabilization was achieved, the flow-through cell was disconnected from the

    sample tubing and the sample containers were filled directly. Field filtering of analytes that require field filtering was accomplished using a new inline 0.45-micron disposable filter by Geotech.

- Vadose zone lysimeters (West B4 Lysimeter 10ft, 25ft, and 50ft, and East B4 Lysimeter 10ft, 25ft, and 50ft):
    - Each stainless steel lysimeter was purged empty before drawing fresh vadose zone water into the lysimeter for sampling. Purging was completed by applying pressure using a pump until the lysimeter was completely evacuated. Vacuum was then applied to the lysimeter over a period of several hours in order to draw in fresh water. Sample containers were filled directly from the sample tubing by again applying pressure to the lysimeter using a pump. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary. Lysimeters were completely emptied after the sample containers were filled so that no stagnant water remains within the lysimeter.
- Reclaimed water samples at Basin #4 (Reclaimed Water 1, Reclaimed Water 1-Duplicate, and Reclaimed Water 2):
    - Reclaimed water samples were collected at outlets in the black plastic discharge piping at Basin #4. Outlets exhibiting the highest flow were selected for sample collection. Sample containers were filled directly by holding the container under the flow. Sample collection was achieved without the sample water contacting the outside of the black plastic discharge piping. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary.

Sample containers were labeled, sealed, placed in a cooler packed with ice, and shipped under chain of custody to Eurofins Eaton Analytical in Monrovia, California. Sample analytes are shown in Table 1.

Table 1. Quarterly Water Quality Monitoring Analytical Parameters

Parameter	Method	Hold Time Extraction	Hold Time Analysis	QC Conducted by Laboratory
Residual Chemicals, including metformin and thiabendazole	EEA's PPCP LC/MS/MS Method	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Trihalomethanes/VOCs	EPA 524.2	----	14 Days	LCS, Method Blank, MRL Check, MS/MSD
HAA5	SM 6251B	14 days	14 days	LCS, Method Blank, MRL Check, MS/MSD

Parameter	Method	Hold Time Extraction	Hold Time Analysis	QC Conducted by Laboratory
PFOS/PFOA + Other PFCs	EEA's MWH PFC Method	14 days	14 days	LCS, Method Blank, MRL Check, MS/MSD
NDMA	EPA 521	14 days	28 days	LCS, Method Blank, MRL Check, MS/MSD
1,4-Dioxane	EPA 522	28 days	28 days	LCS, Method Blank, MRL Check, MS/MSD
TKN, ammonia	EPA 300. 351.1, 351.2	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Nitrate, nitrite,	EPA 300.0, 353.2	----	48 hours	LCS, Method Blank, MRL Check, MS/MSD
Total phosphorous,	SM4500P-E	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Ortho-phosphorous	SM4500P-E		48 hours	LCS, Method Blank, MRL Check, MS/MSD
Total organic carbon	SM 5310C	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Biodegradable organic carbon	Allgeier, 1996	48 hours	----	LCS, Method Blank, MRL Check, MS/MSD
Metals (Ag, As, Ca, Cd, Cr, Cu, Fe, Hg, K, Pb, Mg, Mn, Na, Pb, Ni, Se, Si, Zn)	EPA 200 series	----	180 days	LCS, Method Blank, MRL Check, MS/MSD
Sulfate, chloride	EPA 300	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Total dissolved solids	EPA SM2540C	----	7 days	LCS, Method Blank, MRL Check, MS/MSD
Total Alkalinity	SM2320B	----	14 Days	LCS, Method Blank, MRL Check, MS/MSD

A copy of the completed chain-of-custody (COC) forms is included in the data packages for all batches analyzed for the sampling event. The forms were properly filled out and include relinquished and received signatures. Shipments were received by the laboratory on the day following sampling.

The cooler temperatures ranged from 1.8° C to 4.2° C. Compliance is 4° C plus or minus 2° C; therefore, no samples were qualified on the basis of cooler temperature.

The maximum holding times for the various analyses are included in Table 1. Samples were extracted and analyzed within the holding times with the following exceptions:

- Samples analyzed for Dissolved Organic Carbon – Final exceeded hold times for lab report 731662. The samples were qualified as J.
- Samples analyzed for Dissolved Organic Carbon – Initial exceeded hold times for lab report 731662. The samples were qualified as J.
- Samples analyzed for Biodegradable Dis. Org. Carbon exceeded hold times for lab report 731662. The sample results were qualified as UJ for non-detections or J for detections.
- Samples analyzed for Dissolved Orthophosphate as P exceeded hold times for lab reports 731662 and 731744. The sample results were qualified as UJ for non-detections or J for detections.
- Per the hold time study conducted by Eurofins in 2016, four compounds (amoxicillin, azithromycin, cimetidine, and nonyl-phenol) show analytical variability on individual days and between days. Therefore, the results for these compounds are considered semi quantitative (i.e., concentration results are estimates). “J” data quality flags are assigned for all of the results for these compounds (non-detects are assigned a “UJ” flag).

DETECTION LIMIT

Detection limits are specified by the analytical methods. For samples that were diluted by the laboratory, the MRL was raised by the factor of the dilution (e.g., for an MRL of 0.1 mg/L and dilution factor of 2, the diluted MRL is calculated to be 0.2 mg/L). No qualifications were made to the data due to dilutions. Analytes with results below the MRL or the diluted MRL are defined as “ND” (Not Detected).

MINIMUM REPORTING LEVEL CHECK

A reporting level standard is included with every batch/analytical run to confirm the instrument response with the given batch. In instances where the method reporting level check was higher than QC limits, but the sample was non-detect, no qualifications were made. All reporting levels were within QC limits, with the exceptions listed in Table 2.

Table 2. Minimum Reporting Level Checks Exceeding QC Limits

Lab Report	Sample ID	Analyte	Sample Result	Recovery (%)	QC Limits (%)	Qualifier
730807	MW-9	Primidone	ND	5.7	50-150	UJ
	MW-26	Primidone	ND	5.7	50-150	UJ

SURROGATE SPIKE RECOVERIES

Surrogates are organic compounds that are similar in chemical composition, extraction, and chromatography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analysis. Surrogate recoveries were within control limits, with exceptions listed in Table 3.

Table 3. Surrogate Spike Recoveries Exceeding QC Limits

Lab Report	Sample ID	Analyte	Sample Result	Recovery (%)	QC Limits (%)	Qualifier
730308	MW-16	Perfluoro butanoic acid	ND	53	70-130	UJ
		Perfluoro-n-decanoic acid	ND	63	70-130	UJ
	MW-25	Perfluoro butanoic acid	ND	52	70-130	UJ
		Perfluoro-n-decanoic acid	ND	62	70-130	UJ
	MW-3A	Perfluoro butanoic acid	ND	49	70-130	UJ
		Perfluoro-n-decanoic acid	ND	68	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	66	70-130	UJ
		Perfluoro octanoic acid	17	66	70-130	J
	Reclaimed Water 1	Perfluoro butanoic acid	ND	50	70-130	UJ
		Perfluoro-n-decanoic acid	ND	51	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	61	70-130	UJ
		Perfluoro octanoic acid	20	50	70-130	J
	Reclaimed Water 1-Duplicate	Perfluoro butanoic acid	ND	46	70-130	UJ
		Perfluoro-n-decanoic acid	ND	65	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	57	70-130	UJ
		Perfluoro octanoic acid	18	51	70-130	J
730807	MW-20	Perfluoro-n-decanoic acid	ND	69	70-130	UJ
731322	MW-14	Perfluoro-n-decanoic acid	ND	53	70-130	UJ
	MW-23	Perfluoro-n-decanoic acid	ND	58	70-130	UJ
	MW-27	Perfluoro butanoic acid	ND	63	70-130	UJ
		Perfluoro-n-decanoic acid	ND	50	70-130	UJ
		Perfluoro-1-hexanesulfonic acid	ND	66	70-130	UJ
	Reclaimed Water 2	Perfluoro-n-decanoic acid	ND	53	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	61	70-130	UJ
		Perfluoro octanesulfonic acid	ND	67	70-130	UJ
731520	MW-5	Perfluoro butanoic acid	ND	64	70-130	UJ
		Perfluoro-n-decanoic acid	ND	62	70-130	UJ
	MW-8	Perfluoro butanoic acid	ND	61	70-130	UJ
		Perfluoro octanesulfonic acid	ND	65	70-130	UJ
		Perfluoro-n-decanoic acid	ND	56	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	67	70-130	UJ
731744	West B4 Lysimeter, 10 ft	Perfluoro butanoic acid	ND	60	70-130	UJ
		Perfluoro-n-decanoic acid	ND	53	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	63	70-130	UJ
		Perfluoro octanesulfonic acid	ND	59	70-130	UJ
		Perfluoro octanoic acid	18	65	70-130	J

Lab Report	Sample ID	Analyte	Sample Result	Recovery (%)	QC Limits (%)	Qualifier
		Perfluoro-1-hexanesulfonic acid	ND	65	70-130	UJ
	West B4 Lysimeter, 25 ft	Perfluoro butanoic acid	ND	68	70-130	UJ
		Perfluoro-n-decanoic acid	ND	60	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	65	70-130	UJ
	East B4 Lysimeter, 10 ft	Perfluoro butanoic acid	10	69	70-130	J
		Perfluoro-n-decanoic acid	ND	61	70-130	UJ
	East B4 Lysimeter, 25 ft	Perfluoro butanoic acid	ND	68	70-130	UJ
		Perfluoro-n-decanoic acid	ND	54	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	68	70-130	UJ

LABORATORY MATRIX SPIKES AND SPIKE DUPLICATES

To assess potential matrix effects, an environmental sample and a duplicate are spiked with known concentrations of target analytes. The percent recovery of the target analytes is compared to statistical control limits.

Analytes that failed both MS and MSD are qualified as estimated. Analytes with MS/MSD recoveries below 10 percent were rejected. Analytes that failed on only the MS or the MSD are considered acceptable and the data are not qualified for these analytes. Sample concentrations that exceed the spike added concentrations by more than a factor of four are not flagged.

MS and MSD recoveries were all within the QC limits with the following exceptions noted in Table 4. In addition, in instances where the spike recovery is high, but the result is ND, there is no impact on the data since ND with high recovery is still ND. Samples spiked for MS/MSD from non-LOTT projects were not evaluated.

Table 4. Laboratory Matrix Spikes and Spike Duplicates Exceeding QC Limits

Lab Report	Sample ID	Analyte	Sample Result	MS % Yield	MSD % Yield	RPD	QC Limits (%)	Qualifier
731744	West B4 Lysimeter, 10 ft	2,4-D	13 ng/L	55	47	12	60-140	J
		Butalbital	16 ng/L	35	35	0.81	60-140	J

LABORATORY CONTROL SAMPLES

Laboratory Control Samples (LCS) are samples of known concentration that are carried through the extraction and analysis process. The percent recovery is the percentage of the theoretical concentration, and has statistical control limits indicating that the analytical process is “in control.”

An LCS sample was run in duplicate with the work order samples. In instances where the LCS recovery is high, but the sample result is ND, there is no impact on the data since ND with high recovery is still ND. The RPD for the LCS samples were within acceptable laboratory tolerances, with the exceptions listed in Table 5.

Table 5. Laboratory Control Spikes Exceeding QC Limits

Lab Report	Sample ID	Analyte	Sample Result	LCS Yield (%)	LCSD Yield (%)	RPD (%)	QC Limits (%)	Qualifier
730807	MW-9	4-nonylphenol	ND	12	38	100	60-140, 40%	R
		4-tert-Octylphenol	ND	39	624	180	60-140, 40%	UJ
	MW-20	4-nonylphenol	ND	12	38	100	60-140, 40%	R
		4-tert-Octylphenol	ND	39	624	180	60-140, 40%	UJ
	MW-26	4-nonylphenol	ND	12	38	100	60-140, 40%	R
		4-tert-Octylphenol	ND	39	624	180	60-140, 40%	UJ

Per the hold time study conducted by Eurofins in 2016, two compounds (nifedipine and theophyline) show concentrations consistently under or over the LCS limits, but show no evidence of inconsistent variability or degradation. This appears to be the result of a sample matrix effect or calibration artifact for this sample. "J" data quality flags are assigned for all of the results for these compounds (non-detects are assigned a "UJ" flag).

LABORATORY METHOD BLANK

An aliquot of reagent water was carried through the entire analytical process. The method blank results indicate any possible contamination exposure during the sample handling, digestion, or extraction process and analysis. In most instances, compounds were not detected at or above the method reporting limits. If the target analyte was detected in the method blank, but the sample was ND, no qualification was made. If the sample result was less than 10 times the result of the method blank, the sample was qualified as an estimate biased high. The qualifications made based on this criterion are shown in Table 6.

Table 6. Method Blanks Results

Lab Report	Sample ID	Analyte	Sample Result	Blank Result	Qualifier
730308	MW-3A	Dissolved Organic Carbon - Final	1.5 mg/L	0.498	J+
		Dissolved Organic Carbon - Initial	1.9 mg/L	0.725	J+
	MW-9	Dissolved Organic Carbon - Final	1.3 mg/L	0.498	J+
		Dissolved Organic Carbon - Initial	1.7 mg/L	0.725	J+
	MW-16	Dissolved Organic Carbon - Final	0.99 mg/L	0.498	J+
		Dissolved Organic Carbon - Initial	1.3 mg/L	0.725	J+
	MW-20	Dissolved Organic Carbon - Final	0.5 mg/L	0.498	J+
		Dissolved Organic Carbon - Initial	0.72 mg/L	0.725	J+
	MW-25	Dissolved Organic Carbon - Final	0.86 mg/L	0.498	J+
		Dissolved Organic Carbon - Initial	0.71 mg/L	0.725	J+
	MW-26	Dissolved Organic Carbon - Final	0.54	0.498	J+
		Dissolved Organic Carbon - Initial	0.79	0.725	J+
	Reclaimed Water 1	Dissolved Organic Carbon - Final	4 mg/L	0.498	J+
		Dissolved Organic Carbon - Initial	4.7 mg/L	0.725	J+
	Reclaimed Water 1-Duplicate	Dissolved Organic Carbon - Final	4.2 mg/L	0.498	J+
		Dissolved Organic Carbon - Initial	4.9 mg/L	0.725	J+

Lab Report	Sample ID	Analyte	Sample Result	Blank Result	Qualifier
731322	MW-14	Dissolved Organic Carbon - Final	0.48 mg/L	0.500	J+
		Dissolved Organic Carbon - Initial	0.84 mg/L	0.732	J+
	MW-23	Dissolved Organic Carbon - Final	0.32 mg/L	0.500	J+
		Dissolved Organic Carbon - Initial	0.69 mg/L	0.732	J+
	MW-27	Dissolved Organic Carbon - Final	0.84 mg/L	0.500	J+
		Dissolved Organic Carbon - Initial	1.1 mg/L	0.732	J+
	MW-28	Dissolved Organic Carbon - Final	0.36 mg/L	0.500	J+
		Dissolved Organic Carbon - Initial	0.78 mg/L	0.732	J+
	Reclaimed Water 2	Dissolved Organic Carbon - Final	5.1 mg/L	0.500	J+
		Dissolved Organic Carbon - Initial	5.6 mg/L	0.732	J+
731520	MW-5	Biodegradable Dis. Org. Carbon	1.1 mg/L	0.323	J+
		Dissolved Organic Carbon - Final	1.9 mg/L	0.482	J+
		Dissolved Organic Carbon - Initial	3 mg/L	0.805	J+
	MW-8	Biodegradable Dis. Org. Carbon	0.5 mg/l	0.323	J+
		Dissolved Organic Carbon - Final	1.1 mg/L	0.482	J+
		Dissolved Organic Carbon - Initial	1.6 mg/L	0.805	J+
7316	West B4 Lysimeter, 50 ft	Dissolved Organic Carbon - Final	2.6 mg/L	0.482	J
		Dissolved Organic Carbon - Initial	1.9 mg/L	0.805	J
731744	West B4 Lysimeter, 10 ft	Dissolved Organic Carbon - Initial	4.3 mg/L	0.805	J+
	West B4 Lysimeter, 25 ft	Biodegradable Dis. Org. Carbon	0.42 mg/L	0.323	J+
		Dissolved Organic Carbon - Final	3.4 mg/L	0.482	J+
		Dissolved Organic Carbon - Initial	3.8 mg/L	0.805	J+
	East B4 Lysimeter, 10 ft	Biodegradable Dis. Org. Carbon	0.6 mg/L	0.323	J+
		Dissolved Organic Carbon - Final	3.7 mg/L	0.482	J+
		Dissolved Organic Carbon - Initial	4.3 mg/L	0.805	J+
	East B4 Lysimeter, 25 ft	Biodegradable Dis. Org. Carbon	0.5 mg/L	0.323	J+
		Dissolved Organic Carbon - Final	2.1 mg/L	0.482	J+
		Dissolved Organic Carbon - Initial	2.6 mg/L	0.805	J+

J is assigned to samples from lab report 731744 due to an additional holding time qualifier.

DUPLICATE FIELD SAMPLE

In order to assess field precision, a duplicate sample was collected for Reclaimed Water 1 (Reclaimed Water 1-Duplicate). Original and duplicate sample values with a RPD exceeding 20% were qualified as estimated. However, if either result was less than 5 times the analyte's MRL, the difference between the original and duplicate sample values was instead used to qualify the data. A difference exceeding the respective MRL flags the sample as estimated. All duplicate samples were within relative control limits.

Results exceeding RPD or MRL control were qualified as estimated as shown in Table 7.

Table 7. Relative Percent Difference (RPD) Exceeding 20% for Duplicate Sample from Reclaimed Water 1

Analyte	Reclaimed Water 1 (ng/L)	Reclaimed Water 1-Duplicate (ng/L)	RPD (%)	MRL	Qualifier (original/ duplicate)
4-nonylphenol	290	490	51.3	100	J/J
Acetaminophen	47	76	47.1	5	J/J
Carbamazepine	410	320	24.7	5	J/J
Iohexal	1500	990	41.0	100	J/J
N-Nitroso-dimethylamine	5.1	7.3	35.5	2	J/J
Primidone	270	340	23.0	20	J/J
Theophylline	ND	120	NA	100	UJ/J
Triclosan	12	ND	NA	10	J/UJ
Trimethoprim	57	46	21.4	5	J/J

RPD = [(Parent Sample) – (Duplicate)]/[mean(Parent Sample, Duplicate)] x 100

DATA VALIDATION REPORT

LOTT Tracer Test and Water Quality Monitoring
May Monthly Water Quality Sampling Event

Laboratory: Eurofins Eaton Analytical

Laboratory Report Numbers: 736489, 737056, and 737175

Dates of Sampling: 5/7/2018, 5/8/2018, and 5/9/2018

INTRODUCTION

This report presents data validation for the May, 2018 monthly tracer test and water quality monitoring event collected for the Reclaimed Water Infiltration Study. These samples were collected in accordance with the procedures and protocols specified in the *Tracer Testing and Water Quality Monitoring of Treatment Effectiveness (Task 2.1.3) Work Plan*. The laboratory data report and Quality Assurance and Quality Control (QA/QC) data are included in this data validation report. Verification and validation steps addressed in this report are:

- Sampling Procedures
- Holding Times
- Quantitation Limits
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries and Relative Percent Differences
- Laboratory Control Sample Recoveries
- Method Blank
- Laboratory and Field Replicate and Duplicate Relative Percent Differences.

SAMPLING PROCEDURES, CHAIN OF CUSTODY, AND HOLDING TIMES

Grab samples were collected from groundwater monitoring wells, vadose zone lysimeters, and the reclaimed water discharge pipe at LOTT Hawks Prairie recharge Basin #4. Sampling locations and procedures are described below.

- Groundwater monitoring wells (MW-3A, MW-5, MW-8, MW-9, MW-14, MW-16, MW-20, MW-23, MW-25, MW-26, MW-27, and MW-28):
    - Each monitoring well is equipped with a dedicated bladder pump with an intake set within the well screen interval. The bladder pumps are PFC-free pumps by Geotech Environmental, Inc., incorporating polyethylene bladders and stainless steel construction. Each well was purged at a rate of approximately 500 milliliters/minute while recording stabilization parameters with a YSI Professional Plus water quality meter and flow-through cell. Once stabilization was achieved, the flow-through cell was disconnected from the sample tubing and the sample containers were filled

directly. Field filtering of analytes that require field filtering was accomplished using a new inline 0.45-micron disposable filter by Geotech.

- Vadose zone lysimeters (West B4 Lysimeter 10 ft, 25 ft, and 50 ft, and East B4 Lysimeter 10 ft, 25 ft, and 50 ft):
  - Each stainless steel lysimeter was purged empty before drawing fresh vadose zone water into the lysimeter for sampling. Purging was completed by applying pressure using a pump until the lysimeter was completely evacuated. Vacuum was then applied to the lysimeter over a period of several hours in order to draw in fresh water. Sample containers were filled directly from the sample tubing by again applying pressure to the lysimeter using a pump. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary. Lysimeters were completely emptied after the sample containers were filled so that no stagnant water remains within the lysimeter.
- Reclaimed water samples at Basin #4 (Reclaimed Water 1, Reclaimed Water 1-Duplicate, and Reclaimed Water 2):
  - Reclaimed water samples were collected at outlets in the black plastic discharge piping at Basin #4. Outlets exhibiting the highest flow were selected for sample collection. Sample containers were filled directly by holding the container under the flow. Sample collection was achieved without the sample water contacting the outside of the black plastic discharge piping. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary.

Sample containers were labeled, sealed, placed in a cooler packed with ice, and shipped under chain of custody to Eurofins Eaton Analytical in Monrovia, California. Sample analytes are shown in Table 1.

Table 1. Monthly Water Quality Monitoring Analytical Parameters

Parameter	Method	Hold Time Analysis	QC Conducted by Laboratory
TKN, ammonia	EPA 350.1, 351.2	28 days	LCS, Method Blank, MRL Check, MS/MSD
Nitrate, nitrite	EPA 300.0	28 days	LCS, Method Blank, MRL Check, MS/MSD
Ortho-phosphate as P	SM4500P-E/ 365.1	48 hours	LCS, Method Blank, MRL Check, MS/MSD

Parameter	Method	Hold Time Analysis	QC Conducted by Laboratory
Total organic carbon	SM 5310C/ E415.3	28 days	LCS, Method Blank, MRL Check, MS/MSD
Biodegradable organic carbon	Allgeier, 1996	48 hours	LCS, Method Blank, MRL Check, MS/MSD
Chloride	EPA 300.0	28 days	LCS, Method Blank, MRL Check, MS/MSD

A copy of the completed chain-of-custody (COC) form is included in the data packages for all batches analyzed for the sampling event. The forms were properly filled out and include relinquished and received signatures. Shipments were received by the laboratory on the day following sampling. The cooler temperatures ranged from 0.7° C to 1.3° C. Compliance is 4° C plus or minus 2° C; therefore, no qualifications were made based on cooler temperature.

The maximum holding times for the various analyses are included in Table 1. All samples were extracted and analyzed within the holding times.

DETECTION LIMIT

Detection limits are specified by the analytical methods. For samples that were diluted by the laboratory, the MRL was raised by the factor of the dilution (e.g., for an MRL of 0.1 mg/L and dilution factor of 2, the diluted MRL is calculated to be 0.2 mg/L). No qualifications were made to the data due to dilutions. Analytes with results below the MRL or the diluted MRL are defined as “ND” (Not Detected).

MINIMUM REPORTING LEVEL CHECK

A reporting level standard is included with every batch/analytical run to confirm the instrument response with the given batch. In instances where the method reporting level check was higher than QC limits, but the sample was non-detect, no qualifications were made. No qualifications were made for data exceeding MRL recoveries QC limits.

LABORATORY MATRIX SPIKES AND SPIKE DUPLICATES

To assess potential matrix effects, an environmental sample and a duplicate are spiked with known concentrations of target analytes. The percent recovery of the target analytes is compared to statistical control limits.

Analytes that failed both MS and MSD are qualified as estimated. Analytes with MS/MSD recoveries below 10 percent were rejected. Analytes that failed on only the MS or the MSD are considered acceptable and the data are not qualified for these analytes. Sample concentrations that exceed the spike added concentrations by more than a factor of four are not flagged.

MS and MSD recoveries were all within the QC limits. In instances where the spike recovery is high, but the result is ND, there is no impact on the data since ND with high recovery is still ND. Samples spiked for MS/MSD from non-LOTT projects were not evaluated.

LABORATORY CONTROL SAMPLES

Laboratory Control Samples (LCS) are samples of known concentration that are carried through the extraction and analysis process. The percent recovery is the percentage of the theoretical concentration, and has statistical control limits indicating that the analytical process is "in control." An LCS sample was run in duplicate with the work order samples. LCS recoveries were all within the QC limits.

LABORATORY METHOD BLANK

An aliquot of reagent water was carried through the entire analytical process. The method blank results indicate any possible contamination exposure during the sample handling, digestion, or extraction process and analysis. In most instances, compounds were not detected at or above the method reporting limits. If the target analyte was detected in the method blank, but the sample was ND, no qualification was made. If the sample result was less than 10 times the result of the method blank, the sample was qualified as an estimate biased high. The qualifications made based on this criterion are shown in Table 2.

Table 2. Method Blank Results

Lab Report	Sample ID	Analyte	Sample Result	Blank Result	Qualifier
736489	Reclaimed Water 1	Dissolved Organic Carbon - Final	3.6 mg/L	0.506	J+
		Dissolved Organic Carbon - Initial	4.6 mg/L	0.714	J+

DUPLICATE FIELD SAMPLE

In order to assess field precision, a duplicate sample was collected for Reclaimed Water 1 (Reclaimed Water 1-Duplicate). Original and duplicate sample values with a RPD exceeding 20% were qualified as estimated. However, if either result was less than 5 times the analyte's MRL, the difference between the original and duplicate sample values was instead used to qualify the data. A difference exceeding the respective MRL flags the sample as estimated. All duplicate samples were within relative control limits.

DATA VALIDATION REPORT

LOTT Wastewater and Reclaimed Water
June Water Quality Characterization Sampling Events

Laboratory: Eurofins Eaton Analytical

Laboratory Report Numbers: 743535, 743545, 743925, 743930, 744210, 744226, 744521, 744547, 74551, 744610, 744628, and 744725

Dates of Sampling: 6/11/2018, 6/12/2018, 6/13/2018, 6/14/2018, and 6/15/2018

INTRODUCTION

This report presents data validation for the wastewater and reclaimed water quality characterization sampling events collected for the Reclaimed Water Infiltration Study. These samples were collected in accordance with the procedures and protocols specified in the *Tracer Testing and Water Quality Monitoring of Treatment Effectiveness (Task 2.1.3) Work Plan*. The laboratory data report and Quality Assurance and Quality Control (QA/QC) data are included in this data validation report. Verification and validation steps addressed in this report are:

- Sampling Procedures
- Holding Times
- Quantitation Limits
- Surrogate Recoveries
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries and Relative Percent Differences
- Laboratory Control Sample Recoveries
- Method Blank
- Laboratory and Field Replicate and Duplicate Relative Percent Differences.

SAMPLING PROCEDURES, CHAIN OF CUSTODY, AND HOLDING TIMES

Grab samples were collected from groundwater monitoring wells, vadose zone lysimeters, and the reclaimed water discharge pipe at LOTT Hawks Prairie recharge Basin #4. Sampling locations and sampling procedures are described below.

- Groundwater monitoring wells (MW-3A, MW-5, MW-8, MW-9, MW-14, MW-16, MW-20, MW-23, MW-25, MW-26, MW-27, and MW-28):
    - Each monitoring well is equipped with a dedicated bladder pump with an intake set within the well screen interval. The bladder pumps are PFC-free pumps by Geotech, incorporating polyethylene bladders and stainless steel construction. Each well was purged at a rate of approximately 500 milliliters/minute while recording stabilization parameters with a YSI Professional Plus water quality meter and flow-through cell.

Once stabilization was achieved, the flow-through cell was disconnected from the sample tubing and the sample containers were filled directly. Field filtering of analytes that require field filtering was accomplished using a new inline 0.45-micron disposable filter by Geotech.

- Vadose zone lysimeters (West B4 Lysimeter 10ft, 25ft, and 50ft, and East B4 Lysimeter 10ft, 25ft, and 50ft):
  - Each stainless steel lysimeter was purged empty before drawing fresh vadose zone water into the lysimeter for sampling. Purging was completed by applying pressure using a pump until the lysimeter was completely evacuated. Vacuum was then applied to the lysimeter over a period of several hours in order to draw in fresh water. Sample containers were filled directly from the sample tubing by again applying pressure to the lysimeter using a pump. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary. Lysimeters were completely emptied after the sample containers were filled so that no stagnant water remains within the lysimeter.
- Reclaimed water samples at Basin #4 (Reclaimed Water 1, Reclaimed Water 1-Duplicate, and Reclaimed Water 2):
  - Reclaimed water samples were collected at outlets in the black plastic discharge piping at Basin #4. Outlets exhibiting the highest flow were selected for sample collection. Sample containers were filled directly by holding the container under the flow. Sample collection was achieved without the sample water contacting the outside of the black plastic discharge piping. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary.

Sample containers were labeled, sealed, placed in a cooler packed with ice, and shipped under chain of custody to Eurofins Eaton Analytical in Monrovia, California. Sample analytes are shown in Table 1.

Table 1. Quarterly Water Quality Monitoring Analytical Parameters

Parameter	Method	Hold Time Extraction	Hold Time Analysis	QC Conducted by Laboratory
Residual Chemicals, including metformin and thiabendazole	EEA's PPCP LC/MS/MS Method	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Trihalomethanes/VOCs	EPA 524.2	----	14 Days	LCS, Method Blank, MRL Check, MS/MSD

Parameter	Method	Hold Time Extraction	Hold Time Analysis	QC Conducted by Laboratory
HAA5	SM 6251B	14 days	14 days	LCS, Method Blank, MRL Check, MS/MSD
PFOS/PFOA + Other PFCs	EEA’s MWH PFC Method	14 days	14 days	LCS, Method Blank, MRL Check, MS/MSD
NDMA	EPA 521	14 days	28 days	LCS, Method Blank, MRL Check, MS/MSD
1,4-Dioxane	EPA 522	28 days	28 days	LCS, Method Blank, MRL Check, MS/MSD
TKN, ammonia	EPA 300. 351.1, 351.2	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Nitrate, nitrite,	EPA 300.0, 353.2	----	48 hours	LCS, Method Blank, MRL Check, MS/MSD
Total phosphorous,	SM4500P-E	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Ortho-phosphorous	SM4500P-E		48 hours	LCS, Method Blank, MRL Check, MS/MSD
Total organic carbon	SM 5310C	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Biodegradable organic carbon	Allgeier, 1996	48 hours	----	LCS, Method Blank, MRL Check, MS/MSD
Metals (Ag, As, Ca, Cd, Cr, Cu, Fe, Hg, K, Pb, Mg, Mn, Na, Pb, Ni, Se, Si, Zn)	EPA 200 series	----	180 days	LCS, Method Blank, MRL Check, MS/MSD
Sulfate, chloride	EPA 300	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Total dissolved solids	EPA SM2540C	----	7 days	LCS, Method Blank, MRL Check, MS/MSD
Total Alkalinity	SM2320B	----	14 Days	LCS, Method Blank, MRL Check, MS/MSD

A copy of the completed chain-of-custody (COC) forms is included in the data packages for all batches analyzed for the sampling event. The forms were properly filled out and include relinquished and received signatures. Shipments were received by the laboratory on the day following sampling. The cooler temperatures ranged from 0.2° C to 3.9° C. Compliance is 4° C plus or minus 2° C, therefore no samples were qualified on the basis of cooler temperature.

The maximum holding times for the various analyses are included in Table 1. All samples were extracted and analyzed within the holding times. However, per the hold time study conducted by Eurofins in 2016, four compounds (amoxicillin, azithromycin, cimetidine, and nonyl-phenol) show analytical variability on individual days and between days. As such, the results for these compounds are considered semi quantitative (i.e., concentration results are estimates). "J" data quality flags are assigned for all of the results for these compounds (non-detects are assigned a "UJ" flag).

DETECTION LIMIT

Detection limits are specified by the analytical methods. For samples that were diluted by the laboratory, the MRL was raised by the factor of the dilution (e.g., for an MRL of 0.1 mg/L and dilution factor of 2, the diluted MRL is calculated to be 0.2 mg/L). No qualifications were made to the data due to dilutions. Analytes with results below the MRL or the diluted MRL are defined as "ND" (Not Detected).

MINIMUM REPORTING LEVEL CHECK

A reporting level standard is included with every batch/analytical run to confirm the instrument response with the given batch. In instances where the method reporting level check was higher than QC limits, but the sample was non-detect, no qualifications were made. All reporting levels are within QC limits, with the exceptions listed in Table 2.

Table 2. Minimum Reporting Level Checks Exceeding QC Limits

Lab Report	Sample ID	Analyte	Sample Result	Recovery (%)	QC Limits (%)	Qualifier
743930	MW-20	1,1,1,2-Tetrachloroethane	ND	48	50-150	UJ
	MW-25	1,1,1,2-Tetrachloroethane	ND	48	50-150	UJ
744521	East B4 Lysimeter, 25 ft	1,1,1,2-Tetrachloroethane	ND	48	50-150	UJ
744610	East B4 Lysimeter, 50 ft	1,1,1,2-Tetrachloroethane	ND	48	50-150	UJ
	West B4 Lysimeter, 10 ft	1,1,1,2-Tetrachloroethane	ND	48	50-150	UJ

SURROGATE SPIKE RECOVERIES

Surrogates are organic compounds that are similar in chemical composition, extraction, and chromatography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analysis. Surrogate recoveries are within control limits, with exceptions listed in Table 3.

Table 3. Surrogate Spike Recoveries Exceeding QC Limits

Lab Report	Sample ID	Analyte	Sample Result	Recovery (%)	QC Limits (%)	Qualifier
74353	Reclaimed Water 1	Perfluoro octanesulfonic acid	ND	60	70-130	UJ
		Perfluoro-n-decanoic acid	ND	52	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	63	70-130	UJ
	Reclaimed Water 1-Duplicate	Perfluoro-n-decanoic acid	ND	48	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	55	70-130	UJ
		Perfluoro octanesulfonic acid	ND	64	70-130	UJ
743545	MW-26	Perfluoro octanesulfonic acid	ND	67	70-130	UJ
		Perfluoro-n-decanoic acid	ND	53	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	69	70-130	UJ
	MW-27	Perfluoro-n-decanoic acid	ND	57	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	65	70-130	UJ
743925	MW-14	Perfluoro octanesulfonic acid	ND	63	70-130	UJ
		Perfluoro-n-decanoic acid	ND	41	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	66	70-130	UJ
	MW-28	Perfluoro octanesulfonic acid	ND	68	70-130	UJ
		Perfluoro-n-decanoic acid	ND	40	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	62	70-130	UJ
743930	MW-20	Perfluoro-n-decanoic acid	ND	58	70-130	UJ
	MW-25	Perfluoro-n-decanoic acid	ND	62	70-130	UJ
744210	MW-16	Perfluoro octanoic acid	19 ng/L	67	70-130	J
		Perfluoro-n-decanoic acid	ND	57	70-130	UJ
		Perfluoro-n-nonanoic acid	7.8 ng/L	66	70-130	J
744226	Reclaimed Water 2	Perfluoro-n-decanoic acid	ND	64	70-130	UJ
		Perfluoro octanesulfonic acid	ND	66	70-130	UJ
744521	East B4 Lysimeter, 10 ft	Perfluoro butanoic acid	ND	67	70-130	UJ
		Perfluoro octanesulfonic acid	ND	69	70-130	UJ
		Perfluoro-n-decanoic acid	ND	51	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	67	70-130	UJ
	East B4 Lysimeter, 25 ft	Perfluoro butanoic acid	ND	69	70-130	UJ
		Perfluoro-n-decanoic acid	ND	52	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	62	70-130	UJ
744547	MW-5	Perfluoro-n-decanoic acid	ND	58	70-130	UJ
	MW-23	Perfluoro-n-decanoic acid	ND	62	70-130	UJ
744551	MW-9	Perfluoro octanesulfonic acid	ND	62	70-130	UJ
		Perfluoro-n-decanoic acid	ND	49	70-130	UJ
	MW-8	Perfluoro-n-decanoic acid	ND	67	70-130	UJ
744610	East B4 Lysimeter, 50 ft	Perfluoro butanoic acid	ND	68	70-130	UJ
		Perfluoro-1-hexanesulfonic acid	ND	67	70-130	UJ
		Perfluoro-n-decanoic acid	ND	52	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	64	70-130	UJ
	West B4 Lysimeter, 10 ft	Perfluoro butanoic acid	ND	65	70-130	UJ
		Perfluoro octanoic acid	15 ng/L	67	70-130	J
		Perfluoro-n-decanoic acid	ND	52	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	65	70-130	UJ
744628	West B4 Lysimeter, 25 ft	N-Nitroso-dimethylamine	ND	67	70-130	UJ
		Perfluoro butanoic acid	ND	66	70-130	UJ
		Perfluoro octanoic acid	16 ng/L	66	70-130	J
		Perfluoro-n-decanoic acid	ND	52	70-130	UJ
		Perfluoro-n-nonanoic acid	ND	62	70-130	UJ

	West B4 Lysimeter, 50 ft	Perfluoro octanesulfonic acid	ND	68	70-130	UJ
		Perfluoro-n-decanoic acid	ND	57	70-130	UJ

LABORATORY MATRIX SPIKES AND SPIKE DUPLICATES

To assess potential matrix effects, an environmental sample and a duplicate are spiked with known concentrations of target analytes. The percent recovery of the target analytes is compared to statistical control limits.

Analytes that failed both MS and MSD are qualified as estimated. Analytes with MS/MSD recoveries below 10 percent were rejected. Analytes that failed on only the MS or the MSD are considered acceptable and the data are not qualified for these analytes. Sample concentrations that exceed the spike added concentrations by more than a factor of four are not flagged.

MS and MSD recoveries are within the QC limits with the following exceptions noted in Table 4. In addition, in instances where the spike recovery is high, but the result is ND, there is no impact on the data since ND with high recovery is still ND. Samples spiked for MS/MSD from non-LOTT projects were not evaluated.

Table 4. Laboratory Matrix Spikes and Spike Duplicates Exceeding QC Limits

Lab Report	Sample ID	Analyte	Sample Result	MS % Yield	MSD % Yield	RPD	QC Limits (%)	Qualifier
744521	East B4 Lysimeter, 10 ft	Amoxicillin	ND	48	59	21	60-140, 20%	UJ
		Atenolol	30 ng/L	165	146	10	60-140, 20%	J
		Carbamazepine	550 ng/L	805	719	11	60-140, 20%	J
		Chloramphenicol	ND	49	35	33	60-140, 20%	UJ
		Chloridazon	ND	23	26	12	60-140, 20%	UJ
		DEET	130 ng/L	805	765	3.8	60-140, 20%	J
		Dehydronifedipine	5.7 ng/L	152	149	1.7	60-140, 20%	J
		Ethinyl Estradiol - 17 alpha	ND	0	30	200	60-140, 20%	UJ
		Isobutylparaben	ND	44	32	30	60-140, 20%	UJ
		Lidocaine	120 ng/L	-20.4	39	44	60-140, 20%	J-
		Meprobamate	ND	12	12	1.8	60-140, 20%	UJ
		Metformin	11 ng/L	8	12	19	60-140, 20%	J-
		Methylparaben	48 ng/L	53	36	30	60-140, 20%	J-
		Oxolinic acid	ND	35	42	18	60-140, 20%	UJ
		Pentoxifylline	ND	34	49	38	60-140, 20%	UJ
		Sulfachloropyridazine	ND	23	32	32	60-140, 20%	UJ
		Sulfadiazine	ND	37	19	65	60-140, 20%	UJ
		Sulfamethizole	ND	39	48	19	60-140, 20%	UJ
		Sulfamethoxazole	110 ng/L	1.1	28	21	60-140, 20%	J-
		Sulfathiazole	ND	24	22	7.8	60-140, 20%	UJ
		TDCPP	ND	21	193	57	60-140, 20%	UJ

LABORATORY CONTROL SAMPLES

Laboratory Control Samples (LCS) are samples of known concentration that are carried through the extraction and analysis process. The percent recovery is the percentage of the theoretical concentration, and has statistical control limits indicating that the analytical process is "in control."

An LCS sample was run in duplicate with the work order samples. In instances where the LCS recovery is high, but the sample result is ND, there is no impact on the data since ND with high recovery is still ND. The RPD for the LCS samples are within acceptable laboratory tolerances, with the exceptions listed in Table 5.

Table 5. Laboratory Control Spikes Exceeding QC Limits

Lab Report	Sample ID	Analyte	Sample Result	LCS Yield (%)	LCSD Yield (%)	RPD (%)	QC Limits (%)	Qualifier
743930	MW-20	Dichlorodifluoromethane	0.5	107	198	59	70-130, 20%	J
	MW-25	Dichlorodifluoromethane	0.63	107	198	59	70-130, 20%	J
743925	MW-14	Dichlorodifluoromethane	0.69	107	198	59	70-130, 20%	J
744521	East B4 Lysimeter, 10 ft	Albuterol	7.1	81	135	50	60-140, 30%	J
		Cotinine	12	88	138	44	60-140, 30%	J
		Lidocaine	120	62	87	35	60-140, 30%	J-
	East B4 Lysimeter, 25 ft	Lidocaine	11	62	87	35	60-140, 30%	J
744547	MW-5	Lidocaine	70	62	87	35	60-140, 30%	J
744551	MW-9	Lidocaine	5.5	62	87	35	60-140, 30%	J
744610	East B4 Lysimeter, 50 ft	Lidocaine	7.1	62	87	35	60-140, 30%	J
	West B4 Lysimeter, 10 ft	Albuterol	5.9	81	135	50	60-140, 30%	J
		Cotinine	12	88	138	44	60-140, 30%	J
		Lidocaine	78	62	87	35	60-140, 30%	J
744628	West B4 Lysimeter, 25 ft	Albuterol	5	81	135	50	60-140, 30%	J
		Lidocaine	57	62	87	35	60-140, 30%	J
	West B4 Lysimeter, 50 ft	Lidocaine	43	62	87	35	60-140, 30%	J

Per the hold time study conducted by Eurofins in 2016, two compounds (nifedipine and theophyline) show concentrations consistently under or over the LCS limits, but show no evidence of inconsistent variability or degradation. This appears to be the result of a sample matrix effect or calibration artifact for this sample. “J” data quality flags are assigned for all of the results for these compounds (non-detects are assigned a “UJ” flag).

LABORATORY METHOD BLANK

An aliquot of reagent water was carried through the entire analytical process. The method blank results indicate any possible contamination exposure during the sample handling, digestion, or extraction process and analysis. In most instances, compounds were not detected at or above the method reporting limits. If the target analyte was detected in the method blank, but the sample was ND, no qualification was made. If the sample result was less than 10 times the result of the method blank, the sample was qualified as an estimate biased high. The qualifications made based on this criterion are shown in Table 6.

Table 6. Method Blanks Results

Lab Report	Sample ID	Analyte	Sample Result	Blank Result	Qualifier
743535	Reclaimed Water 1	Dissolved Organic Carbon - Final	3.6 mg/L	0.501	J+
		Dissolved Organic Carbon - Initial	4.5 mg/L	0.708	J+
	Reclaimed Water 1-Duplicate	Dissolved Organic Carbon - Final	3.8 mg/L	0.501	J+
		Dissolved Organic Carbon - Initial	4.7 mg/L	0.708	J+
743545	MW-26	Dissolved Organic Carbon - Final	0.47 mg/L	0.504	J+
		Dissolved Organic Carbon - Initial	0.81 mg/L	0.646	J+
	MW-27	Dissolved Organic Carbon - Final	0.73 mg/L	0.504	J+
		Dissolved Organic Carbon - Initial	1.1 mg/L	0.646	J+
743925	MW-14	Dissolved Organic Carbon - Final	0.4 mg/L	0.501	J+
		Dissolved Organic Carbon - Initial	0.77 mg/L	0.708	J+
	MW-28	Dissolved Organic Carbon - Final	0.32 mg/L	0.501	J+
		Dissolved Organic Carbon - Initial	0.67 mg/L	0.708	J+
743930	MW-20	Dissolved Organic Carbon - Initial	0.64 mg/L	0.708	J+
	MW-25	Dissolved Organic Carbon - Initial	0.7 mg/L	0.708	J+
744210	MW-16	Dissolved Organic Carbon - Final	0.9 mg/L	0.501	J+
		Dissolved Organic Carbon - Initial	1.3 mg/L	0.708	J+
	MW-3A	Dissolved Organic Carbon - Final	1.6 mg/L	0.501	J+
		Dissolved Organic Carbon - Initial	2.1 mg/L	0.708	J+
744226	Reclaimed Water 2	Dissolved Organic Carbon - Final	3.4 mg/L	0.501	J+
		Dissolved Organic Carbon - Initial	4.6 mg/L	0.708	J+
744521	East B4 Lysimeter, 10 ft	Dissolved Organic Carbon - Final	4 mg/L	0.404	J+
		Dissolved Organic Carbon - Initial	3.3 mg/L	0.658	J+
	East B4 Lysimeter, 25 ft	Dissolved Organic Carbon - Final	2.4 mg/L	0.404	J+
		Dissolved Organic Carbon - Initial	2.8 mg/L	0.658	J+
744547	MW-5	Dissolved Organic Carbon - Final	2.3 mg/L	0.404	J+
		Dissolved Organic Carbon - Initial	2.8 mg/L	0.658	J+
	MW-23	Dissolved Organic Carbon - Final	0.37 mg/L	0.404	J+
		Dissolved Organic Carbon - Initial	0.74 mg/L	0.658	J+
744610	East B4 Lysimeter, 50 ft	Dissolved Organic Carbon - Final	2.5 mg/L	0.404	J+
		Dissolved Organic Carbon - Initial	1.8 mg/L	0.658	J+
	West B4 Lysimeter, 10 ft	Dissolved Organic Carbon - Initial	3.8 mg/L	0.658	J+
744628	West B4 Lysimeter, 25 ft	Dissolved Organic Carbon - Final	3.7 mg/L	0.404	J+
		Dissolved Organic Carbon - Initial	3.5 mg/L	0.658	J+

744725	West B4 Lysimeter, 50 ft	Dissolved Organic Carbon - Final	4.4 mg/L	0.463	J+
		Dissolved Organic Carbon - Initial	3 mg/L	0.602	J+
744551	MW-9	Dissolved Organic Carbon - Final	1.1 mg/L	0.404	J+
		Dissolved Organic Carbon - Initial	1.5 mg/L	0.658	J+
	MW-8	Dissolved Organic Carbon - Final	2.7 mg/L	0.404	J+
		Dissolved Organic Carbon - Initial	1.7 mg/L	0.658	J+

DUPLICATE FIELD SAMPLE

In order to assess field precision, a duplicate sample was collected for Reclaimed Water 1 (Reclaimed Water 1-Duplicate). Original and duplicate sample values with a RPD exceeding 20% are qualified as estimated. However, if either the original or duplicate sample result is less than 5 times the analyte’s MRL, their difference is used to qualify the results. If the difference is greater than the relative MRL the sample is flagged. Results exceeding RPD or MRL control were qualified as estimated as shown in Table 7.

Table 7. Relative Percent Difference (RPD) Exceeding 20% for Duplicate Sample from Reclaimed Water 1

Analyte	Reclaimed Water 1	Reclaimed Water 1-Duplicate	RPD (%)	MRL	Qualifier (original/duplicate)
Carisoprodol	8.5	15	55.3	25	J/J
Kjeldahl Nitrogen	0.73	0.96	27.2	1	J/J
Salicylic Acid	130	ND	NA	100	J/UJ
TCEP	120	170	34.5	50	J/J
Triclosan	80	130	47.6	50	J/J

RPD = [(Parent Sample) – (Duplicate)]/[mean(Parent Sample, Duplicate)] x 100

DATA VALIDATION REPORT

LOTT Tracer Test and Water Quality Monitoring
July Monthly Water Quality Sampling Event

Laboratory: Eurofins Eaton Analytical

Laboratory Report Numbers: 748505, 748878, and 749657

Dates of Sampling: 7/9/2018, 7/10/2018, and 7/12/2018

INTRODUCTION

This report presents data validation for the July 2018 monthly tracer test and water quality monitoring event collected for the Reclaimed Water Infiltration Study. These samples were collected in accordance with the procedures and protocols specified in the *Tracer Testing and Water Quality Monitoring of Treatment Effectiveness (Task 2.1.3) Work Plan*. The laboratory data report and Quality Assurance and Quality Control (QA/QC) data are included in this data validation report. Verification and validation steps addressed in this report are:

- Sampling Procedures
- Holding Times
- Quantitation Limits
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries and Relative Percent Differences
- Laboratory Control Sample Recoveries
- Method Blank
- Laboratory and Field Replicate and Duplicate Relative Percent Differences.

SAMPLING PROCEDURES, CHAIN OF CUSTODY, AND HOLDING TIMES

Grab samples were collected from groundwater monitoring wells, vadose zone lysimeters, and the reclaimed water discharge pipe at LOTT Hawks Prairie recharge Basin #4. Sampling locations and procedures are described below.

- Groundwater monitoring wells (MW-3A, MW-5, MW-8, MW-9, MW-14, MW-16, MW-20, MW-23, MW-25, MW-26, MW-27, and MW-28):
    - Each monitoring well is equipped with a dedicated bladder pump with an intake set within the well screen interval. The bladder pumps are PFC-free pumps by Geotech Environmental, Inc., incorporating polyethylene bladders and stainless steel construction. Each well was purged at a rate of approximately 500 milliliters/minute while recording stabilization parameters with a YSI Professional Plus water quality meter and flow-through cell. Once stabilization was achieved, the flow-through cell was disconnected from the sample tubing and the sample containers were filled

    directly. Field filtering of analytes that require field filtering was accomplished using a new inline 0.45-micron disposable filter by Geotech.

- Vadose zone lysimeters (West B4 Lysimeter 10 ft, 25 ft, and 50 ft, and East B4 Lysimeter 10 ft, 25 ft, and 50 ft):
    - Each stainless steel lysimeter was purged empty before drawing fresh vadose zone water into the lysimeter for sampling. Purging was completed by applying pressure using a pump until the lysimeter was completely evacuated. Vacuum was then applied to the lysimeter over a period of several hours in order to draw in fresh water. Sample containers were filled directly from the sample tubing by again applying pressure to the lysimeter using a pump. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary. Lysimeters were completely emptied after the sample containers were filled so that no stagnant water remains within the lysimeter.
- Reclaimed water samples at Basin #4 (Reclaimed Water 1, Reclaimed Water 1-Duplicate, and Reclaimed Water 2):
    - Reclaimed water samples were collected at outlets in the black plastic discharge piping at Basin #4. Outlets exhibiting the highest flow were selected for sample collection. Sample containers were filled directly by holding the container under the flow. Sample collection was achieved without the sample water contacting the outside of the black plastic discharge piping. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary.

Sample containers were labeled, sealed, placed in a cooler packed with ice, and shipped under chain of custody to Eurofins Eaton Analytical in Monrovia, California. Sample analytes are shown in Table 1.

Table 1. Monthly Water Quality Monitoring Analytical Parameters

Parameter	Method	Hold Time Analysis	QC Conducted by Laboratory
TKN, ammonia	EPA 350.1, 351.2	28 days	LCS, Method Blank, MRL Check, MS/MSD
Nitrate, nitrite	EPA 300.0	28 days	LCS, Method Blank, MRL Check, MS/MSD
Ortho-phosphate as P	SM4500P-E/ 365.1	48 hours	LCS, Method Blank, MRL Check, MS/MSD

Parameter	Method	Hold Time Analysis	QC Conducted by Laboratory
Total organic carbon	SM 5310C/ E415.3	28 days	LCS, Method Blank, MRL Check, MS/MSD
Biodegradable organic carbon	Allgeier, 1996	48 hours	LCS, Method Blank, MRL Check, MS/MSD
Chloride	EPA 300.0	28 days	LCS, Method Blank, MRL Check, MS/MSD

A copy of the completed chain-of-custody (COC) form is included in the data packages for all batches analyzed for the sampling event. The forms were properly filled out and include relinquished and received signatures. Shipments were received by the laboratory on the day following sampling. The cooler temperatures ranged from 1.0° C to 2.1° C. Compliance is 4° C plus or minus 2° C; therefore, no qualifications were made based on cooler temperature.

The maximum holding times for the various analyses are included in Table 1. All samples were extracted and analyzed within the holding times.

DETECTION LIMIT

Detection limits are specified by the analytical methods. For samples that were diluted by the laboratory, the MRL was raised by the factor of the dilution (e.g., for an MRL of 0.1 mg/L and dilution factor of 2, the diluted MRL is calculated to be 0.2 mg/L). No qualifications were made to the data due to dilutions. Analytes with results below the MRL or the diluted MRL are defined as "ND" (Not Detected).

MINIMUM REPORTING LEVEL CHECK

A reporting level standard is included with every batch/analytical run to confirm the instrument response with the given batch. In instances where the method reporting level check was higher than QC limits, but the sample was non-detect, no qualifications were made. No qualifications were made for data exceeding MRL recoveries QC limits.

LABORATORY MATRIX SPIKES AND SPIKE DUPLICATES

To assess potential matrix effects, an environmental sample and a duplicate are spiked with known concentrations of target analytes. The percent recovery of the target analytes is compared to statistical control limits.

Analytes that failed both MS and MSD are qualified as estimated. Analytes with MS/MSD recoveries below 10 percent were rejected. Analytes that failed on only the MS or the MSD are considered acceptable and the data are not qualified for these analytes. Sample concentrations that exceed the spike added concentrations by more than a factor of four are not flagged.

MS and MSD recoveries were all within the QC limits. In instances where the spike recovery is high, but the result is ND, there is no impact on the data since ND with high recovery is still ND. Samples spiked for MS/MSD from non-LOTT projects were not evaluated.

LABORATORY CONTROL SAMPLES

Laboratory Control Samples (LCS) are samples of known concentration that are carried through the extraction and analysis process. The percent recovery is the percentage of the theoretical concentration, and has statistical control limits indicating that the analytical process is "in control." An LCS sample was run in duplicate with the work order samples. LCS recoveries were all within the QC limits.

LABORATORY METHOD BLANK

An aliquot of reagent water was carried through the entire analytical process. The method blank results indicate any possible contamination exposure during the sample handling, digestion, or extraction process and analysis. In most instances, compounds were not detected at or above the method reporting limits. If the target analyte was detected in the method blank, but the sample was ND, no qualification was made. If the sample result was less than 10 times the result of the method blank, the sample was qualified as an estimate biased high. The qualifications made based on this criterion are shown in Table 2.

Table 2. Method Blank Results

Lab Report	Sample ID	Analyte	Sample Result	Blank Result	Qualifier
748505	Reclaimed Water 1	Dissolved Organic Carbon - Final	4.6 mg/L	0.478 mg/L	J+
		Dissolved Organic Carbon - Initial	5.4 mg/L	0.678 mg/L	J+
	Reclaimed Water 1 - Duplicate	Dissolved Organic Carbon - Final	4.5 mg/L	0.478 mg/L	J+
		Dissolved Organic Carbon - Initial	5.3 mg/L	0.678 mg/L	J+
749657	Reclaimed Water 2	Dissolved Organic Carbon - Final	5 mg/L	0.622 mg/L	J+
		Dissolved Organic Carbon - Initial	5.4 mg/L	0.767 mg/L	J+

DUPLICATE FIELD SAMPLE

In order to assess field precision, a duplicate sample was collected for Reclaimed Water 1 (Reclaimed Water 1-Duplicate). Original and duplicate sample values with a RPD exceeding 20% were qualified as estimated. However, if either result was less than 5 times the analyte's MRL, the difference between the original and duplicate sample values was instead used to qualify the data. A difference exceeding the respective MRL flags the sample as estimated. All duplicate samples were within relative control limits.

DATA VALIDATION REPORT

LOTT Wastewater and Reclaimed Water
August Water Quality Characterization Sampling Events

Laboratory: Eurofins Eaton Analytical

Laboratory Report Numbers: 754181, 754189, 754346, 754565, 754709, 754960, 754962, 755185, 755199, 755200, 755308

Dates of Sampling: 8/6/2018, 8/7/2018, 8/8/2018, 8/9/2018

INTRODUCTION

This report presents data validation for the wastewater and reclaimed water quality characterization sampling events collected for the Reclaimed Water Infiltration Study. These samples were collected in accordance with the procedures and protocols specified in the *Tracer Testing and Water Quality Monitoring of Treatment Effectiveness (Task 2.1.3) Work Plan*. The laboratory data report and Quality Assurance and Quality Control (QA/QC) data are included in this data validation report. Verification and validation steps addressed in this report are:

- Sampling Procedures
- Holding Times
- Quantitation Limits
- Surrogate Recoveries
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries and Relative Percent Differences
- Laboratory Control Sample Recoveries
- Method Blank
- Laboratory and Field Replicate and Duplicate Relative Percent Differences.

SAMPLING PROCEDURES, CHAIN OF CUSTODY, AND HOLDING TIMES

Grab samples were collected from groundwater monitoring wells, vadose zone lysimeters, and the reclaimed water discharge pipe at LOTT Hawks Prairie recharge Basin #4. Sampling locations and sampling procedures are described below.

- Groundwater monitoring wells (MW-3A, MW-5, MW-8, MW-9, MW-14, MW-16, MW-20, MW-23, MW-25, MW-26, MW-27, and MW-28):
    - Each monitoring well is equipped with a dedicated bladder pump with an intake set within the well screen interval. The bladder pumps are PFC-free pumps by Geotech, incorporating polyethylene bladders and stainless steel construction. Each well was purged at a rate of approximately 500 milliliters/minute while recording stabilization parameters with a YSI Professional Plus water quality meter and flow-through cell.

    Once stabilization was achieved, the flow-through cell was disconnected from the sample tubing and the sample containers were filled directly. Field filtering of analytes that require field filtering was accomplished using a new inline 0.45-micron disposable filter by Geotech.

- Vadose zone lysimeters (West B4 Lysimeter 10ft, 25ft, and 50ft, and East B4 Lysimeter 10ft, 25ft, and 50ft):
    - Each stainless steel lysimeter was purged empty before drawing fresh vadose zone water into the lysimeter for sampling. Purging was completed by applying pressure using a pump until the lysimeter was completely evacuated. Vacuum was then applied to the lysimeter over a period of several hours in order to draw in fresh water. Sample containers were filled directly from the sample tubing by again applying pressure to the lysimeter using a pump. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary. Lysimeters were completely emptied after the sample containers were filled so that no stagnant water remains within the lysimeter.
- Reclaimed water samples at Basin #4 (Reclaimed Water 1, Reclaimed Water 1-Duplicate, and Reclaimed Water 2):
    - Reclaimed water samples were collected at outlets in the black plastic discharge piping at Basin #4. Outlets exhibiting the highest flow were selected for sample collection. Sample containers were filled directly by holding the container under the flow. Sample collection was achieved without the sample water contacting the outside of the black plastic discharge piping. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary.

Sample containers were labeled, sealed, placed in a cooler packed with ice, and shipped under chain of custody to Eurofins Eaton Analytical in Monrovia, California. Sample analytes are shown in Table 1.

Table 1. Quarterly Water Quality Monitoring Analytical Parameters

Parameter	Method	Hold Time Extraction	Hold Time Analysis	QC Conducted by Laboratory
Residual Chemicals, including metformin and thiabendazole	EEA's PPCP LC/MS/MS Method	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Trihalomethanes/VOCs	EPA 524.2	----	14 Days	LCS, Method Blank, MRL Check, MS/MSD

Parameter	Method	Hold Time Extraction	Hold Time Analysis	QC Conducted by Laboratory
HAA5	SM 6251B	14 days	14 days	LCS, Method Blank, MRL Check, MS/MSD
PFOS/PFOA + Other PFCs	EEA's MWH PFC Method	14 days	14 days	LCS, Method Blank, MRL Check, MS/MSD
NDMA	EPA 521	14 days	28 days	LCS, Method Blank, MRL Check, MS/MSD
1,4-Dioxane	EPA 522	28 days	28 days	LCS, Method Blank, MRL Check, MS/MSD
TKN, ammonia	EPA 300. 351.1, 351.2	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Nitrate, nitrite,	EPA 300.0, 353.2	----	48 hours	LCS, Method Blank, MRL Check, MS/MSD
Total phosphorous,	SM4500P-E	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Ortho-phosphorous	SM4500P-E		48 hours	LCS, Method Blank, MRL Check, MS/MSD
Total organic carbon	SM 5310C	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Biodegradable organic carbon	Allgeier, 1996	48 hours	----	LCS, Method Blank, MRL Check, MS/MSD
Metals (Ag, As, Ca, Cd, Cr, Cu, Fe, Hg, K, Pb, Mg, Mn, Na, Pb, Ni, Se, Si, Zn)	EPA 200 series	----	180 days	LCS, Method Blank, MRL Check, MS/MSD
Sulfate, chloride	EPA 300	----	28 days	LCS, Method Blank, MRL Check, MS/MSD
Total dissolved solids	EPA SM2540C	----	7 days	LCS, Method Blank, MRL Check, MS/MSD
Total Alkalinity	SM2320B	----	14 Days	LCS, Method Blank, MRL Check, MS/MSD

A copy of the completed chain-of-custody (COC) forms is included in the data packages for all batches analyzed for the sampling event. The forms were properly filled out and include relinquished and received signatures. Shipments were received by the laboratory on the day following sampling. The cooler temperatures ranged from 0.2° C to 3.5° C. Compliance is 4° C plus or minus 2° C, therefore no samples were qualified on the basis of cooler temperature.

The maximum holding times for the various analyses are included in Table 1. All samples were extracted and analyzed within the holding times with the exceptions of Method Allgeier 1996 in lab report 754189. Non-detects and detections were flagged as UJ and J- respectively. In addition, per the hold time study conducted by Eurofins in 2016, four compounds (amoxicillin, azithromycin, cimetidine, and nonyl-phenol) show analytical variability on individual days and between days. As such, the results for these compounds are considered semi quantitative (i.e., concentration results are estimates). "J" data quality flags are assigned for all of the results for these compounds (non-detects are assigned a "UJ" flag).

DETECTION LIMIT

Detection limits are specified by the analytical methods. For samples that were diluted by the laboratory, the MRL was raised by the factor of the dilution (e.g., for an MRL of 0.1 mg/L and dilution factor of 2, the diluted MRL is calculated to be 0.2 mg/L). No qualifications were made to the data due to dilutions. Analytes with results below the MRL or the diluted MRL are defined as "ND" (Not Detected).

MINIMUM REPORTING LEVEL CHECK

A reporting level standard is included with every batch/analytical run to confirm the instrument response with the given batch. In instances where the method reporting level check was higher than QC limits, but the sample was non-detect, no qualifications were made. All reporting levels are within QC limits, with the exceptions listed in Table 2.

Table 2. Minimum Reporting Level Checks Exceeding QC Limits

Lab Report	Sample ID	Analyte	Recovery (%)	QC Limits (%)	Qualifier
755308	MW-3A	Chloroform (Trichloromethane)	198	50-150	J
	MW-5	Chloroform (Trichloromethane)	198	50-150	J

SURROGATE SPIKE RECOVERIES

Surrogates are organic compounds that are similar in chemical composition, extraction, and chromatography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analysis. Surrogate recoveries were within control limits.

LABORATORY MATRIX SPIKES AND SPIKE DUPLICATES

To assess potential matrix effects, an environmental sample and a duplicate are spiked with known concentrations of target analytes. The percent recovery of the target analytes is compared to statistical control limits.

Analytes that failed both MS and MSD are qualified as estimated. Analytes with MS/MSD recoveries below 10 percent were rejected. Analytes that failed on only the MS or the MSD are considered acceptable and the data are not qualified for these analytes. Sample concentrations that exceed the spike added concentrations by more than a factor of four are not flagged.

MS and MSD recoveries are within the QC limits with the following exceptions noted in Table 3. In addition, in instances where the spike recovery is high, but the result is ND, there is no impact on the data since ND with high recovery is still ND. Samples spiked for MS/MSD from non-LOTT projects were not evaluated.

Table 3. Laboratory Matrix Spikes and Spike Duplicates Exceeding QC Limits

Lab Report	Sample ID	Analyte	Sample Result	MS % Yield	MSD % Yield	RPD	QC Limits (%)	Qualifier
754181	Reclaimed Water 1	Amoxicillin (semi-quantitative)	ND	41	55	30	60-140	UJ
	Reclaimed Water 1 – Duplicate		ND	41	55	30	60-140	UJ
	Reclaimed Water 1	Bromacil	ND	39	40	2.3	60-140	UJ
	Reclaimed Water 1 – Duplicate		ND	39	40	2.3	60-140	UJ
	Reclaimed Water 1	Carbadox	ND	39	48	19	60-140	UJ
	Reclaimed Water 1 – Duplicate		ND	39	48	19	60-140	UJ
	Reclaimed Water 1	Chloridazon	ND	37	46	20	60-140	UJ
	Reclaimed Water 1 – Duplicate		ND	37	46	20	60-140	UJ
	Reclaimed Water 1	Cimetidine	ND	36	42	17	60-140	UJ
	Reclaimed Water 1 – Duplicate		ND	36	42	17	60-140	UJ
	Reclaimed Water 1	Diltiazem	5.1 ng/L	293	211	32	60-140	J+
	Reclaimed Water 1 – Duplicate		5.1 ng/L	293	211	32	60-140	J+
	Reclaimed Water 1	Lidocaine	ND	34	54	46	60-140	UJ
	Reclaimed Water 1 – Duplicate		7.3 ng/L	34	54	46	60-140	J-
	Reclaimed Water 1	Meclofenamic Acid	8.6 ng/L	684	463	38	60-140	J+
	Reclaimed Water 1	Pentoxifylline	ND	58	48	20	60-140	UJ
	Reclaimed Water 1 – Duplicate		ND	58	48	20	60-140	UJ
	Reclaimed Water 1	Sulfadiazine	ND	37	24	40	60-140	UJ
	Reclaimed Water 1 – Duplicate		ND	37	24	40	60-140	UJ
	Reclaimed Water 1	Sulfamethazine	ND	34	53	44	60-140	UJ
	Reclaimed Water 1 – Duplicate		ND	34	53	44	60-140	UJ
	Reclaimed Water 1	Sulfathiazole	ND	30	28	4.7	60-140	UJ
	Reclaimed Water 1 – Duplicate		ND	30	28	4.7	60-140	UJ
	Reclaimed Water 1	Thiabendazole	16 ng/L	46	45	2.0	60-140	J-

Lab Report	Sample ID	Analyte	Sample Result	MS % Yield	MSD % Yield	RPD	QC Limits (%)	Qualifier
	Reclaimed Water 1 – Duplicate		50 ng/L	46	45	2.0	60-140	J-
754709	MW-14	Dissolved Total Phosphorus as P	0.021 mg/L	114	116	1.4	90-110	J+
755185	West B4 Lysimeter, 25ft	Amoxicillin (semi-quantitative)	ND	48	50	4.0	60-140	UJ
		Bromacil	ND	22	26	14	60-140	UJ
		Carbadox	ND	28	29	2.0	60-140	UJ
		Carisoprodol	10 ng/L	39	41	3.1	60-140	J-
		Dilantin	ND	35	32	8.1	60-140	UJ
		Diltiazem	5.3 ng/L	204	202	1.1	60-140	J+
		Diuron	47 ng/L	51	49	1.9	60-140	J-
		Fluoxetine	ND	58	56	3.3	60-140	UJ
		Ketorolac	ND	42	44	3.4	60-140	UJ
		Lidocaine	240 ng/L	26	34	2.8	60-140	J-
		OUST (Sulfameturon,methyl)	ND	51	49	4.4	60-140	UJ
		Pentoxifylline	ND	27	21	25	60-140	UJ
		Quinoline	ND	43	32	31	60-140	UJ
		Sulfachloropyridazine	ND	36	36	0	60-140	UJ
		Sulfamerazine	ND	58	56	3.8	60-140	UJ
		Sulfamethizole	ND	45	44	2.8	60-140	UJ
		Sulfathiazole	ND	42	49	15	60-140	UJ
		TCEP	240	53	56	1.6	60-140	J-
		TCPP	1100 ng/L	233	225	2.6	40-160	J+
		Theophylline	130 ng/L	22	33	19	60-140	J-
		Thiabendazole	ND	58	57	1.8	60-140	UJ
755308	West B4 Lysimeter, 10 ft	Nitrite Nitrogen by IC	ND	77	77	0.078	80-120	UJ

LABORATORY CONTROL SAMPLES

Laboratory Control Samples (LCS) are samples of known concentration that are carried through the extraction and analysis process. The percent recovery is the percentage of the theoretical concentration, and has statistical control limits indicating that the analytical process is "in control."

An LCS sample was run in duplicate with the work order samples. In instances where the LCS recovery is high, but the sample result is ND, there is no impact on the data since ND with high recovery is still ND. The RPD for the LCS samples are within acceptable laboratory tolerances, with the exceptions listed in Table 4.

Table 4. Laboratory Control Spikes Exceeding QC Limits

Lab Report	Sample ID	Analyte	Sample Result	LCS Yield (%)	LCSD Yield (%)	RPD (%)	QC Limits (%)	Qualifier
755308	MW-3A	Perfluoro octanoic acid - PFOA	14 ng/L	97	120	22	70-130 20	J
	MW-5		15 ng/L					J

Per the hold time study conducted by Eurofins in 2016, two compounds (nifedipine and theophyline) show concentrations consistently under or over the LCS limits, but show no evidence of inconsistent variability or degradation. This appears to be the result of a sample matrix effect or calibration artifact for this sample. “J” data quality flags are assigned for all of the results for these compounds (non-detects are assigned a “UJ” flag).

LABORATORY METHOD BLANK

An aliquot of reagent water was carried through the entire analytical process. The method blank results indicate any possible contamination exposure during the sample handling, digestion, or extraction process and analysis. In most instances, compounds were not detected at or above the method reporting limits. If the target analyte was detected in the method blank, but the sample was ND, no qualification was made. If the sample result was less than 10 times the result of the method blank, the sample was qualified as an estimate biased high. The qualifications made based on this criterion are shown in Table 6.

Table 6. Method Blanks Results

Lab Report	Sample ID	Analyte	Sample Result	Blank Result	Qualifier
754181	Reclaimed Water 1	Dissolved Organic Carbon - Final	4.4 mg/L	0.602 mg/L	J+
		Dissolved Organic Carbon - Initial	5.3 mg/L	0.858 mg/L	J+
	Reclaimed Water 1 Duplicate	Dissolved Organic Carbon - Final	4.5 mg/L	0.602 mg/L	J+
		Dissolved Organic Carbon - Initial	5.4 mg/L	0.858 mg/L	J+
754189	MW-23	Dissolved Organic Carbon - Final	0.77 mg/L	0.602 mg/L	J+
		Dissolved Organic Carbon - Initial	0.89 mg/L	0.858 mg/L	J+
	MW-16	Dissolved Organic Carbon - Final	1.9 mg/L	0.602 mg/L	J+
		Dissolved Organic Carbon - Initial	1.8 mg/L	0.858 mg/L	J+
754346	MW-26	Dissolved Organic Carbon - Final	0.8 mg/L	0.602 mg/L	J+
		Dissolved Organic Carbon - Initial	1.2 mg/L	0.858 mg/L	J+
	MW-27	Dissolved Organic Carbon - Final	0.61 mg/L	0.602 mg/L	J+
		Dissolved Organic Carbon - Initial	0.88 mg/L	0.858 mg/L	J+
754709	MW-14	Dissolved Organic Carbon - Final	0.67 mg/L	0.628 mg/L	J+
		Dissolved Organic Carbon - Initial	1.1 mg/L	0.925 mg/L	J+
	MW-28	Dissolved Organic Carbon - Final	0.43 mg/L	0.628 mg/L	J+
		Dissolved Organic Carbon - Initial	0.69 mg/L	0.925 mg/L	J+
754960	MW-25	Dissolved Organic Carbon - Final	4.3 mg/L	0.478 mg/L	J+
		Dissolved Organic Carbon - Initial	5 mg/L	0.746 mg/L	J+
	MW-20	Dissolved Organic Carbon - Final	1.5 mg/L	0.478 mg/L	J+
		Dissolved Organic Carbon - Initial	0.76 mg/L	0.746 mg/L	J+
754962	Reclaimed Water 2	Dissolved Organic Carbon - Final	0.63 mg/L	0.478 mg/L	
		Dissolved Organic Carbon - Initial	0.78 mg/L	0.746 mg/L	
755185	West B4 Lysimeter, 25ft	Dissolved Organic Carbon - Initial	3.9 mg/L	0.746 mg/L	J+
755199	East B4 Lysimeter, 10 ft	Dissolved Organic Carbon - Final	4.8 mg/L	0.599 mg/L	J+
		Dissolved Organic Carbon - Initial	3.3 mg/L	0.788 mg/L	J+
	East B4 Lysimeter, 25 ft	Dissolved Organic Carbon - Final	4.8 mg/L	0.599 mg/L	J+
		Dissolved Organic Carbon - Initial	3.5 mg/L	0.788 mg/L	J+
755200	West B4 Lysimeter, 10 ft	Dissolved Organic Carbon - Final	5.6 mg/L	0.599 mg/L	J+
		Dissolved Organic Carbon - Initial	3.5 mg/L	0.788 mg/L	J+

	East B4 Lysimeter, 50 ft	Dissolved Organic Carbon - Final	3.1 mg/L	0.599 mg/L	J+
		Dissolved Organic Carbon - Initial	2.5 mg/L	0.788 mg/L	J+

DUPLICATE FIELD SAMPLE

In order to assess field precision, a duplicate sample was collected for Reclaimed Water 1 (Reclaimed Water 1-Duplicate). Original and duplicate sample values with a RPD exceeding 20% are qualified as estimated. However, if either the original or duplicate sample result is less than 5 times the analyte's MRL, their difference is used to qualify the results. If the difference is greater than the relative MRL the sample is flagged. Results exceeding RPD or MRL control were qualified as estimated as shown in Table 7.

Table 7. Relative Percent Difference (RPD) Exceeding 20% for Duplicate Sample from Reclaimed Water 1

Analyte	Reclaimed Water 1	Reclaimed Water 1-Duplicate	RPD (%)	MRL	Qualifier (original/duplicate)
4-nonylphenol - semi quantitative	ND	220 ng/L	NA	100	UJ/J
Lopressor	540 ng/L	750 ng/L	33	20	J/J
Meprobamate	37 ng/L	30 ng/L	21	5	J/J
Quinoline	20 ng/L	14 ng/L	NA	5	J/J
Thiabendazole	50 ng/L	16 ng/L	NA	5	J/J
Triclosan	130 ng/L	80 ng/L	48	10	J/J

RPD = [(Parent Sample) – (Duplicate)]/[mean(Parent Sample, Duplicate)] x 100

DATA VALIDATION REPORT

LOTT Tracer Test and Water Quality Monitoring
September Monthly Water Quality Sampling Event

Laboratory: Eurofins Eaton Analytical

Laboratory Report Numbers: 761326, 761785, and 762000, and 762342

Dates of Sampling: 9/10/2018, 9/11/2018, 9/12/2018

INTRODUCTION

This report presents data validation for the September 2018 monthly tracer test and water quality monitoring event collected for the Reclaimed Water Infiltration Study. These samples were collected in accordance with the procedures and protocols specified in the *Tracer Testing and Water Quality Monitoring of Treatment Effectiveness (Task 2.1.3) Work Plan*. The laboratory data report and Quality Assurance and Quality Control (QA/QC) data are included in this data validation report. Verification and validation steps addressed in this report are:

- Sampling Procedures
- Holding Times
- Quantitation Limits
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries and Relative Percent Differences
- Laboratory Control Sample Recoveries
- Method Blank
- Laboratory and Field Replicate and Duplicate Relative Percent Differences.

SAMPLING PROCEDURES, CHAIN OF CUSTODY, AND HOLDING TIMES

Grab samples were collected from groundwater monitoring wells, vadose zone lysimeters, and the reclaimed water discharge pipe at LOTT Hawks Prairie recharge Basin #4. Sampling locations and procedures are described below.

- Groundwater monitoring wells (MW-3A, MW-5, MW-8, MW-9, MW-14, MW-16, MW-20, MW-23, MW-25, MW-26, MW-27, and MW-28):
    - Each monitoring well is equipped with a dedicated bladder pump with an intake set within the well screen interval. The bladder pumps are PFC-free pumps by Geotech Environmental, Inc., incorporating polyethylene bladders and stainless steel construction. Each well was purged at a rate of approximately 500 milliliters/minute while recording stabilization parameters with a YSI Professional Plus water quality meter and flow-through cell. Once stabilization was achieved, the flow-through cell was disconnected from the sample tubing and the sample containers were filled

    - directly. Field filtering of analytes that require field filtering was accomplished using a new inline 0.45-micron disposable filter by Geotech.
- Vadose zone lysimeters (West B4 Lysimeter 10 ft, 25 ft, and 50 ft, and East B4 Lysimeter 10 ft, 25 ft, and 50 ft):
    - Each stainless steel lysimeter was purged empty before drawing fresh vadose zone water into the lysimeter for sampling. Purging was completed by applying pressure using a pump until the lysimeter was completely evacuated. Vacuum was then applied to the lysimeter over a period of several hours in order to draw in fresh water. Sample containers were filled directly from the sample tubing by again applying pressure to the lysimeter using a pump. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary. Lysimeters were completely emptied after the sample containers were filled so that no stagnant water remains within the lysimeter.
- Reclaimed water samples at Basin #4 (Reclaimed Water 1, Reclaimed Water 1-Duplicate, and Reclaimed Water 2):
    - Reclaimed water samples were collected at outlets in the black plastic discharge piping at Basin #4. Outlets exhibiting the highest flow were selected for sample collection. Sample containers were filled directly by holding the container under the flow. Sample collection was achieved without the sample water contacting the outside of the black plastic discharge piping. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary.

Sample containers were labeled, sealed, placed in a cooler packed with ice, and shipped under chain of custody to Eurofins Eaton Analytical in Monrovia, California. Sample analytes are shown in Table 1.

Table 1. Monthly Water Quality Monitoring Analytical Parameters

Parameter	Method	Hold Time Analysis	QC Conducted by Laboratory
TKN, ammonia	EPA 350.1, 351.2	28 days	LCS, Method Blank, MRL Check, MS/MSD
Nitrate, nitrite	EPA 300.0	28 days	LCS, Method Blank, MRL Check, MS/MSD
Ortho-phosphate as P	SM4500P-E/ 365.1	48 hours	LCS, Method Blank, MRL Check, MS/MSD

Parameter	Method	Hold Time Analysis	QC Conducted by Laboratory
Total organic carbon	SM 5310C/ E415.3	28 days	LCS, Method Blank, MRL Check, MS/MSD
Biodegradable organic carbon	Allgeier, 1996	48 hours	LCS, Method Blank, MRL Check, MS/MSD
Chloride	EPA 300.0	28 days	LCS, Method Blank, MRL Check, MS/MSD

A copy of the completed chain-of-custody (COC) form is included in the data packages for all batches analyzed for the sampling event. The forms were properly filled out and include relinquished and received signatures. Shipments were received by the laboratory on the day following sampling. The cooler temperatures ranged from 0.5° C to 2.6 C. Compliance is 4° C plus or minus 2° C; therefore, no qualifications were made based on cooler temperature.

The maximum holding times for the various analyses are included in Table 1. All samples were extracted and analyzed within the holding times.

DETECTION LIMIT

Detection limits are specified by the analytical methods. For samples that were diluted by the laboratory, the MRL was raised by the factor of the dilution (e.g., for an MRL of 0.1 mg/L and dilution factor of 2, the diluted MRL is calculated to be 0.2 mg/L). No qualifications were made to the data due to dilutions. Analytes with results below the MRL or the diluted MRL are defined as “ND” (Not Detected).

MINIMUM REPORTING LEVEL CHECK

A reporting level standard is included with every batch/analytical run to confirm the instrument response with the given batch. In instances where the method reporting level check was higher than QC limits, but the sample was non-detect, no qualifications were made. No qualifications were made for data exceeding MRL recoveries QC limits.

LABORATORY MATRIX SPIKES AND SPIKE DUPLICATES

To assess potential matrix effects, an environmental sample and a duplicate are spiked with known concentrations of target analytes. The percent recovery of the target analytes is compared to statistical control limits.

Analytes that failed both MS and MSD are qualified as estimated. Analytes with MS/MSD recoveries below 10 percent were rejected. Analytes that failed on only the MS or the MSD are considered acceptable and the data are not qualified for these analytes. Sample concentrations that exceed the spike added concentrations by more than a factor of four are not flagged.

MS and MSD recoveries were all within the QC limits with the following exception noted in Table 2. In instances where the spike recovery is high, but the result is ND, there is no impact on the data since ND with high recovery is still ND. Samples spiked for MS/MSD from non-LOTT projects were not evaluated.

Table 2. Laboratory Matrix Spikes and Spike Duplicates Exceeding QC Limits

Lab Report	Sample ID	Analyte	Sample Result	MS % Yield	MSD % Yield	RPD	QC Limits (%)	Qualifier
761326	MW-25	Total Kjeldahl Nitrogen	ND	82	NA	NA	90-110	UJ

LABORATORY CONTROL SAMPLES

Laboratory Control Samples (LCS) are samples of known concentration that are carried through the extraction and analysis process. The percent recovery is the percentage of the theoretical concentration, and has statistical control limits indicating that the analytical process is "in control." An LCS sample was run in duplicate with the work order samples. LCS recoveries were all within the QC limits.

LABORATORY METHOD BLANK

An aliquot of reagent water was carried through the entire analytical process. The method blank results indicate any possible contamination exposure during the sample handling, digestion, or extraction process and analysis. In most instances, compounds were not detected at or above the method reporting limits. If the target analyte was detected in the method blank, but the sample was ND, no qualification was made. If the sample result was less than 10 times the result of the method blank, the sample was qualified as an estimate biased high. The qualifications made based on this criterion are shown in Table 3.

Table 3. Method Blank Results

Lab Report	Sample ID	Analyte	Sample Result	Blank Result	Qualifier
761326	Reclaimed Water 1	Biodegradable Dis. Org. Carbon	0.64 mg/L	0.388	J+
	Reclaimed Water 1-Duplicate		0.8 mg/L		J+
	Reclaimed Water 1 Reclaimed Water 1-Duplicate	Dissolved Organic Carbon - Final	4.1 mg/L	0.425 mg/L	J+
			4.1 mg/L		J+
		Dissolved Organic Carbon - Initial	4.7 mg/L	0.812 mg/L	J+
			4.9 mg/L		J+
762000	Reclaimed Water 2	Dissolved Organic Carbon - Initial	4.9 mg/L	0.751 mg/L	J+

DUPLICATE FIELD SAMPLE

In order to assess field precision, a duplicate sample was collected for Reclaimed Water 1 (Reclaimed Water 1-Duplicate). Original and duplicate sample values with a RPD exceeding 20% were qualified as estimated. However, if either result was less than 5 times the analyte's MRL, the difference between the original and duplicate sample values was instead used to qualify the data. A difference exceeding the respective MRL flags the sample as estimated. All duplicate samples were within relative control limits.

DATA VALIDATION REPORT

LOTT Tracer Test and Water Quality Monitoring
October Monthly Water Quality Sampling Event

Laboratory: Eurofins Eaton Analytical

Laboratory Report Numbers: 765338, 765742, and 766118

Dates of Sampling: 10/1/2018, 10/2/2018, 10/3/2018

INTRODUCTION

This report presents data validation for the October 2018 monthly tracer test and water quality monitoring event collected for the Reclaimed Water Infiltration Study. These samples were collected in accordance with the procedures and protocols specified in the *Tracer Testing and Water Quality Monitoring of Treatment Effectiveness (Task 2.1.3) Work Plan*. The laboratory data report and Quality Assurance and Quality Control (QA/QC) data are included in this data validation report. Verification and validation steps addressed in this report are:

- Sampling Procedures
- Holding Times
- Quantitation Limits
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries and Relative Percent Differences
- Laboratory Control Sample Recoveries
- Method Blank
- Laboratory and Field Replicate and Duplicate Relative Percent Differences.

SAMPLING PROCEDURES, CHAIN OF CUSTODY, AND HOLDING TIMES

Grab samples were collected from groundwater monitoring wells, vadose zone lysimeters, and the reclaimed water discharge pipe at LOTT Hawks Prairie recharge Basin #4. Sampling locations and procedures are described below.

- Groundwater monitoring wells (MW-3A, MW-5, MW-8, MW-9, MW-14, MW-16, MW-20, MW-23, MW-25, MW-26, MW-27, and MW-28):
  - Each monitoring well is equipped with a dedicated bladder pump with an intake set within the well screen interval. The bladder pumps are PFC-free pumps by Geotech Environmental, Inc., incorporating polyethylene bladders and stainless steel construction. Each well was purged at a rate of approximately 500 milliliters/minute while recording stabilization parameters with a YSI Professional Plus water quality meter and flow-through cell. Once stabilization was achieved, the flow-through cell was disconnected from the sample tubing and the sample containers were filled

directly. Field filtering of analytes that require field filtering was accomplished using a new inline 0.45-micron disposable filter by Geotech.

- Vadose zone lysimeters (West B4 Lysimeter 10 ft, 25 ft, and 50 ft, and East B4 Lysimeter 10 ft, 25 ft, and 50 ft):
    - Each stainless steel lysimeter was purged empty before drawing fresh vadose zone water into the lysimeter for sampling. Purging was completed by applying pressure using a pump until the lysimeter was completely evacuated. Vacuum was then applied to the lysimeter over a period of several hours in order to draw in fresh water. Sample containers were filled directly from the sample tubing by again applying pressure to the lysimeter using a pump. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary. Lysimeters were completely emptied after the sample containers were filled so that no stagnant water remains within the lysimeter.
- Reclaimed water samples at Basin #4 (Reclaimed Water 1, Reclaimed Water 1-Duplicate, and Reclaimed Water 2):
    - Reclaimed water samples were collected at outlets in the black plastic discharge piping at Basin #4. Outlets exhibiting the highest flow were selected for sample collection. Sample containers were filled directly by holding the container under the flow. Sample collection was achieved without the sample water contacting the outside of the black plastic discharge piping. A field-time decision was made to not field filter analytes that typically require field filtering. The decision was contingent upon passing a settleable solids test. Tests for settleable solids were conducted by filling clear glass jars with reclaimed water and then letting stand for 10 minutes. No settleable solids formed in the jars, and therefore field filtering was not deemed necessary.

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Ortho-phosphate as P	SM4500P-E/ 365.1	48 hours	LCS, Method Blank, MRL Check, MS/MSD

Parameter	Method	Hold Time Analysis	QC Conducted by Laboratory
Total organic carbon	SM 5310C/ E415.3	28 days	LCS, Method Blank, MRL Check, MS/MSD
Biodegradable organic carbon	Allgeier, 1996	48 hours	LCS, Method Blank, MRL Check, MS/MSD
Chloride	EPA 300.0	28 days	LCS, Method Blank, MRL Check, MS/MSD

A copy of the completed chain-of-custody (COC) form is included in the data packages for all batches analyzed for the sampling event. The forms were properly filled out and include relinquished and received signatures. Shipments were received by the laboratory on the day following sampling. The cooler temperatures ranged from 1.5° C to 2.6 C. Compliance is 4° C plus or minus 2° C; therefore, no qualifications were made based on cooler temperature.

The maximum holding times for the various analyses are included in Table 1. All samples were extracted and analyzed within the holding times.

DETECTION LIMIT

Detection limits are specified by the analytical methods. For samples that were diluted by the laboratory, the MRL was raised by the factor of the dilution (e.g., for an MRL of 0.1 mg/L and dilution factor of 2, the diluted MRL is calculated to be 0.2 mg/L). No qualifications were made to the data due to dilutions. Analytes with results below the MRL or the diluted MRL are defined as “ND” (Not Detected).

MINIMUM REPORTING LEVEL CHECK

A reporting level standard is included with every batch/analytical run to confirm the instrument response with the given batch. In instances where the method reporting level check was higher than QC limits, but the sample was non-detect, no qualifications were made. No qualifications were made for data exceeding MRL recoveries QC limits.

LABORATORY MATRIX SPIKES AND SPIKE DUPLICATES

To assess potential matrix effects, an environmental sample and a duplicate are spiked with known concentrations of target analytes. The percent recovery of the target analytes is compared to statistical control limits.

Analytes that failed both MS and MSD are qualified as estimated. Analytes with MS/MSD recoveries below 10 percent were rejected. Analytes that failed on only the MS or the MSD are considered acceptable and the data are not qualified for these analytes. Sample concentrations that exceed the spike added concentrations by more than a factor of four are not flagged.

MS and MSD recoveries were all within the QC limits. In instances where the spike recovery is high, but the result is ND, there is no impact on the data since ND with high recovery is still ND. Samples spiked for MS/MSD from non-LOTT projects were not evaluated. MS/MSD recoveries were all within QC limits.

LABORATORY CONTROL SAMPLES

Laboratory Control Samples (LCS) are samples of known concentration that are carried through the extraction and analysis process. The percent recovery is the percentage of the theoretical concentration, and has statistical control limits indicating that the analytical process is "in control." An LCS sample was run in duplicate with the work order samples. LCS recoveries were all within the QC limits.

LABORATORY METHOD BLANK

An aliquot of reagent water was carried through the entire analytical process. The method blank results indicate any possible contamination exposure during the sample handling, digestion, or extraction process and analysis. In most instances, compounds were not detected at or above the method reporting limits. If the target analyte was detected in the method blank, but the sample was ND, no qualification was made. If the sample result was less than 10 times the result of the method blank, the sample was qualified as an estimate biased high. The qualifications made based on this criterion are shown in Table 2.

Table 2. Method Blank Results

Lab Report	Sample ID	Analyte	Sample Result	Blank Result	Qualifier
765338	Reclaimed Water 1	Dissolved Organic Carbon - Final	4.3 mg/L	0.516 mg/L	J+
	Reclaimed Water 1 Duplicate	Dissolved Organic Carbon - Initial	5.2 mg/L	0.768 mg/L	J+
	Reclaimed Water 1	Dissolved Organic Carbon - Final	4.2 mg/L	0.516 mg/L	J+
	Reclaimed Water 1 Duplicate	Dissolved Organic Carbon - Initial	5.2 mg/L	0.768 mg/L	J+
766118	Reclaimed Water 2	Dissolved Organic Carbon - Final	4.5 mg/L	0.516 mg/L	J+
		Dissolved Organic Carbon - Initial	5.6 mg/L	0.768 mg/L	J+

DUPLICATE FIELD SAMPLE

In order to assess field precision, a duplicate sample was collected for Reclaimed Water 1 (Reclaimed Water 1-Duplicate). Original and duplicate sample values with a RPD exceeding 20% were qualified as estimated. However, if either result was less than 5 times the analyte's MRL, the difference between the original and duplicate sample values was instead used to qualify the data. A difference exceeding the respective MRL flags the sample as estimated. All duplicate samples were within relative control limits.

Appendix D: Lab Reports

(Note: Provided as separate files.)

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Appendix E: Tracer Concentrations – Bromide, SF_6

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Observed Bromide and SF6 Concentrations

				East Lysimeters			West Lysimeters								
Tracer Intro Elapsed Time (days)	Date	RW West	RW East	10 ft	25 ft	50 ft	10 ft	25 ft	50 ft	MW-1		MW-2		MW-3a	
Tracer Introduced 1/16/2018 - 2/3/2018		Br-	Br-	Br-	Br-	Br-	Br-	Br-	Br-	Br-	SF_6	Br-	SF_6	Br-	SF_6
Background Sampling	1/10/2018														
	1/11/2018														
	1/12/2018														
	1/13/2018														
	1/15/2018														
0	1/16/2018			34	50	42	38	29		36				46	0.05
1	1/17/2018	24000	23000	1000	52	41	7100		36			33	0.05	46	0.05
2	1/18/2018	22000	22000	14000	51	41	10000	62	47	34					
3	1/19/2018	42000	43000	17000	51	43	15000	4400	160			29		48	0.05
4	1/20/2018			20000	50	38	15000	7800	660						
6	1/22/2018	36000	34000	24000	49	43	17000	12000	3400	34	0.05	32	0.05		
7	1/23/2018	32000	32000	21000	51	62	19000	14000	7000	36	0.05	34	0.05	290	0.05
8	1/24/2018			22000	50	41	18000	15000	8100	33	2.01	32	0.05		
9	1/25/2018			16000	44	42	13000	15000	10000	32	0.872	32	0.05	800	0.05
10	1/26/2018	31000	31000	1700	54	42	9100	16000	10000	31	0.05	31	0.05		
13	1/29/2018	27000	25000	8200	51	870	8700	5000	10000	37	0.05	35	0.05	2600	0.05
14	1/30/2018	9800													
15	1/31/2018		30000	11000	61	2900	12000	2800	8300	56	0.05	32	0.05	3300	0.05
16	2/1/2018	29000													
17	2/2/2018		24000	24000	50	5700	19000	3400	9200	94	1.36	36	0.05	4000	0.05
20	2/5/2018	45								210	0.05	32			
21	2/6/2018			5800	52	9200	11000	5900	12000					4800	11.4
22	2/7/2018									290					
23	2/8/2018			110	50	8900	2800	2900	13000					5200	0.05
24	2/9/2018									340		10			
27	2/12/2018													6200	11.5
28	2/13/2018			64	72	10000	650	250	5100	560		28			
29	2/14/2018														
30	2/15/2018			56	150	11000	290	140	3300					5600	
31	2/16/2018									800		28			
36	2/21/2018									1400		26		4600	4.25
37	2/22/2018			60	1300	9600	200	120	2000						
41	2/26/2018			56	3000	6300	130	90	1500				29300		
42	2/27/2018														6.23
43	2/28/2018														
44	3/1/2018														
45	3/2/2018														
50	3/7/2018														

Notes:

1. Bromide concentrations in ug/L, MRL for bromide ranges from 5 - 25 ug/L
2. SF6 concentrations in pmol/L, MRL for SF6 = 0.05 pmol/L
3. For samples below or above the reporting limit, the corresponding reporting limit was entered

Observed Bromide and SF6 Concentrations

Tracer Intro Elapsed Time (days)	Date	RW West	RW East	10 ft	25 ft	50 ft	10 ft	25 ft	50 ft	MW-1		MW-2		MW-3a	
Tracer Introduced 1/16/2018 - 2/3/2018		Br-	Br-	Br-	Br-	Br-	Br-	Br-	Br-	Br-	SF_6	Br-	SF_6	Br-	SF_6
55	3/12/2018									Sampling discontinued after 2/21/2018		Sampling discontinued after 2/21/2018		2100	
56	3/13/2018			92	1800	2300	95	74	770						
57	3/14/2018														
58	3/15/2018														
69	3/26/2018						81	51	530						
70	3/27/2018			47	3600	1200								1400	294
71	3/28/2018														
83	4/9/2018													1100	802
84	4/10/2018														
85	4/11/2018			64	490	700	46	54	260						
86	4/12/2018														
87	4/13/2018														
97	4/23/2018														
98	4/24/2018													810	1470
99	4/25/2018			64	490	700	46	54	260						
100	4/26/2018			58	1700	760	56	55	220						
111	5/7/2018			69	600	430	80	76							
112	5/8/2018													660	2110
113	5/9/2018								160						
114	5/10/2018														
146	6/11/2018			140	68	450	57	57							
147	6/12/2018														
148	6/13/2018													400	1830
149	6/14/2018								120						
150	6/15/2018														
174	7/9/2018													400	1060
175	7/10/2018			54	61	520	77	59	85						
176	7/11/2018														
177	7/12/2018														
202	8/6/2018														
203	8/7/2018														
204	8/8/2018			150	54	270	57	51	88						
205	8/9/2018													220	1200
206	8/10/2018														
237	9/10/2018														
238	9/11/2018			57	66	330	130	52	71					220	638
239	9/12/2018														
240	9/13/2018														
258	10/1/2018														
259	10/2/2018			270	56	120	80	69	75					150	616
260	10/3/2018														
261	10/4/2018														

Notes:

1. Bromide concentrations in ug/L, MRL for bromide ranges from 5 - 25 ug/L
2. SF6 concentrations in pmol/L, MRL for SF6 = 0.05 pmol/L
3. For samples below or above the reporting limit, the corresponding reporting limit was entered

Observed Bromide and SF6 Concentrations

Tracer Intro Elapsed Time (days)	Date	MW-5		MW-6		MW-7		MW-8		MW-9		MW-11		Lacey MW-11	
Tracer Introduced 1/16/2018 - 2/3/2018		Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6
Background Sampling	1/10/2018														
	1/11/2018	34	0.05					52	0.66	43	0.05	54			
	1/12/2018														
	1/13/2018													56	0.05
	1/15/2018														
0	1/16/2018														
1	1/17/2018														
2	1/18/2018	740	10	30	0.05	33	0.05	50	0.05	43	0.05				
3	1/19/2018											50			
4	1/20/2018														
6	1/22/2018	16000	257		0.05	32	0.05	51		200	0.05	54	0.05		
7	1/23/2018							60							
8	1/24/2018	18000	354	28	0.35	34	0.05			660	0.0945				
9	1/25/2018							160	0.05						
10	1/26/2018	14000	483	24	0.05	31	0.05			1400	0.198				
13	1/29/2018	11000	844	39	0.05			930	0.05						
14	1/30/2018			140		33	0.05			2600	7.45				
15	1/31/2018	12000	891					1400							
16	2/1/2018			26		31	0.05			3100	8.69	55	2.08		
17	2/2/2018	14000	1120			31	0.05	1900	0.05						
20	2/5/2018			26						3800	15	55			
21	2/6/2018	14000	1820			30		2800	2						
22	2/7/2018			24						4400	43.2				
23	2/8/2018	8600	1710			17		3200	14.4	4500					
24	2/9/2018			24	60						154				
27	2/12/2018	3600	1280					3800	3060	4900	1520				
28	2/13/2018			23	100	26						48			
29	2/14/2018														
30	2/15/2018	2000	2610			27		4200	7710	4400	2600				
31	2/16/2018			23											
36	2/21/2018	910	832					4000	12800	3900	3000				
37	2/22/2018											55	0.05		
41	2/26/2018				7.88		32900								
42	2/27/2018		699						7290		1410		2.24		
43	2/28/2018													72	3.88
44	3/1/2018														
45	3/2/2018														
50	3/7/2018														

Notes:

1. Bromide concentrations in ug/L, MRL for bromide ranges from 5 - 25 ug/L
2. SF6 concentrations in pmol/L, MRL for SF6 = 0.05 pmol/L
3. For samples below or above the reporting limit, the corresponding reporting limit was entered

Observed Bromide and SF6 Concentrations

Tracer Intro Elapsed Time (days)	Date	MW-5		MW-6		MW-7		MW-8		MW-9		MW-11		Lacey MW-11	
Tracer Introduced 1/16/2018 - 2/3/2018		Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6
55	3/12/2018			Sampling discontinued after 2/26/2018		Sampling discontinued after 2/26/2018									
56	3/13/2018	260	453					2600	2840	2000	666				
57	3/14/2018											52	6.51	81	0.05
58	3/15/2018														
69	3/26/2018											51	0.05		
70	3/27/2018	140	338					1900	2290	1300	633				
71	3/28/2018													81	0.05
83	4/9/2018														
84	4/10/2018									1100	395	52	0.05		
85	4/11/2018														
86	4/12/2018	120	242					1300	1070						
87	4/13/2018													83	0.05
97	4/23/2018													81	0.05
98	4/24/2018	95	202					1000	802	850	272				
99	4/25/2018											52	0.05		
100	4/26/2018														
111	5/7/2018														
112	5/8/2018	110	154					750	834	720	277				
113	5/9/2018											83	0.05		
114	5/10/2018													54	0.05
146	6/11/2018														
147	6/12/2018														
148	6/13/2018														
149	6/14/2018	80	134					480	758	550	272				
150	6/15/2018											160	0.05	80	0.05
174	7/9/2018														
175	7/10/2018														
176	7/11/2018													75	0.05
177	7/12/2018	100	76.1					340	921	400	353	480	0.05		
202	8/6/2018														
203	8/7/2018							330	804	370	416				
204	8/8/2018														
205	8/9/2018	83	62									250	0.05		
206	8/10/2018													68	0.05
237	9/10/2018											330	0.05		
238	9/11/2018														
239	9/12/2018	100						320	220	270	464				
240	9/13/2018													59	0.05
258	10/1/2018														
259	10/2/2018														
260	10/3/2018	83	15.7					310	141	280	353	350	0.05		
261	10/4/2018													54	0.05

Notes:

1. Bromide concentrations in ug/L, MRL for bromide ranges from 5 - 25 ug/L
2. SF6 concentrations in pmol/L, MRL for SF6 = 0.05 pmol/L
3. For samples below or above the reporting limit, the corresponding reporting limit was entered

Observed Bromide and SF6 Concentrations

Tracer Intro Elapsed Time (days)	Date	MW-12		MW-13		MW-14		MW-15		MW-16		MW-20		MW-21		MW-22	
Tracer Introduced 1/16/2018 - 2/3/2018		Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6
Background Sampling	1/10/2018											16					
	1/11/2018																
	1/12/2018					33		46									
	1/13/2018	62	0.05	69										36			
	1/15/2018									51	0.05						
0	1/16/2018																
1	1/17/2018							50	2.448	50	5						
2	1/18/2018																
3	1/19/2018			70	0.05			50	0.05	48	0.05						
4	1/20/2018							50		48	0.05						
6	1/22/2018							48	0.05	49	0.05						
7	1/23/2018							50	0.05	52	0.05						
8	1/24/2018					32	0.05	51	0.05	58	0.05						
9	1/25/2018							47	0.05	65	0.05						
10	1/26/2018							47	0.05	79	0.05						
13	1/29/2018							48	0.05	250	0.05						
14	1/30/2018											16	0.05				
15	1/31/2018							46	0.05	460	0.05						
16	2/1/2018	64	0.05	65	2.03	34	0.05										
17	2/2/2018							41	3.28	680	10						
20	2/5/2018					34	4	45	0.05	1100	7.8						
21	2/6/2018																
22	2/7/2018	63	0.05	100	0.05			40		1300		16	0.05				
23	2/8/2018																
24	2/9/2018							33		1500							
27	2/12/2018							42									
28	2/13/2018					35	275			1900	90000	15					
29	2/14/2018	61	1.78	240	0.877												
30	2/15/2018							38		1900							
31	2/16/2018																
36	2/21/2018					190	601										
37	2/22/2018			480	21			38	240	2100	32900	17					
41	2/26/2018								32900								
42	2/27/2018												0.05				
43	2/28/2018		2.88		108		0.05										
44	3/1/2018													20	1.99		
45	3/2/2018											16	0.05				
50	3/7/2018											16	0.05				

Notes:

1. Bromide concentrations in ug/L, MRL for bromide ranges from 5 - 25 ug/L
2. SF6 concentrations in pmol/L, MRL for SF6 = 0.05 pmol/L
3. For samples below or above the reporting limit, the corresponding reporting limit was entered

Observed Bromide and SF6 Concentrations

Tracer Intro Elapsed Time (days)	Date	MW-12		MW-13		MW-14		MW-15		MW-16		MW-20		MW-21		MW-22	
Tracer Introduced 1/16/2018 - 2/3/2018		Br-	SF$_6$	Br-	SF$_6$	Br-	SF$_6$	Br-	SF$_6$	Br-	SF$_6$	Br-	SF$_6$	Br-	SF$_6$	Br-	SF$_6$
55	3/12/2018	110	11.6	870	500			42	231000	1800	231000			20	0.05		
56	3/13/2018																
57	3/14/2018					42	0.05					18				66	20.5
58	3/15/2018																
69	3/26/2018					35	1.57	220		1600		16	0.05				
70	3/27/2018	110	18.3	870	687												
71	3/28/2018													20	0.05	61	0.05
83	4/9/2018							1,700	X	1500	7570						
84	4/10/2018	110	26.8	800	782							16	0.05				
85	4/11/2018					36	0.05							20	0.05	64	0.05
86	4/12/2018																
87	4/13/2018																
97	4/23/2018							88	33,500	1200	12000	16	0.05				
98	4/24/2018					36	4.67										
99	4/25/2018	94	35.8	680	895									20	0.05	37	0.05
100	4/26/2018																
111	5/7/2018									1200	5260	16	0.05				
112	5/8/2018					39	35.9	190	33500								
113	5/9/2018	85	28.3	540	712												
114	5/10/2018													20	0.05	46	0.05
146	6/11/2018																
147	6/12/2018					38	1.28	210	5990			16	0.05				
148	6/13/2018									1000	4220						
149	6/14/2018													21	0.05	110	0.05
150	6/15/2018	74	21.1	390	784												
174	7/9/2018					38	0.05	120	2800	660	3240						
175	7/10/2018	72		340	573							15	0.05	21	0.05		
176	7/11/2018																
177	7/12/2018																
202	8/6/2018									450	903						
203	8/7/2018	60		330	234	38	1.33										
204	8/8/2018							97	2910			16	0.05				
205	8/9/2018																
206	8/10/2018													20	0.05		
237	9/10/2018																
238	9/11/2018	61	1.54	300	588	39	0.05			440	1410	14	0.05				
239	9/12/2018							120	3190								
240	9/13/2018													18	0.05		
258	10/1/2018													18	0.05		
259	10/2/2018	64	2.3	290	442	39	0.05	100	2557	400	1298	14	0.05				
260	10/3/2018																
261	10/4/2018																

Notes:

1. Bromide concentrations in ug/L,
2. SF6 concentrations in pmol/L, MRL for SF6 = 0.05 pmol/L
3. For samples below or above the reporting limit, the corresponding reporting limit was entered
4. On 8/7/2018 the bromide samples from MW-12 and MW-13 were mislabeled. The values reported here are corrected. The values reported in the lab reports reflect the mislabeling.

Observed Bromide and SF6 Concentrations

Tracer Intro Elapsed Time (days)	Date	MW-23		MW-24		MW-25		MW-26		MW-27		MW-28		Landfill MW-1		Landfill MW-10S	
Tracer Introduced 1/16/2018 - 2/3/2018		Br-	SF$_6$	Br-	SF$_6$	Br-	SF$_6$	Br-	SF$_6$	Br-	SF$_6$	Br-	SF$_6$	Br-	SF$_6$	Br-	SF$_6$
Background Sampling	1/10/2018									38	0.05						
	1/11/2018																
	1/12/2018					15		38									
	1/13/2018	32	0.05	7.1								21	0.05				
	1/15/2018																
0	1/16/2018																
1	1/17/2018																
2	1/18/2018									36							
3	1/19/2018			7													
4	1/20/2018																
6	1/22/2018									36							
7	1/23/2018																
8	1/24/2018																
9	1/25/2018																
10	1/26/2018																
13	1/29/2018																
14	1/30/2018			6.4	0.05	17	0.05			390	0.05						
15	1/31/2018																
16	2/1/2018																
17	2/2/2018																
20	2/5/2018					17				910	1.13						
21	2/6/2018	30		6.1	367												
22	2/7/2018																
23	2/8/2018																
24	2/9/2018																
27	2/12/2018																
28	2/13/2018	5				64	2.21			1500	1640						
29	2/14/2018																
30	2/15/2018																
31	2/16/2018																
36	2/21/2018									1500	11900						
37	2/22/2018					310	0.05										
41	2/26/2018																
42	2/27/2018										11900		0.05				
43	2/28/2018		0.05		0.05												
44	3/1/2018					180								150	0.05	21	0.05
45	3/2/2018									1300	9560	19					
50	3/7/2018					68	0.05			1200	7530	19	0.05				

Notes:

1. Bromide concentrations in ug/L, MRL for bromide ranges from 5 - 25 ug/L
2. SF6 concentrations in pmol/L, MRL for SF6 = 0.05 pmol/L
3. For samples below or above the reporting limit, the corresponding reporting limit was entered

Observed Bromide and SF6 Concentrations

Tracer Intro Elapsed Time (days)	Date	MW-23		MW-24		MW-25		MW-26		MW-27		MW-28		Landfill MW-1		Landfill MW-10S	
Tracer Introduced 1/16/2018 - 2/3/2018		Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6	Br-	SF_6
55	3/12/2018					53				1000	5450						
56	3/13/2018	29	4.72	5.2	4.44												
57	3/14/2018													180	0.05	23	0.05
58	3/15/2018											19					
69	3/26/2018											20	0.05				
70	3/27/2018									830	3360						
71	3/28/2018	29	0.05	5.1	0.05	90	0.05							120	0.05	19	0.05
83	4/9/2018			6.6		110	2.1										
84	4/10/2018																
85	4/11/2018	29	0.05							750	2100	19	0.05				
86	4/12/2018													120	0.05	22	0.05
87	4/13/2018																
97	4/23/2018											19	0.05				
98	4/24/2018	29	0.05	8.7	0.05												
99	4/25/2018									690	867			110	0.05	21	0.05
100	4/26/2018					91	0.05										
111	5/7/2018					160	0.05			580	583	18	0.05				
112	5/8/2018							25	0.05								
113	5/9/2018	29	0.05	8	0.05									110	0.05	20	0.05
114	5/10/2018																
146	6/11/2018							28	0.05	430	326						
147	6/12/2018					140	0.05						0.05				
148	6/13/2018													110	0.05	22	0.05
149	6/14/2018	30	0.05	7	0.05												
150	6/15/2018																
174	7/9/2018					96	0.05	26	0.05	330	169						
175	7/10/2018											18	0.05				
176	7/11/2018			9	0.05									110	0.05	23	0.05
177	7/12/2018	28	0.05														
202	8/6/2018	30	0.05							340	113						
203	8/7/2018											17					
204	8/8/2018					40	0.05						0.05	110	0.05	20	0.05
205	8/9/2018			8.9	0.05												
206	8/10/2018																
237	9/10/2018	28	0.05			40	0.05					16	0.05				
238	9/11/2018																
239	9/12/2018													100	0.05	22	0.05
240	9/13/2018			8	0.05												
258	10/1/2018	32	0.05	7.6	0.05	30	0.05					17	0.05				
259	10/2/2018																
260	10/3/2018													110	0.05	23	0.05
261	10/4/2018																

Notes:

1. Bromide concentrations in ug/L, MRL for bromide ranges from 5 - 25 ug/L
2. SF6 concentrations in pmol/L, MRL for SF6 = 0.05 pmol/L
3. For samples below or above the reporting limit, the corresponding reporting limit was entered

Appendix F: Vadose Zone Instrumentation and Monitoring

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Technical Memorandum

To: **Wendy Steffensen, LOTT**

From: **Ida Fischer, Mike Murray, and Jeff Hansen, HDR**

Date: **October 30, 2019**

Subject: **Discussion of Vadose Zone Instrumentation at the LOTT Hawks Prairie Facility, Basin 4, Reclaimed Water Infiltration Study**

1.0 Introduction

Two sets of dedicated instruments were installed during the hydrogeologic characterization effort (Task 2.1.1) to measure and record soil pore-water moisture, conductivity, and temperature, and to measure soil oxygen in individual boreholes adjacent to the lysimeters. This work is documented in *Hydrogeologic Characterization Report On-site Well and Lysimeter Installation (Task 2.1.1.A) Off-site Monitoring Wells (Task 2.1.2.C) Hawks Prairie Area* (HDR 2018). One set of instruments was installed in the east half and one set in the west half of Basin 4. The purpose of these instruments is to record soil parameters during recharge testing and to assist in determination of the recharge wetting front through the vadose zone. The pore-water moisture, conductivity, and temperature instruments are the ECH20/5TE sensor and the EM50 digital logger manufactured from Decagon Devices (also known as The Meter Group). The soil oxygen instruments are the SO-110 manufactured by Apogee Instruments. The instruments were installed together in a 50-foot-deep, 7-inch-diameter borehole at depths of 10, 25 and 50 feet. The instruments were tied to a 1-inch-diameter PVC guide pipe using plastic zip-ties and placed in the boring. A bentonite chip seal was placed at the top 2 feet of the borehole and inside the PVC guide pipe and native cuttings were placed in the borehole annulus around the instruments. The construction diagrams for the soil instruments are presented in the figure below.

The data collected are discussed in the following sections. Included in this discussion are reasons why the soil moisture, bulk electrical conductivity, and soil oxygen data have been deemed unusable for further analysis and have therefore not been included in other documentation of the tracer test and water quality monitoring effort that was conducted in 2018. The observed reclaimed water and subsurface temperature further supports the characterization of how reclaimed water travels through the vadose zone.

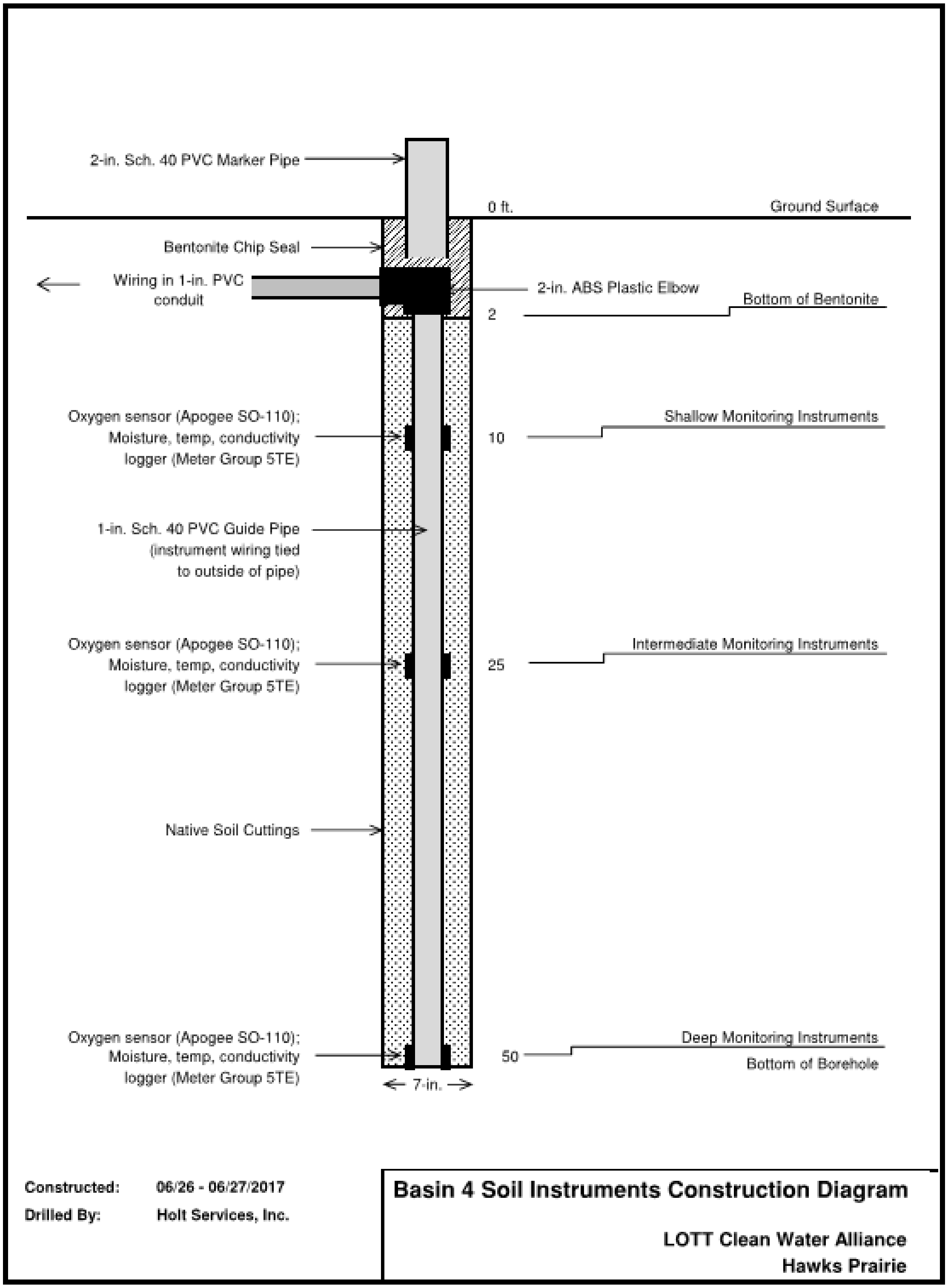


Figure 1. Basin 4 Soil Instruments Construction Diagram

2.0 Soil Moisture Data

The soil moisture measurement results are discussed in the context of soil physics theory, laboratory measured physical soil parameters, and the data from the soil moisture sensors.

2.1 Soil Moisture Concepts

The water content of soil is expressed on a volumetric or gravimetric basis:

Volumetric water content: θ = volume water/bulk volume soil (cm^3/cm^3)
Gravimetric water content: θg = mass water/mass dry soil (g/g)
Where:
cm^3 = cubic centimeters and g is grams

For soil samples collected from the field and submitted for commercial laboratory testing, moisture content is typically measured on a gravimetric basis. The volumetric water content is typically 40 to 60 percent greater than the gravimetric content and the relationship between the two is expressed as follows:

$$\theta = (\rho b/\rho w) \times \theta g$$

Where:
ρb = the dry bulk density (typically between 1.4 to 1.6 g/cm^3)
ρw = the density of water (1 g/cm^3)

2.1.1 Soil-Water Retention (Background)

To understand how water interacts with soil, visualize a 1-gallon bucket with holes drilled in the bottom, which contains very dry soil and is free draining (no standing water on the bottom of bucket). A teaspoon of water is poured on top of the soil. A small wet spot on the surface of soil forms. The water infiltrates about 0.5-inch into the soil under gravity, but then stops moving. This water stops moving because it is held under suction (often referred to as pore-water pressure or soil-water potential) that is imparted by the dry soil. A pea seed is placed in the moist soil. The seed begins to germinate but dies (wilts) within a day or two due to lack of soil water to support growth. In a few days, the soil moisture content is near dry due to evaporation.

Next, 0.5 gallon of water is slowly poured onto the soil (poured slowly enough that there is no water runoff from the top of the soil). The entire soil column becomes very wet (saturated) and water begins to drain out of the bottom of the bucket. The soil feels wet to the touch. The bucket is allowed to sit for several days. The amount of free draining water drops quickly, with most of the water draining during the first few hours after adding the water and then quickly dropping in volume until there are only a few drops draining after 24 hours. About 0.25 gallon of water is collected from the bottom of the bucket over this time-period. The water remaining in the bucket (about 0.25 gallon) is held under suction (it no longer free-drains under the force of gravity), however, the soil is moist. A pea seed is added to the soil, it germinates and the soil provides moisture for the plant to grow for several weeks. The soil becomes drier over the 2-week period due to evaporation and transpiration.

Soil suction (matric potential) and soil water content are interrelated, which is shown as a soil-water retention curve or soil water characteristic curve (**Figure 3**). The curve describes the soil suction relative to the volume of water stored in soil pores. The wetter the soil becomes, the greater the moisture content and the lower soil suction. As soil dries, the remaining soil pore water is held tighter (becomes a film around soil particles and soil pores become filled with air) and is less available to plant roots.

Two points of interest on the soil-water retention curve for irrigation management and when assessing reclaimed water basin infiltration are the *field capacity* and the *permanent wilting point.* Field capacity is the water content or pore-water pressure at which free drainage by gravity is negligible. For most soils, field capacity pore-water pressures (suction) range between -100 centimeters for sandy soils, -350 centimeters for medium-textured soil, and -500 centimeters for clayey soils (**Figure 2**). (Note: in Figure 2 soil suction is expressed in centimeters, which is energy per unit weight of soil, see Radcliffe and Simunek 2010 for details).

In the example above, the soil moisture content in the soil after it was allowed to drain for several days would be reflective of the field capacity. Soil water in excess of field capacity is subject to drainage (moves below the root zone). At field capacity, plant roots can easily absorb water.

As roots absorb water and the soil becomes drier, eventually a water deficit develops inside the plant and the plant wilts. The permanent wilting point is the soil-water content or pore-water pressure at which plants can no longer extract water. The permanent wilting point depends upon plant type and soil, but typically is about -15,000 centimeters (**Figure 2**).

The difference between field capacity and the permanent wilting point water content is the water available for plant growth and transpiration, and this is called the *soil water holding capacity*. For example, for a loam soil, the field capacity is 0.29 (volumetric water content) and the permanent wilting point is 0.09 (volumetric water content), resulting in a water holding capacity of 0.20. In irrigation management, the water holding capacity is typically expressed as inches of water/inches of soil. Thus, the water holding capacity for a silt loam is 0.20 inch of water per inch of soil. For a 60-inch root zone, the water holding capacity is 12 inches.

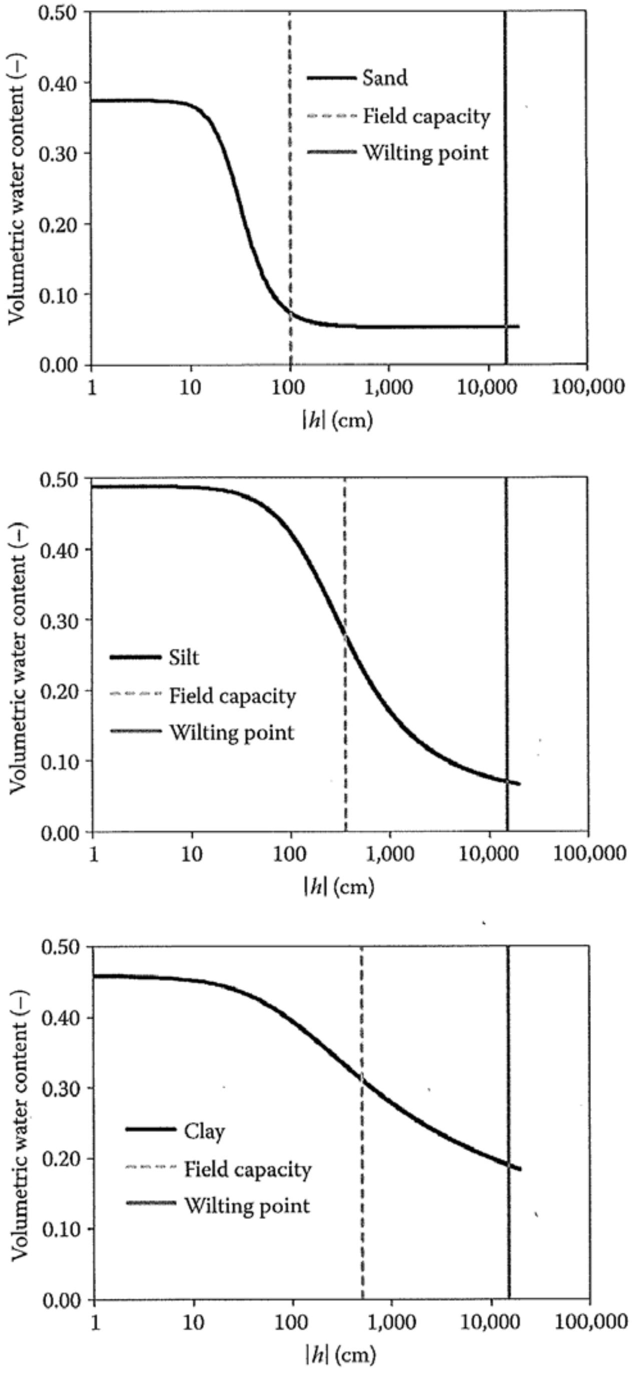
Table 1 presents typical field capacity, permanent wilting point, and water holding capacity as a function of soil texture. Soils with the highest water holding capacity have silt loam and clay loam textures and soils with the lowest holding capacity have sand textures. **Table 1** is based on “typical” values throughout the United States.

Table 1. Field Capacity, Permanent Wiling Potential, and Water Holding Capacity Water Contents for Soils

Soil Texture	Field Capacity	Permanent Wilting Point	Water Holding Capacity
	θ – volumetric water content (inches water/inch soil)		
Sand	0.10	0.05	0.05
Fine Sand	0.15	0.06	0.09
Sandy Loam	0.20	0.07	0.13
Fine Sandy Loam	0.25	0.08	0.17
Loam	0.29	0.09	0.20
Silt Loam	0.31	0.10	0.21
Clay Loam	0.39	0.18	0.21
Clay	0.40	0.23	0.17

Source: Fetter 1988

In irrigation management, the goal is to maintain soil moisture between the field capacity (on the high end) and about 50 percent of the available water holding capacity on the dry end (Ashley et. al, 1998). Going below 50 percent of the available water holding capacity can stress the crop and result in a yield reduction (the actual depletion percent is variable depending upon crop type and growth stage).



(Source: Figure from Radchliffe and Simunek 2010)

Figure 2.Soil Retention Curves for Sand, Silt, and Clay

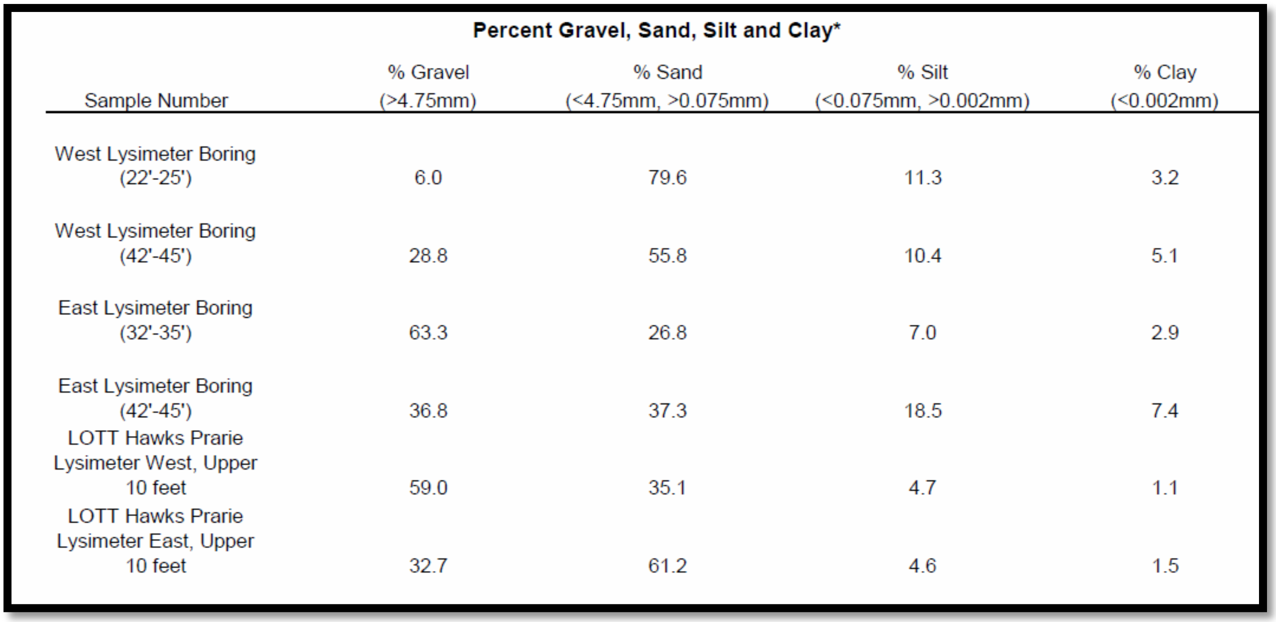
2.2 Infiltration Basins

For the Hawks Prairie infiltration basin tracer study, reclaimed water was applied almost continuously for the 304 day study period. However, only half the basin was active at any given time, with the other half of the basin allowed to drain. Thus, similar to the examples given above, with an even application of water onto a moist soil at or near field capacity, a wetting front occurs as water percolates through the soil under gravity and the soil matrix (suction) approaches 0 centimeters. For example, in **Figure 2** the top chart (sand textured soil), a soil that has rested (no water application, thus soil becomes free draining) for several days would be expected have a moisture content around 0.1 cm^3/cm^3 (field capacity). This can also be expressed as 10 percent (0.1 cm^3/cm^3 X 100). As water is added, the moisture content in the soil will increase to approximately 38 percent (cm^3/cm^3), which is considered to be saturation. As long as water is applied the soil would remain saturated with a moisture content of near 38 percent. Once water application is stopped, the moisture content will decrease as the soil drains until the field capacity is reached (back to approximately 10 percent or 0.1 cm^3/cm^3). For soil moisture to drop below field capacity, evaporation or transpiration would need to occur. Thus, soils near the surface would be expected to go below field capacity due to evaporation (assuming no vegetation), while deeper soils would remain near field capacity when allowed to drain.

2.2.1 Laboratory Evaluation

During the installation of lysimeters in Basin 4, undisturbed soil samples were collected and soil moisture characteristics were measured including soil retention curves (work by Daniel B Stephens & Associates, Inc.). **Table 2** provides texture content and description of soils. The soil retention curves illustrated in **Figure 2** are for sand, silt, and clay dominant soils. Soils high in gravel content (as the case for most of the Hawk Prairie samples, **Table 2**) would have a lower water holding capacity.

Table 2. Percent Gravel, Sand, Silt, Clay

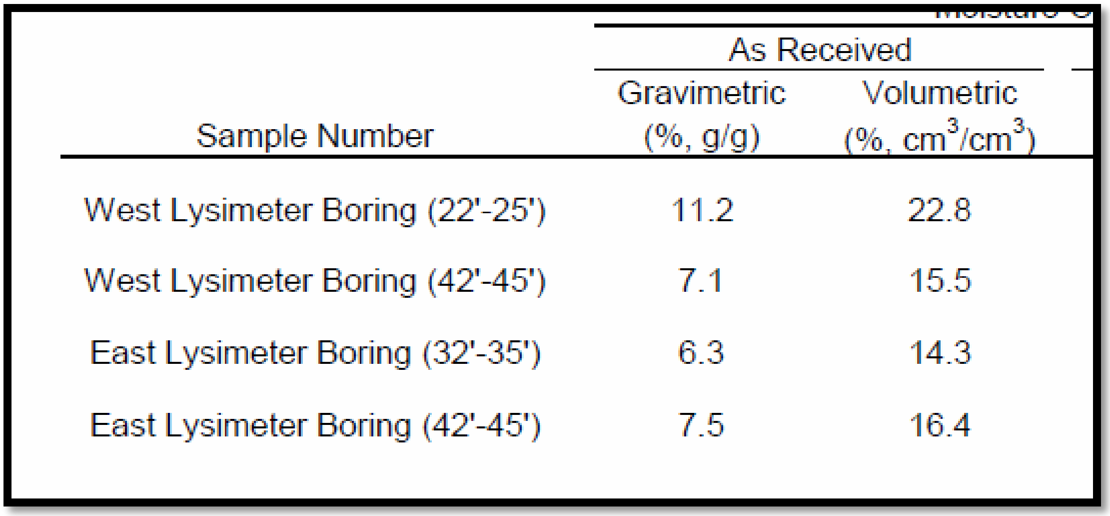


Percent Gravel, Sand, Silt and Clay*

Sample Number	% Gravel (>4.75mm)	% Sand (<4.75mm, >0.075mm)	% Silt (<0.075mm, >0.002mm)	% Clay (<0.002mm)
West Lysimeter Boring (22'-25')	6.0	79.6	11.3	3.2
West Lysimeter Boring (42'-45')	28.8	55.8	10.4	5.1
East Lysimeter Boring (32'-35')	63.3	26.8	7.0	2.9
East Lysimeter Boring (42'-45')	36.8	37.3	18.5	7.4
LOTT Hawks Prarie Lysimeter West, Upper 10 feet	59.0	35.1	4.7	1.1
LOTT Hawks Prarie Lysimeter East, Upper 10 feet	32.7	61.2	4.6	1.5

Table 3 presents the moisture content of the collected samples. Given that a drill rig was used to obtain samples from within the basin, sampling occurred during a basin drying cycle (no reclaimed water added). Thus, the volumetric content reflects “draining” conditions and we would expect moisture contents to be between saturated and field capacity.

Table 3. Moisture Content of Sampled Soils



	As Received	
Sample Number	Gravimetric (%, g/g)	Volumetric (%, cm^3/cm^3)
West Lysimeter Boring (22'-25')	11.2	22.8
West Lysimeter Boring (42'-45')	7.1	15.5
East Lysimeter Boring (32'-35')	6.3	14.3
East Lysimeter Boring (42'-45')	7.5	16.4

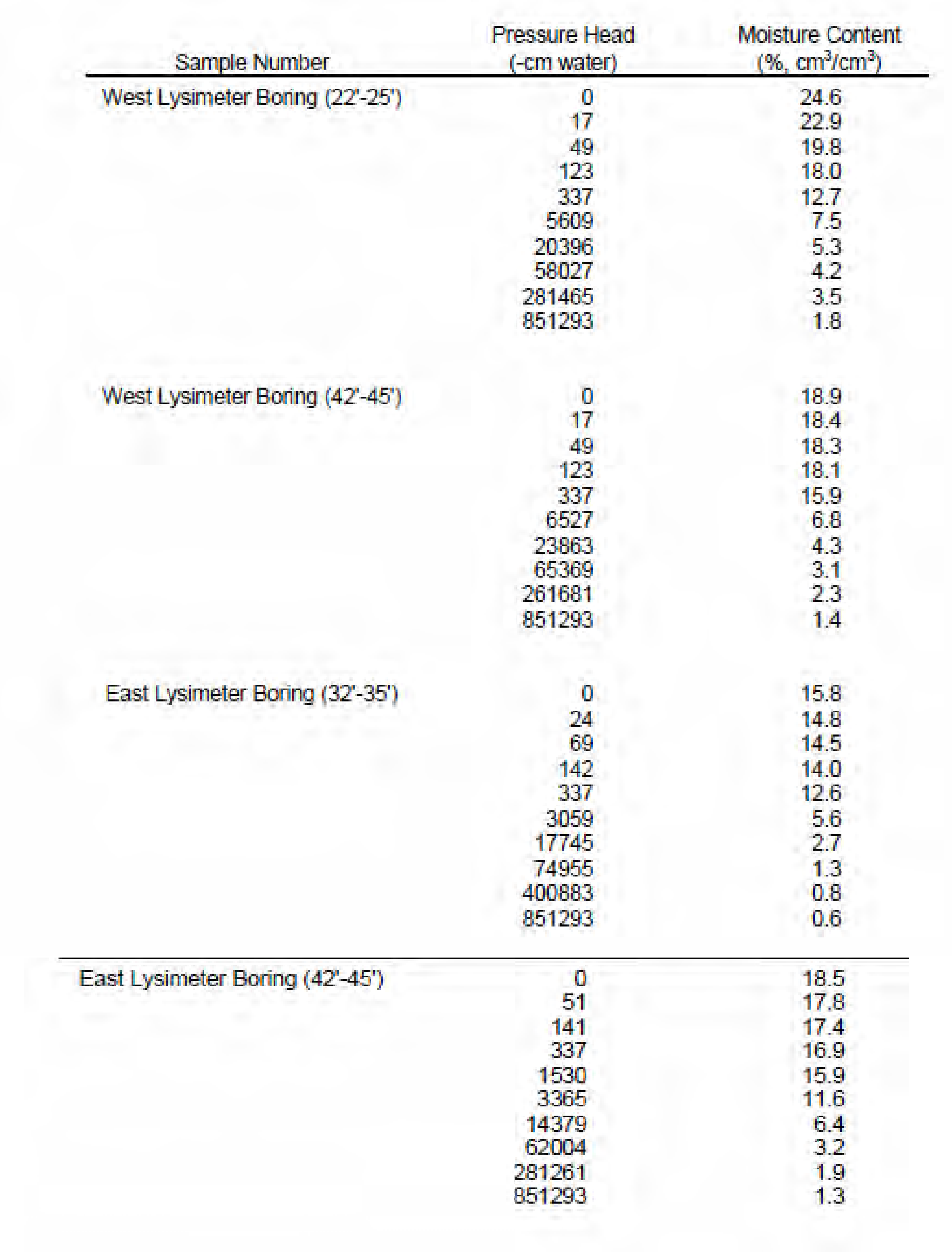
Table 4 presents the moisture characteristics for these samples (suction versus moisture content). In general, the saturated gravimetric moisture content ranges from 15.8 to 24.6 percent (cm^3/cm^3). The field capacity (assume approximately -100 cm for a sandy soil) ranges from 17 to 18 percent (cm^3/cm^3). For the samples with high gravel and sand content, the difference in moisture content between saturated and field capacity is small. For example:

- West Lysimeter Boring 42 to 45 feet saturated (0 cm) = 18.9 percent (cm3/cm3) compared to field capacity (-100 cm) of 18.2 percent (cm3/cm3), only a difference of 0.7 cm.

Based on soil moisture characterization of Basin 4 soils, the following summary is made:

- Expect saturated moisture contents to range from 15 to 25 percent (cm^3/cm^3) range.
- Expect field capacity moisture content (drained soils) to be in the 14 to 18 percent (cm^3/cm^3) range.
- Expect near surface soils to show greater range in moisture content as these soils would be subject to evaporation compared to deeper soils.

Table 4. Soil Moisture Characteristics



Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
West Lysimeter Boring (22'-25')	0	24.6
	17	22.9
	49	19.8
	123	18.0
	337	12.7
	5609	7.5
	20396	5.3
	58027	4.2
	281465	3.5
	851293	1.8
West Lysimeter Boring (42'-45')	0	18.9
	17	18.4
	49	18.3
	123	18.1
	337	15.9
	6527	6.8
	23863	4.3
	65369	3.1
	261681	2.3
	851293	1.4
East Lysimeter Boring (32'-35')	0	15.8
	24	14.8
	69	14.5
	142	14.0
	337	12.6
	3059	5.6
	17745	2.7
	74955	1.3
	400883	0.8
	851293	0.6
East Lysimeter Boring (42'-45')	0	18.5
	51	17.8
	141	17.4
	337	16.9
	1530	15.9
	3365	11.6
	14379	6.4
	62004	3.2
	281261	1.9
	851293	1.3

2.2.2 On-Site Probes

Six soil moisture probes were installed in Basin 4:

- West Basin: 10, 25, 50 feet
- East Basin: 10, 25, 50 feet

Boreholes were advanced and probes placed at specified depths by securing the probes (sensors) on the outside of a PVC pipe. The borehole was then backfilled with native material. The sensors are metal prongs that should be pushed into native soil for good contact. Since the probes were placed in the borehole which was then backfilled with native soil cuttings, good contact with the native soil is uncertain.

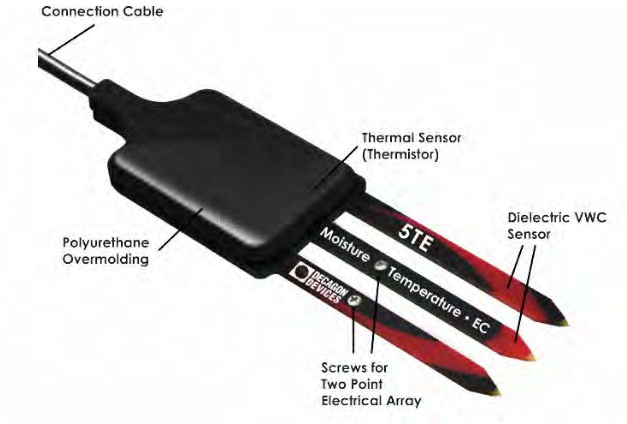


Figure 3. 5TE Components

Readings from the soil moisture probes are summarized in the figure below. Given the gravel and sand textured soils, gravimetric moisture content should be between 15 to 25 percent (cm^3/cm^3) (saturated to field capacity range). Readings from the sensors, as summarized in **Figure 4** and **Figure 5**, are at least 2 times higher than expected and are not physically possible for these types of soils. This suggests either the sensors are reading different textured material (the sensors are reading the backfill material) or the sensors do not have good physical contact with native soils. As noted by the manufacturer, it is important to avoid air gaps and the prongs need to be inserted fully into the soil.

Given the depths of the installation, it is doubtful these prongs have good physical contact with soils. Thus, theses readings are not reliable and not reflective of gravelly sandy textured soils found at the site.

While the readings are not reliable, relative differences in readings (change over time) may be useful for comparing changes in moisture content. The 10-foot sample appears to respond to changes in moisture and may be indicative of saturated conditions followed by drainage (see discussion above). However, the swing in moisture changes of over 2 percent (cm^3/cm^3) is not indicative of gravelly sandy soils but a finer texture material. Whereas the deeper readings show little change and may reflect more continuous saturated conditions. (Note that units in **Figure 4** and **Figure 5** are m^3/m^3, which is the same as cm^2/cm^2. To get percentage, multiply by 100.)

The blue shading in **Figure 4** and **Figure 5** reflects the time periods when reclaimed water was added. The 10-foot water content reflects the recharge period (at least for June through August). For this depth, when water is added (blue shade area) the volumetric moisture content is about 36 percent (m^3/m^3). When no water is being added, the basin is draining, meaning the moisture content is decreasing until it reaches near field capacity. For June through August, the 10-foot monitoring point drops in moisture content during the draining periods to about 24 percent moisture. The deeper monitoring points do not show this trend, and either reflect near saturated conditions or the probes are not properly reading soil moisture. Given that groundwater depth is greater than 75 feet below ground surface (even during recharge), drainage does occur, thus a similar trend as shown for the 10-foot monitoring point would be expected.

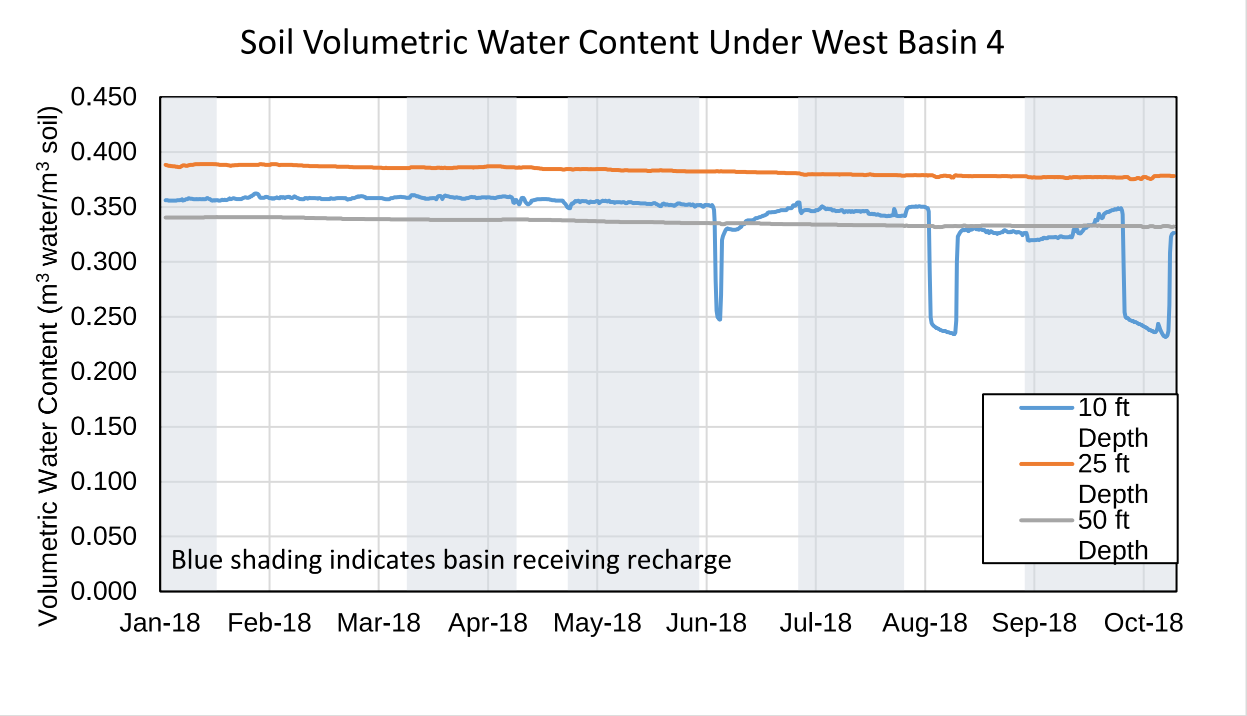


Figure 4. Soil Volumetric Content over Time – West Basin

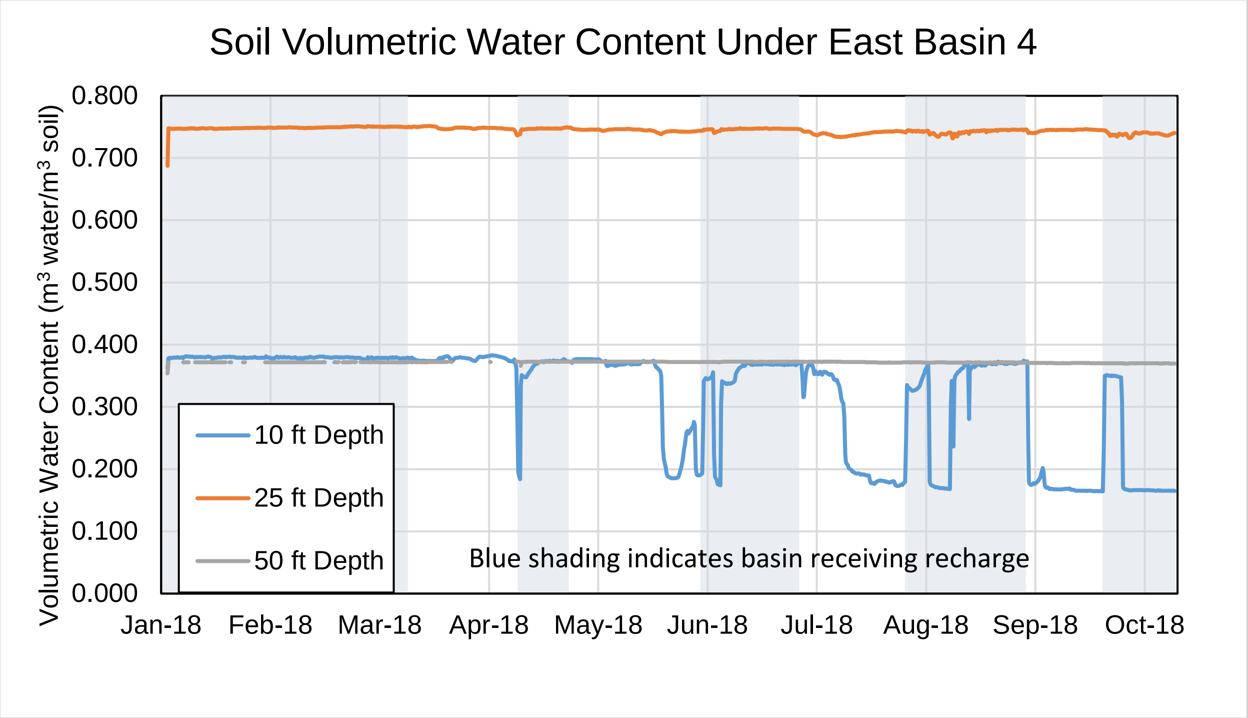


Figure 5. Soil Volumetric Content over Time – East Basin

2.3 Temperature Data

Temperature was measured by the ECH20/5TE at depths of 10, 25, and 50 feet on the west and east halves of Basin 4 (**Figure 6** and **Figure 7**).

Also included in **Figure 6** and **Figure 7** are manual temperature readings of reclaimed water and pore water collected from the lysimeters.

Several observations are made:

- For the temperature probe readings, the 10-foot monitoring point had higher temperatures compared to the deeper 25- and 50-foot samples. The shallower monitoring point (10 feet) is more reflective of the reclaimed water temperature, and as the water moves through the vadose zone it cools (soil acts to buffer the temperature). As such, one would expect the greatest temperature fluctuations in the shallower monitoring point and less fluctuations with depth given the soil's ability to buffer temperature.
- Temperature is highest for all three depths during the summer months, peaks in August and is at the lowest temperature in January and February. The shift in temperature reflects ambient air temperature conditions, where the warmer summer months results in a warmer temperature reclaimed water entering the basins.

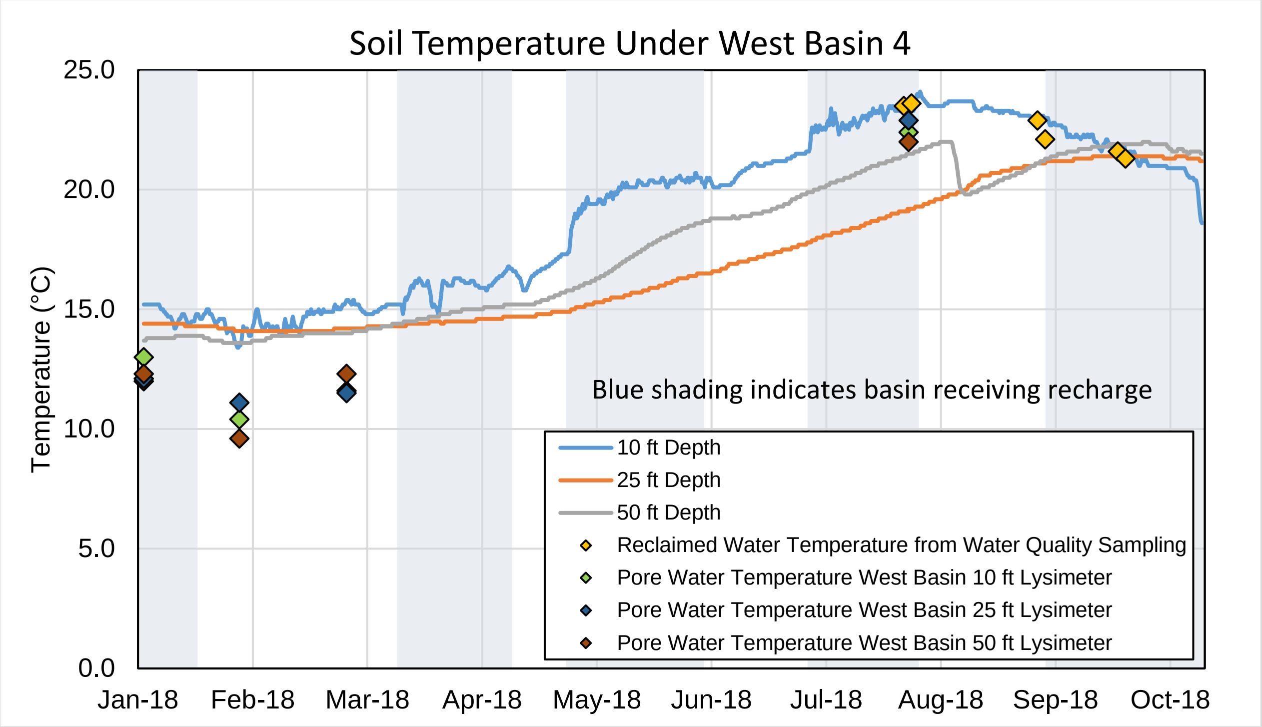


Figure 6. Observed Temperature under West Basin 4

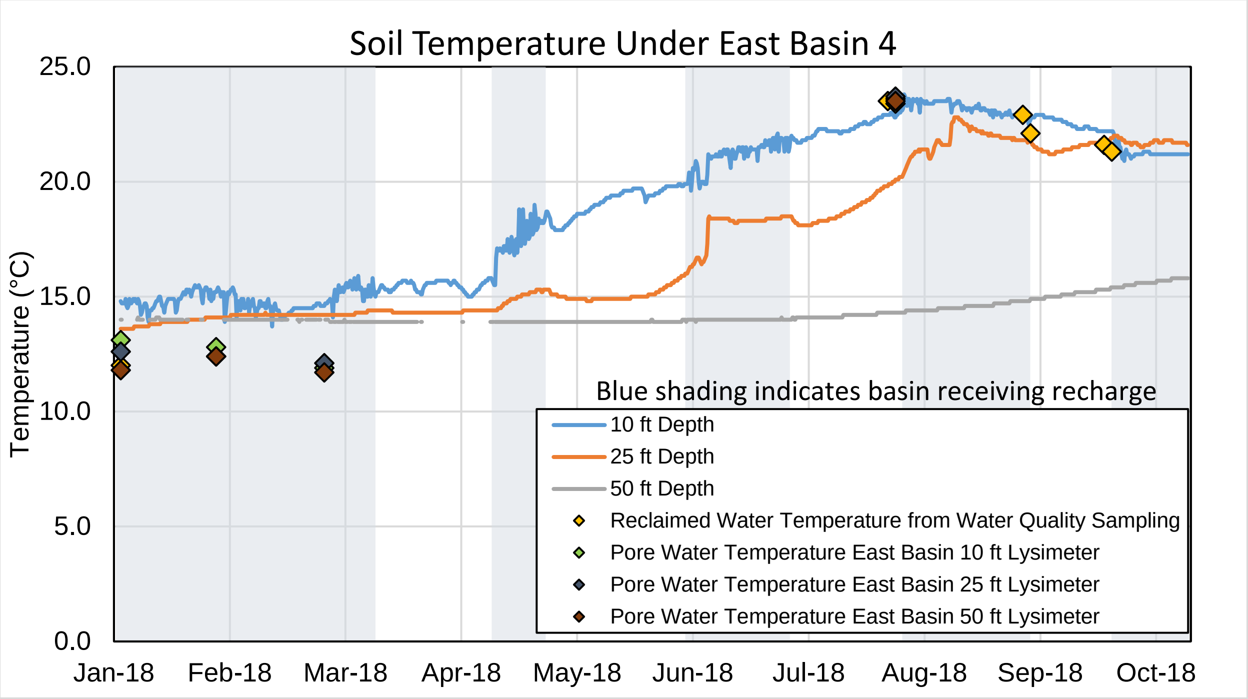


Figure 7. Observed Temperature under East Basin 4

3.0 Electrical Conductivity

Bulk electrical conductivity was measured by the ECH20/5TE at depths of 10, 25, and 50 feet on the west and east halves of Basin 4 (**Figure 8** and **Figure 9**). EC is an indicator of the quantity of dissolved salts. Soluble salts are a combination of positively-charged elements (cations) and negatively-charged elements (anions). Cations include calcium, sodium, magnesium, and potassium, and anions include sulfate, chloride, bicarbonate, phosphate, and nitrate. As discussed in **Section 2.2.2** it is uncertain if the probes are in good contact with the soil. <u>Therefore the electrical conductivity as measured by the buried ECH20/5TE probes is qualitative at best</u>.

The following observations were noted:

- In general electrical conductivity is greater at the 25 foot sensors and in samples collected from the 25 foot lysimeters than at the 50 foot sensors and lysimeters. This may be because as the reclaimed water moves down through the soil profile some cations and anions sorb to clay and organic matter, decreasing the salts in solution.
- The timing of changes in bulk electrical conductivity measured by the 10 foot sensors track with temporal trends in the soil volumetric content measured at by the 10 foot sensors. During the summer months the drops in electrical conductivity occur after a short delay from when reclaimed water is no longer applied to that half of Basin 4 as can be seen in **Figure 8** and **Figure 9**.

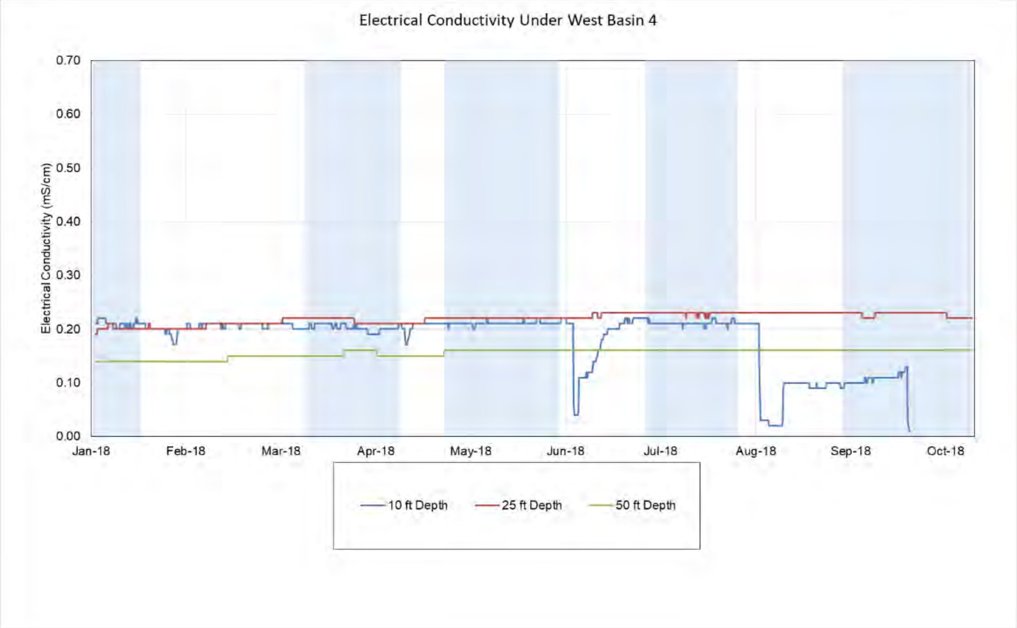


Figure 8. Observed Conductivity Under West Basin 4

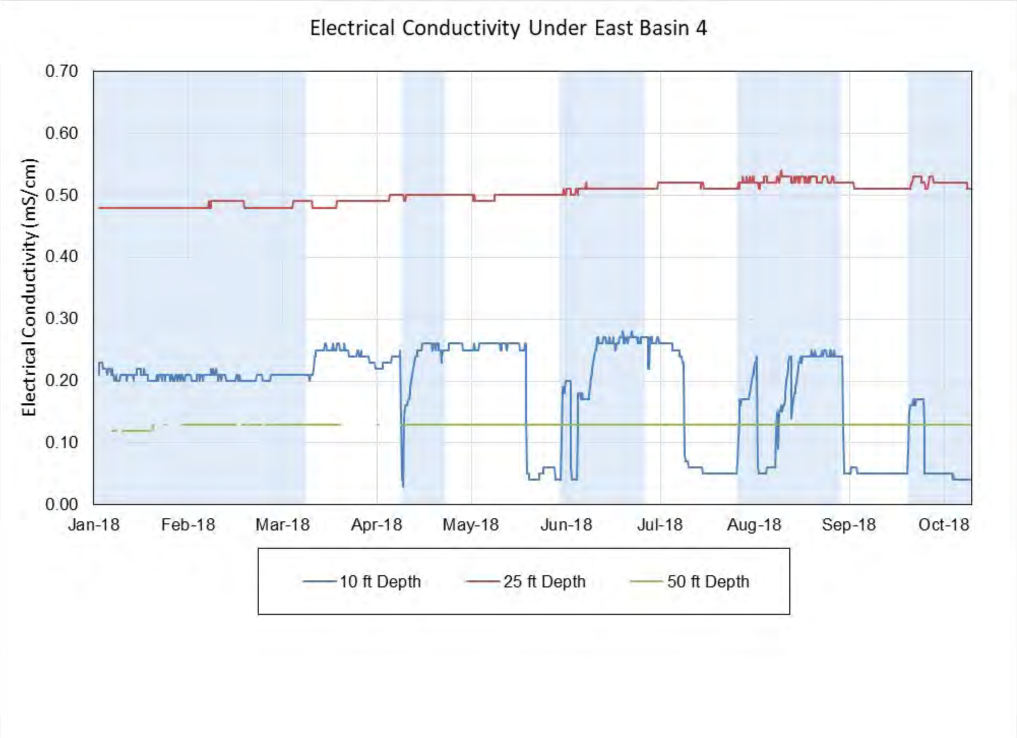


Figure 9. Observed Conductivity Under East Basin 4

5.0 Partial Pressure of Oxygen

Sensors measuring the partial pressure of oxygen were installed alongside the moisture probes as described above. Oxygen sensors were installed at depths of 10, 25, and 50 feet on the west and east sides of Basin 4. The installed sensors are model SO-110 manufactured by Apogee.

The sensor measures gaseous O_2. The SO-110 sensor is a galvanic cell sensor that produces an electrical current via the electrochemical reaction of oxygen and an electrolyte. In ambient air (21% O_2) the sensor is expected to produce a reading of 52 -58 mV, and in the absence of oxygen the sensor is expected to read about 2.6 mV. Readings from the sensor are taken using a voltmeter, the output voltage (mV_m) is then transformed to the partial pressure of oxygen (O_2) using a calibration factor (CF) and offset (which is also derived from the calibration factor).

$$O_2 = CF \cdot mV_m - Offset$$

Calibration factors were not determined before sensor installation in the field. Apogee technical support was contacted to assist with interpretation of collected measurements and to see if there was a representative calibration factor that could be used. The SO-100 series (including the SO-110) have a calibration factor of approximately 0.39 kPa O_2 per mV (yielding a sensitivity of approximately 2.6 mV per % O_2).

The approximate calibration factor of 0.39 could not be applied to readings of 0 mV since all oxygen sensors have a "0 offset" meaning there should always be a positive mV reading, even in the absence gaseous oxygen (about 2.6 mV, the sensitivity noted above). Possible explanations for a reading of 0 mV include that the meter is defective or improperly used. Technical support noted that if the sensor is stored in a 0% O_2 environment for an extended period of time, the sensor's offset voltage becomes lower and response speed to O_2 will become slower. In this case, the sensor will be able to recover to normal response speed after exposure to a normal environment for a period of 24 hours. However, if the sensor is in a 0% O_2 environment for 3 days or longer, sensor characteristics may not recover to the original state. Based on the observed sensor readings in **Table 5**, it appears the sensors were compromised (based on the readings below 2.6 mV and 0 mV), and that the partial pressure of oxygen is not able to be estimated from these data.

Table 5.

Date	West Lysimeters			East Lysimeters		
	10 ft (mV)	25 ft (mV)	50 ft (mV)	10 ft (mV)	25 ft (mV)	50 ft (mV)
1/19/2018	16.8	0.7	0	4.6	0	0
3/27/2018	0	0	0	0.5	0	0
5/10/2018	0	0	0	0	0	0
6/15/2018	0	0	0	2	0	0
7/11/2018	0	0	0	1.2	0	0
7/18/2018	0	0	0	0.9	0	0
8/10/2018	0	0	0.1	1.9	0	0
9/12/2018	0	0	0	1.5	0	0
10/3/2018	0	0	0.1	2.4	0	0
10/23/2018	4	0	0	2.6	0.2	0.1