TECHNICAL MEMORANDUM

Phase II Subsurface Characterization to Support an Evaluation of Treated Wastewater Infiltration in Gates and Mill City, Marion and Linn Counties, Oregon

To: Chris Einmo, PE / Marion County

From: Jesse Hall, GIT / GSI Water Solutions, Inc.
Matt Kohlbecker, RG / GSI Water Solutions, Inc.
Jason Keller, RG / GeoSystems Analysis, Inc.

CC: Peter Olsen, PE / Keller Associates, Inc.
Pamela Villarreal, PE / Keller Associates, Inc.
Brian Nicholas / Marion County
Dave Kinney / City of Mill City
Russ Foltz / City of Mill City
Kari Low / Commonstreet Consulting
Mary Camarata / Department of Environmental Quality

Date: September 12, 2023

This Technical Memorandum (TM), prepared by GSI Water Solutions, Inc. (GSI) and GeoSystems Analysis, Inc. (GSA), summarizes the second phase of a subsurface characterization to evaluate the feasibility of treated wastewater infiltration in Gates and Mill City, Oregon.

1. Introduction

This section summarizes background information about the treated wastewater infiltration project in the Santiam Canyon, including a project overview (Section 1.1) and an overview of the Phase II Subsurface Characterization in Gates and Mill City (Section 1.2).

1.1 Project Overview

The North Santiam Sewer Authority (NSSA) is planning to dispose of treated wastewater by infiltration. Two infiltration facilities are planned—one in the Gates/Mill City area and another in the Detroit/Idanha area. Infiltration facilities will be comprised of rapid infiltration basins and will be authorized by Water Pollution Control Facilities (WPCF) permits from the Oregon Department of Environmental Quality (DEQ).

A phased approach is being used to evaluate infiltration feasibility in the Gates/Mill City area. The phases include:

- **Phase I.** Excavation of test pits and infiltration testing to characterize shallow soils in four study areas.
- **Phase II.** Construction of a single monitoring well and aquifer testing to characterize deep soils in the three study areas that are considered to be the most favorable for infiltration based on the results of Phase I.
- **Phase III.** Construction of two additional monitoring wells, advancement of two temporary borings within the footprint of the planned infiltration basin area, and aquifer testing in the study area that is most favorable to infiltration based on the results of Phase II.

1.2 Phase II Investigation in the Gates/Mill City Area

Permitting and design of an infiltration basin requires characterization of soils and groundwater to evaluate whether infiltration capacity at a site is sufficient to meet the projected volume of wastewater that will be infiltrated. In 2023, GSI developed the *Santiam Canyon Treated Wastewater Infiltration Evaluation Subsurface Characterization Work Plan* (the Work Plan) (GSI and GSA, 2023a) to guide Phase I and Phase II of the subsurface characterization. An addendum to the Work Plan will be prepared to guide Phase III of the characterization.

In the Gates/Mill City area, the Phase I Subsurface Characterization was completed in March of 2023 at the four study areas shown in Figure 1. The Phase II Subsurface Characterization was completed in July of 2023 at study areas GM1, GM4, and GM5, which were most favorable to infiltration based on the results of the Phase I Subsurface Characterization (GSI and GSA, 2023b).

The objective of the Phase II Subsurface Characterization is to collect data that can be used to select one of the three study areas for the Phase III Subsurface Characterization. This TM summarizes the: (1) Phase II subsurface investigation at sites GM1, GM4, and GM5 that consisted of installing groundwater monitoring wells and conducting aquifer tests to estimate aquifer permeability, and (2) analytical groundwater modeling to estimate the volume of wastewater that can be infiltrated at each study area based on data collected during the field event. Monitoring well locations are shown in Figure 2a (study area GM1), Figure 2b (study area GM4), and Figure 2c (study area GM5).

This TM summarizes methods (Section 2) and results (Section 3) of the Gates/Mill City Phase II Subsurface Characterization. Finally, this TM provides conclusions and recommendations (Section 4).

2. Methods

This section describes methods used during the Phase II Subsurface Characterization to: (1) locate subsurface utilities (Subsection 2.1), (2) construct monitoring wells (Subsection 2.2), (3) collect samples for analysis of soil physical properties (Subsection 2.3), (4) collect samples for analysis of groundwater and wastewater quality (Subsection 2.4), (5) conduct a slug test to determine aquifer hydraulic conductivity (Subsection 2.5), and (6) estimate the infiltration capacity at each site (Subsection 2.6).

2.1 Utility Locating

Areas chosen for monitoring wells were located and cleared for subsurface utilities by Pacific Northwest Locating, LLC on May 5th, 2023. No utilities were identified near proposed monitoring well locations.

2.2 Monitoring Well Construction and Development

Groundwater monitoring wells were constructed at sites GM1, GM4, and GM5 within the project boundary provided to GSI by Keller Associates. Monitoring well objectives are: (1) to identify potential restrictive layers at depth, (2) collect soil samples for analysis of physical properties, (3) collect groundwater quality samples,

and (4) to test aquifer permeability. Monitoring well borings were drilled with a track-mounted Terra Sonic 150cc Compact Crawler rotosonic drilling rig operated by Holt Services of Vancouver, Washington. Monitoring well borings were advanced to approximately 20 feet below the water table. Drilling dates, tooling methods, and total monitoring well depths are provided in Table 1.

Table 1. Overview of Monitoring Well Drilling.

Well ID	Drilling Date(s) [1]	Drill Tooling	Total Depth (feet)
GM1-MW1	5/19/2023 – 5/22/2023	6-inch casing, 4-inch core barrel	40
GM4-MW1	5/17/2023 – 5/18/2023	6-inch casing, 4-inch core barrel	45
GM5-MW1	5/15/2023 – 5/16/2023	6-inch casing, 4-inch core barrel	75

Notes

(1) Does not include well completion activities.

Once monitoring well construction was completed, wells were developed using a Waterra Pump System ® with foot valve and surge block. Wells were pumped and surged until at least ten borehole volumes had been removed, turbidity levels in the well dropped below 100 nephelometric turbidity units (NTUs), and water quality parameters stabilized in accordance with Environmental Protection Agency (EPA) well development guidance (Striggow et al, 2008).

2.3 Soil Physical Properties Logging and Sampling

During drilling, GSI personnel continuously logged soils from each borehole in general accordance with the visual-manual method of the Unified Soil Classification System (USCS) (ASTM, 2016). In addition, the following soil physical properties were measured during the Phase II Subsurface Characterization:

- **Saturated Vertical Hydraulic Conductivity, Particle Size Distribution, and Specific Gravity.** Soils were continuously sampled from each monitoring well boring. A subset of the soil samples, selected to be representative of the range of soil lithologies observed in the boring, was submitted to GSA laboratories for analysis of vertical saturated hydraulic conductivity (K_{sat}) by ASTM Method D5856-95 (ASTM, 1995), particle size distribution by ASTM Method D6913-17 (ASTM, 2017a) and ASTM Method D7928-17 (ASTM, 2017b) (wet sieve and hydrometer methods), and specific gravity by ASTM Method D854-14 (ASTM, 2014). A summary of soil property sampling is presented in Table 2.

Table 2. Laboratory Analysis of Vertical K_{sat}, Particle Size Distribution, and Specific Gravity.

Well ID	Depth (feet bgs)	Analysis Performed
GM1-MW1	7.5 - 10	K_{sat}; particle size distribution; specific gravity
	15-17.5	K_{sat}
	22.5-25	K_{sat}; particle size distribution
GM4-MW1	15-17.5	K_{sat}; particle size distribution; specific gravity
	17.5-20	K_{sat}
	22.5-25	K_{sat}; particle size distribution
GM5-MW1	10-12.5	K_{sat}; particle size distribution
	20-22.5	K_{sat}
	50-52.5	K_{sat}; particle size distribution; specific gravity

Notes

ft bgs = feet below ground surface

- **Bulk Density and Water Content.** Each section of soil core (i.e., returned in 2.5 foot long increments) from the monitoring well borings was weighed by GSA personnel in the field. Samples of each soil core were submitted to Oregon State University in Corvallis, Oregon, for measurement of gravimetric water content by ASTM Method D2216-19 (ASTM, 2019). Dry bulk density was calculated from the gravimetric water content and field-measured mass.

2.4 Water Quality Sampling

After monitoring wells were constructed and developed, GSI personnel returned on May 28, 2023, to characterize baseline groundwater quality at each site by sampling groundwater for the suite of contaminants regulated under the Safe Drinking Water Act (SDWA). Monitoring wells were sampled using a Waterra Pump System ® with foot valve using EPA low-flow (minimal drawdown) groundwater sampling procedures (EPA, 1996). Groundwater samples were collected from GM1-MW1, GM4-MW1, and GM5-MW1, stored in ice-chilled coolers, and immediately couriered to Edge Analytical Laboratories in Wilsonville, Oregon for analysis.

In addition to water quality sampling at monitoring wells, untreated wastewater from the City's wastewater treatment was sampled on May 2, 2023, by City personnel and submitted to Waterlab Corporation laboratories for analysis of synthetic organic compounds (SOCs), volatile organic compounds (VOCs), metals, and radionuclides. Because samples were collected upstream of treatment, the samples represent raw wastewater quality. The objective of the wastewater quality sampling was to develop a preliminary understanding of the types and concentrations of pollutants in the City's wastewater.

2.5 Aquifer Testing

After monitoring wells were constructed and developed, GSI conducted multiple slug tests (including 'slug-in' and 'slug-out' tests) at each monitoring well to estimate hydraulic conductivity of the shallow aquifer (i.e., horizontal hydraulic conductivity). A solid, tapered tube, or slug, was introduced (slug-in) or removed (slug-out) from each monitoring well to instantaneously raise or lower the water level in the well. A pressure transducer was used to monitor changes in water level. Horizontal hydraulic conductivity was calculated using the Hvorslev method for monitoring wells where the aquifer exhibited an overdamped response (Hvorslev, 1951), and the Springer-Gelhar method for monitoring wells where the aquifer exhibited an underdamped response (Springer and Gelhar, 1991).

2.6 Infiltration Capacity Modeling

GSA conducted a groundwater mounding analysis to determine the infiltration capacity in study areas GM1, GM4, and GM5. The Zlotnik analytical solution for groundwater mounding (Zlotnik et al, 2017) as applied in MOUNDSOLV (Hydrosolv, 2023) was used to estimate the steady-state groundwater mound that may develop beneath the potential infiltration facilities in response to recharge of treated wastewater. The required model input parameters for a steady-state simulation include recharge rate, recharge basin infiltration area, aquifer saturated hydraulic conductivity, aquifer initial saturated thickness, and horizontal hydraulic gradient. The output of the MOUNDSOLV model is the rise in groundwater levels beneath the infiltration basin.

Simulations were based on the projected year 2045 effluent generation rate of 0.2375 million gallons per day (MGD). For this initial feasibility assessment, the infiltration facility was conservatively assumed to consist of one, square-shaped basin. The size of the infiltration was selected to be sufficiently large to accept the 0.2375 MGD of treated wastewater. The long-term infiltration rate was assumed to be 15 percent of the mean measured near-surface K_{sat} measured by GSA using a single ring infiltrometer with the lateral

divergence correction during the Phase I Subsurface Characterization (GSI, 2023b). The value of 15 percent of K_{sat} was used to account for potential surface clogging (EPA, 1984).

3. Results

This section presents the results of Phase II Subsurface Characterization including monitoring well construction (Subsection 3.1), subsurface geology (Subsection 3.2), saturated hydraulic conductivity (Subsection 3.3), bulk density, gravimetric water content, and specific gravity (Subsection 3.4), water quality sampling (Subsection 3.5), and a groundwater mounding analysis (Subsection 3.6).

3.1 Monitoring Well Construction

Construction information for the monitoring wells installed during the Phase II Subsurface Characterization is summarized in Table 3. Monitoring well locations are shown in Figure 2a (study area GM1), Figure 2b (study area GM4), and Figure 2c (study area GM5). Boring logs showing well construction and soil types are provided in Attachment A.

Table 3. Monitoring Well Construction.

Well ID	Latitude [1]	Longitude [1]	Ground Surface Elevation [1] (ft amsl)	Total Boring Depth (ft bgs)	Depth to Ground-water [2] (ft bgs)	Screened Interval (ft bgs)	Slot Size (inches)	Well Diameter and Material	Filter Pack
GM1-MW1	44.751118°	-122.460715°	852	40	15.4	30 - 40	0.010	2-inch, Sch. 40 PVC	10-20 Silica Sand
GM4-MW1	44.742539°	-122.472156°	880	40	12.7	30 - 40	0.010	2-inch, Sch. 40 PVC	10-20 Silica Sand
GM5-MW1	44.741882°	-122.448286°	1005	76	58.3	65 - 75	0.010	2-inch, Sch. 40 PVC	10-20 Silica Sand

Notes
ft amsl = feet above mean sea level
ft bgs = feet below ground surface
Sch. = schedule
(1) Preliminary latitude, longitude, and ground surface elevation determined by Google Earth. A site survey will occur during Phase III.
(2) At study areas GM4 and GM5, depth to groundwater was measured on June 8, 2023. At study area GM1, depth to groundwater was measured on May 29, 2023.

3.2 Subsurface Geology

Observations of subsurface geology from monitoring well borings are summarized below:

- In each of the three borings, a thin surficial fill layer (less than 3 feet thick) was encountered overlying the Quaternary middle terrace deposits that comprise the primary alluvial geologic unit in the Gates/Mill City area. The Quaternary middle terrace deposits consisted of gravels with varying amounts of sand and fines (i.e., silt and clay) (see boring logs in Attachment A).
- As shown in Table 4, which summarizes laboratory-measured particle size distribution of soils from the monitoring well borings, the soils at study area GM5 consist of significantly more fine material (silt and clay fraction ranging from 16% to 23%) than the soils at study area GM1 and GM4 (ranging from about 4% to 12%). The finer-grained nature of the soils at GM5 based on lab analyses is consistent with the soil classification using the USCS visual-manual method (see boring logs in Attachment A).

Table 4. Percent Gravel, Sand, Silt and Clay.

Well ID	Depth (feet bgs)	% Gravel (>0.475 mm)	% Sand (4.75 mm – 0.075 mm)	% Silt (0.075 mm – 0.002 mm)	% Clay (<0.002 mm)
GM1-MW1	7.5 – 10.0	52.0%	36.2%	11.4%	0.40%
	22.5 – 25.0	34.0%	61.3%	4.5%	0.20%
GM4-MW1	15.0 – 17.5	84.0%	11.4%	4.4%	0.20%
	22.5 – 25.0	57.0%	33.6%	8.8%	0.6%
GM5-MW1	10.0 – 12.5	70.0%	14.0%	11.0%	5.0%
	50.0 – 52.5	46.0%	30.7%	16.7%	6.6%

Notes
mm = millimeters feet bgs = feet below ground surface

3.3 Saturated Hydraulic Conductivity

Saturated hydraulic conductivity is an anisotropic soil property (meaning that hydraulic conductivity may be different in the horizontal and vertical directions) indicating how easily water travels through soil. Due to geologic layering, horizontal hydraulic conductivity may be 10 to 100 times greater in vertical hydraulic conductivity. Vertical saturated hydraulic conductivity was measured in the laboratory based on soil samples collected from monitoring well borings (see Attachment B and discussion in Section 3.3.1) and horizontal saturated conductivity was measured in the field at monitoring wells (see Attachment C and discussion in Section 3.3.2).

3.3.1 Vertical Saturated Hydraulic Conductivity (K_{sat})

Laboratory-measured saturated hydraulic conductivities of soils at study areas GM1, GM4, and GM5 are summarized in Table 5. Because the analyses were conducted on soils above and below the water table, the hydraulic conductivities in Table 5 represent unsaturated zone hydraulic conductivity (soils above the water table) or aquifer hydraulic conductivity (soils below the water table).

The vertical saturated hydraulic conductivity of soil in study area GM5 (geometric mean = 0.0005 feet per day) is significantly lower than the saturated hydraulic conductivity of soil in study area GM1 (10.5 feet per day) and GM4 (9.8 feet per day). The low saturated hydraulic conductivity values in study area GM5 indicate that the deeper unsaturated zone sediments may limit percolation of infiltrated water at this location.

Table 5. Summary of Lab-Measured Vertical Saturated Hydraulic Conductivity.

Well ID	Depth (feet bgs)	Vertical K_{sat} (feet/day)	Geometric Mean Vertical K_{sat} (feet/day)
GM1-MW1	7.5 – 10.0 (unsaturated zone)	2.8	10.5
	15.0 – 17.5 (aquifer)	34.0	
	22.5 – 25.0 (aquifer)	12.2	
GM4-MW1	15.0 – 17.5 (aquifer)	17.6	9.8
	17.5 – 20.0 (aquifer)	6.0	
	22.5 – 25.0 (aquifer)	8.8	
GM5-MW1	10.0 – 12.5 (unsaturated zone)	0.0004	0.0005
	20.0 – 22.5 (unsaturated zone)	0.0015	
	50.0 – 52.5 (unsaturated zone)	0.0002	

Notes
feet bgs = feet below ground surface

3.3.2 Horizontal Saturated Hydraulic Conductivity (Aquifer Hydraulic Conductivity)

Table 6 summarizes geometric mean horizontal saturated hydraulic conductivity in each study area based on multiple slug tests at each monitoring well. Because the slug tests were conducted in saturated soils below the water table, the hydraulic conductivities in Table 6 represent aquifer hydraulic conductivities. The horizontal saturated hydraulic conductivity in study area GM1 (560 feet per day) is significantly higher than in study area GM4 (3.5 feet per day) and GM5 (33 feet per day).

Table 6. Summary of Field-Measured Horizontal Saturated Hydraulic Conductivity.

Well ID	Geometric Mean Horizontal K_{sat} (feet/day)
GM1-MW1	560.3
GM4-MW1	3.54
GM5-MW1	33.0

The following bullets provide additional information about the slug test analyses:

- As shown in Attachment C, some of the slug tests at MW-1 in study area GM-1 exhibited an underdamped response, indicating very high hydraulic conductivities.
- At MW-1 in study area GM-4, the slug tests exhibited an overdamped response, indicating lower hydraulic conductivities. The water level recoveries follow three trends: (1) an early-time trend that reflects the hydraulic conductivity of the monitoring well's filter pack, (2) a middle-time trend that reflects the hydraulic conductivity of the aquifer, and (3) a late-time recovery that reflects deviation of water level recovery from the theoretical aquifer response. The hydraulic conductivities analyzed by the Hvorslev method represent water level recovery during the middle-time trend (i.e., aquifer response).

- At MW-1 in study area GM-5, slug tests indicated an overdamped response. Water levels exhibited two trends: (1) an early-time trend that reflects aquifer permeability and (2) a late-time trend that reflects deviation of water level recovery from the theoretical aquifer response. The hydraulic conductivities analyzed by the Hvorslev method represent water level recovery during the early-time trend (i.e., aquifer response).

3.4 Bulk Density, Gravimetric Water Content, and Specific Gravity

Graphs showing dry bulk density and water content with depth in each boring are provided in Figure 3 (study area GM1), Figure 4 (study area GM4), and Figure 5 (study area GM5) of GSA's technical memorandum in Attachment B. Water content is variable and a function of soil texture (finer texture soil layers generally have greater water content than coarser-textured soil) and position relative to first-encountered groundwater (soil layers closer to or below first-encountered groundwater have greater water content than soil layers further from or above first-encountered groundwater). The water content in soil above first-encountered groundwater at study area GM5 (ranging from about 7% to 47%) was highly variable relative to the water content at study areas GM1 (ranging from about 5% to 13%) and GM4 (ranging from about 7% to 30%), likely due to the differing layers of fine-textured soil overlaying less fine-textured soils.

Specific gravity results are shown in Table 7. Specific gravity ranged from 2.67 grams per cubic centimeter (g/cm^3) to 2.81 g/cm^3.

Table 7. Summary of Specific Gravity.

Well ID	Depth (feet bgs)	Specific Gravity (grams per cubic centimeter)
GM1-MW1	7.5 – 10.0	2.72
GM4-MW1	15.0 – 17.5	2.81
GM5-MW1	50.0 – 52.5	2.67

3.5 Water Quality Sampling

Groundwater and wastewater quality results are provided in Table 8, laboratory reports are provided in Attachment D, and groundwater sampling field forms are included in Attachment E. The following bullets summarize the groundwater quality results. Pollutant concentrations are compared to EPA Maximum Contaminant Levels (MCLs) and EPA Secondary Maximum Contaminant Levels (SMCLs). MCLs are legally-enforceable levels for constituents in drinking water; SMCLs are non-mandatory water quality guidelines to assist public water systems in managing drinking water for aesthetic considerations, including taste, color, and odor. MCLs and SMCLs are used by Oregon's Groundwater Protection Rules to evaluate the significance of a particular pollutant concentration and trigger necessary regulatory action[1].

- **VOCs and SVOCs.** No VOCs or SVOCs were detected in groundwater. In untreated wastewater, the only VOCs and SVOCs detected were di(2-ethylhexyl)phthalate (9.01 micrograms per liter or ug/L, which is above the EPA MCL of 6 ug/L) and toluene (49.6 ug/L, which is below the EPA MCL of 1,000 ug/L).
- **General Geochemical and Inorganic Constituents.** The following bullets summarize the quality of untreated wastewater and groundwater for general geochemical and inorganic constituents, many of which are naturally-occurring.

[1] OAR 340 - 040

- In groundwater, concentrations of aluminum, iron, and manganese exceed the EPA MCL or SMCL. The primary source of iron and manganese is likely naturally occurring iron and manganese oxide minerals that are present in alluvial soils of western Oregon, and the aluminum may be related to aluminosilicate minerals (Frank, 1973). Because concentrations of aluminum, iron, and manganese in untreated wastewater are lower than groundwater, infiltration will improve groundwater quality for these constituents.
- Concentrations of zinc, fluoride, gross alpha, gross beta, and combined radium 226/228 are higher in untreated wastewater than in groundwater. With the exception of fluoride, the concentrations in untreated wastewater are below EPA MCLs.
- Nitrate was not detected in untreated wastewater. This is likely because nitrogen is in the form of ammonia prior to treatment.

3.6 Groundwater Mounding Analysis

A technical memorandum summarizing the results of the groundwater mounding analysis performed by GSA is provided in Attachment F. Table 9 summarizes the input parameters used for the mounding analysis.

Table 9. Input Parameters Used for Groundwater Mounding Analysis.

Input Parameter	GM1	GM4	GM5
Recharge Rate [1]	0.2375 MGD	0.2375 MGD	0.2375 MGD
Recharge Duration	Continuous	Continuous	Continuous
Infiltration Area [2]	0.81 acres	6.23 acres	26.99 acres
Long-Term Infiltration Rate [3]	0.90 feet/day	0.12 feet/day	0.03 feet/day
Aquifer Hydraulic Conductivity [4]	370 feet/day	3.5 feet/day	33.0 feet/day
Depth to Water Table [5]	15.4 feet bgs	30.0 feet bgs	58.3 feet bgs
Initial Aquifer Saturated Thickness [6]	44.6 feet	147 feet	121.7 feet
Initial Horizontal Hydraulic Gradient [7]	0.0139 feet/foot	0.0139 feet/feet	0.0139 feet/foot

Notes
MGD = Million Gallons Per Day bgs = below ground surface
(1) Projected 2045 effluent generation rate
(2) Selected to be sufficiently large to accept the 0.2375 MGD of treated wastewater
(3) 15 percent of the mean measured near-surface K_{sat} for the study area (GSI, 2023b)
(4) See Table 6 in Section 3.3.2
(5) Depth to groundwater at study area GM1 was measured on May 29, 2023 at monitoring well GM1-MW1. Depth to groundwater at study area GM5 was measured on June 8, 2023 at monitoring well GM5-MW1. Depth to groundwater at study area GM4 was selected to be 30 feet below ground surface (bgs) because the depth to groundwater is likely between 12.7 feet bgs (measured near the southern edge of the property near a stream at monitoring well GM4-MW1) and 37 feet bgs (measured in the City's Kingwood Well No. 2, LINN 56359, in April 2013).
(6) Estimated from deep borehole logs. In study area GM1, the nearby 60-feet-deep domestic water well LINN 1443 shows that unconsolidated sediments are at least 60 feet thick (60 feet of unconsolidated sediments – 15.4 feet depth to water = 44.6 feet of aquifer). In study area GM4, the nearby 177-feet-deep domestic water well LINN 2588 shows that unconsolidated sediments are at least 177 feet thick (177 feet of unconsolidated sediments – 30 feet depth to water = 147 feet of aquifer). In study area GM5, the water well LINN 55598 shows that unconsolidated sediments are at least 180 feet thick (180 feet of unconsolidated sediments – 58.3 feet depth to water = 121.7 feet).
(7) Horizontal hydraulic gradient determined based on a groundwater elevation contour map developed from the water levels measured by GSI at GM1-MW1, GM4-MW-1, GM5-MW-1 and water levels from the Oregon Water Resources Department.

Table 8

Wastewater Influent and Groundwater Quality Laboratory Analytical Results

Gates/Mill City Phase II Subsurface Characterization

Lab Report	Lab Sample ID	Reference	Lab
GM1	31092	23-15512	Edge Analytical
GM4	31097	23-15516	Edge Analytical
GM5	31106	23-15521	Edge Analytical
WW Influent	1045	CITMILC	Waterlab Corp.

	Standard	Criteria	Unit	Sample Location			
				Untreated Wastewater	GM1	GM4	GM5
Geochemical and Inorganic Constituents							
Antimony (Total)	0.006	MCL	mg/L	< 0.005U	< 0.001U	< 0.001U	< 0.001U
Aluminum (Total)	0.05 - 0.2	SMCL	mg/L	**0.275**	**0.52**	**3.8**	**2.26**
Arsenic (Total)	0.01	MCL	mg/L	< 0.002U	<0.0005U	**0.0017**	**0.00095**
Barium (Total)	2	MCL	mg/L	**0.0109**	**0.0035**	**0.0211**	**0.012**
Beryllium (Total)	0.004	MCL	mg/L	< 0.001U	< 0.0003U	< 0.0003U	< 0.0003U
Cadmium (Total)	0.005	MCL	mg/L	< 0.001U	< 0.00025U	**0.00019**	< 0.00025U
Chloride	250	SMCL	mg/L	--	**1.4**	**2.1**	**1.4**
Chromium (Total)	0.1	MCL	mg/L	< 0.02U	< 0.001U	**0.0019**	**0.0032**
Copper (Total)	1.3	MCL	mg/L	< 0.002U	**0.002**	**0.0367**	**0.0142**
Cyanide (Total)	0.2	MCL	mg/L	--	< 0.005U	< 0.005U	< 0.005U
Fluoride (Total)	4	MCL	mg/L	**7.41**	< 0.1U	< 0.1U	< 0.1U
Iron (Total)	0.3	SMCL	mg/L	**0.286**	**0.62**	**3.63**	**2.61**
Lead (Total)	0.015	MCL	mg/L	< 0.001U	**0.00027**	**0.00087**	**0.0006**
Manganese (Total)	0.05	SMCL	mg/L	< 0.05U	**0.0776**	**0.449**	**0.106**
Mercury (Total)	0.002	MCL	mg/L	< 0.001U	< 0.0002U	< 0.0002U	< 0.0002U
Nitrite as N	1	MCL	mg/L	< 0.2U	< 0.01U	< 0.01U	< 0.01U
Nitrate as N	10	MCL	mg/L	< 0.2U	**1.10**	**0.02**	**0.46**
Selenium (Total)	0.05	MCL	mg/L	< 0.005U	< 0.001U	< 0.001U	< 0.001U
Silver (Total)	0.1	SMCL	mg/L	< 0.01U	< 0.0002U	< 0.0002U	< 0.0002U
Sulfate	250	SMCL	mg/L	--	**1.6**	**0.9**	**0.3**
Thallium (Total)	0.002	MCL	mg/L	< 0.001U	< 0.0001U	< 0.0001U	< 0.001U
Total Dissolved Solids	500	SMCL	mg/L	--	**78**	**147**	**84**
Zinc (Total)	5	SMCL	mg/L	**0.0547**	**0.0033**	**0.0087**	**0.0059**
Synthetic Organic Compounds (SOCs)							
2, 4-D	0.07	MCL	mg/L	< 0.002U	< 0.0001U	< 0.0001U	< 0.0001U
2, 4, 5-TP (Silvex)	0.05	MCL	mg/L	< 0.005U	< 0.0001U	< 0.0001U	< 0.0001U
Alachlor (Alanex)	0.002	MCL	mg/L	< 0.0002U	< 0.00005U	< 0.00005U	< 0.00005U
Atrazine	0.003	MCL	mg/L	< 0.0003U	< 0.00005U	< 0.00005U	< 0.00005U
Benzo(a)Pyrene	0.0002	MCL	mg/L	< 0.0001U	< 0.00005U	< 0.00005U	< 0.00005U
BHC-gamma (Lindane)	0.0002	MCL	mg/L	< 0.00001U	< 0.00005U	< 0.00005U	< 0.00005U
Carbofuran	0.04	MCL	mg/L	< 0.004U	< 0.001U	< 0.001U	< 0.001U
Chlordane	0.002	MCL	mg/L	< 0.0002U	< 0.0001U	< 0.0001U	< 0.0001U
Dalapon	0.2	MCL	mg/L	< 0.005U	< 0.0005U	< 0.0005U	< 0.0005U
Di(2-ethylhexyl)adipate *(adipates)*	0.4	MCL	mg/L	< 0.004U	< 0.00005U	< 0.00005U	< 0.00005U
Di(2-ethylhexyl)phthalate *(phthalates)*	0.006	MCL	mg/L	**0.00901**	< 0.0001U	< 0.0001U	< 0.0001U
Dibromochloropropane (DBCP)	0.0002	MCL	mg/L	< 0.0000U	< 0.00002U	< 0.00002U	< 0.00002U
Dinoseb	0.007	MCL	mg/L	< 0.001U	< 0.0001U	< 0.0001U	< 0.0001U
Diquat	0.02	MCL	mg/L	< 0.01U	< 0.0004U	< 0.0004U	< 0.0004U
Ethylene Dibromide (EDB)	0.00005	MCL	mg/L	< 0.0000U	< 0.00002U	< 0.00002U	< 0.00002U

Endothall	0.1	MCL	mg/L	< 0.01U	< 0.005U	< 0.005U	< 0.005U
Endrin	0.002	MCL	mg/L	< 0.00001U	< 0.00005U	< 0.00005U	< 0.00005U
Glyphosate	0.7	MCL	mg/L	< 0.05U	< 0.005U	< 0.005U	< 0.005U
Heptachlor	0.0004	MCL	mg/L	< 0.00001U	< 0.00005U	< 0.00005U	< 0.00005U
Heptachlor Epoxide	0.0002	MCL	mg/L	< 0.00001U	< 0.00005U	< 0.00005U	< 0.00005U
Hexachlorobenzene (HCB)	0.001	MCL	mg/L	< 0.0003U	< 0.00005U	< 0.00005U	< 0.00005U
Hexachlorocyclopentadiene	0.05	MCL	mg/L	< 0.005U	< 0.00005U	< 0.00005U	< 0.00005U
Methoxychlor	0.04	MCL	mg/L	< 0.0000U	< 0.00005U	< 0.00005U	< 0.00005U
Pentachlorophenol	0.001	MCL	mg/L	< 0.0005U	< 0.00004	< 0.00004	< 0.00004
Picloram	0.5	MCL	mg/L	< 0.005U	< 0.0001U	< 0.0001U	< 0.0001U
Simazine	0.004	MCL	mg/L	< 0.0004U	< 0.00005U	< 0.00005U	< 0.00005U
Total Polychlorinated Biphenyls (PCBs)	0.0005	MCL	mg/L	< 0.0002U	< 0.0002U	< 0.0002U	< 0.0002U
Toxaphene	0.003	MCL	mg/L	< 0.0003U	< 0.00 1U	< 0.00 1U	< 0.00 1U
Vydate (Oxamyl)	0.2	MCL	mg/L	< 0.004U	< 0.00 1U	< 0.00 1U	< 0.00 1U
Volatile Organic Compounds (VOCs)							
1, 1-Dichloroethylene	0.007	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
1, 2-Dichloroethane (EDC)	0.005	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
1, 2-Dichloropropane	0.005	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
1, 2 ,4-Trichlorobenzene	0.07	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
1, 1, 1-Trichloroethane	0.2	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
1, 1, 2-Trichloroethane	0.005	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Benzene	0.005	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Chlorobenzene (monochlorobenzene)	0.1	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Carbon Tetrachloride	0.005	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
cis-1,2-Dichloroethylene	0.07	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Ethylbenzene	0.7	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Methylene Chloride	0.005	MCL	mg/L	--	< 0.0005U	< 0.0005U	< 0.0005U
o-Dichlorobenzene (1, 2-DCB)	0.6	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
p-Dichlorobenzene (1, 4-DCB)	0.075	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Styrene	0.1	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Tetrachloroethylene (PCE)	0.005	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Toluene	1	MCL	mg/L	**0.0496**	< 0.0005U	< 0.0005U	< 0.0005U
Total Xylenes	10	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
trans-1,2-Dichloroethylene	0.1	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Trichloroethylene (TCE)	0.005	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Vinyl chloride	0.002	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Radionuclides							
Alpa, Gross	15	MCL	pCi/L	**-5**	< 3U	< 3U	< 3U
Beta, Gross	50	MCL	pCi/L	**14.8**	< 4U	< 4U	< 4U
Radium 226, 228 Combined	5	MCL	pCi/L	**2.6**	< 1U	< 1U	< 1U
Uranium	30	MCL	mg/L	< 0.0003U	< 0.001U	< 0.001U	< 0.001U

Notes

MCL = maximum contaminant level for drinking water

Bold = Detected

-- = not tested

Constituent Detected above MCL and/or SMCL

* = Radium 226/228 Combo

LRL = lower reporting limit

XXX U = indicates that the constituent was not detected above the method reporting limit of XXX

The model-predicted steady state groundwater mounding results are provided in Table 10. Contour maps showing the predicted rise in groundwater levels are provided in Figure 2 (study area GM1), Figure 3 (study area GM4) and Figure 4 (study area GM5) of GSA's technical memorandum in Attachment F.

Table 10. Predicted Mounding During Infiltration.

Model Output	GM1	GM4	GM5
Maximum Mound Height	1.6 feet above static	47.4 feet above static	5.0 feet above static
Depth to Groundwater	13.8 feet bgs	0 feet bgs	53.3 feet bgs

Notes
bgs = below ground surface

The following bullets summarize the results of the groundwater mounding analysis:

- At study area GM1, the mounding is predicted to be relatively minor (1.6 feet above the static groundwater level) due to the high aquifer hydraulic conductivity at the site. Because the depth to groundwater in study area GM1 is relatively shallow, the depth to the water table is 13.8 feet bgs during infiltration.
- At study area GM4, a relatively large maximum mound height of 47.4 feet above the static groundwater level was predicted due to the low aquifer hydraulic conductivity at the site. In addition, the water table intersected the ground surface. Preferably, the groundwater mound should be at least 10 feet or greater below ground surface to prevent the groundwater from impacting infiltration rates or resulting in the daylighting of groundwater outside of the basin footprint. Additional model simulations by GSA indicated that an infiltration basin would need to be 364,000 acres to meet the 10 feet bgs depth to groundwater criteria, which exceeds the available acreage of available properties near study area GM4.
- At study area GM5, the mounding is predicted to be relatively minor (5.0 feet above the static groundwater level) due to the high aquifer hydraulic conductivity and large area available for an infiltration basin. However, it's important to note that the mounding analysis does not consider the impact of potential low permeability soils above the water table. The Phase II Subsurface Investigation indicated that numerous low-permeability layers are present in the unsaturated zone at study area GM5, which would limit infiltration rate and create perched water conditions above the water table.

4. Conclusions and Recommendations

Based on data collected during the Phase II Subsurface Characterization and mounding analysis, study area GM1 is considered to be the most favorable to infiltration:

- The aquifer hydraulic conductivity (560 feet per day), vertical hydraulic conductivity (10.5 feet per day), and soil types in the unsaturated zone (generally gravels with 5 to 15 percent fines by weight) are the most permeable of three sites evaluated as a part of Phase II.
- Based on MOUNDSOLV modeling (included in Attachment F), study area GM1 is capable of infiltrating the projected 2045 effluent generation rate while maintaining a depth to groundwater of more than 10 feet bgs.

Therefore, we recommend conducting Phase III Subsurface Characterization at study area GM1. At the remaining sites:

- **Study Area GM5.** Due to low-permeability soil layers in the unsaturated zone that would limit infiltration, we recommend not considering study area GM5 further. Therefore, monitoring well MW-1 at GM5 should be decommissioned.
- **Study Area GM4.** We recommend retaining study area GM4 as a backup site that could be further-evaluated if: (1) the Phase III Subsurface Characterization at study area GM1 produces data that indicate the study area is not as favorable to infiltration as indicated by the Phase I and Phase II data, or (2) groundwater contaminant fate and transport modeling indicates that attenuation of constituents in infiltrating wastewater does not meet DEQ standards. While the MOUNDSOLV simulations at GM4 indicate the site cannot infiltrate the target volume of treated wastewater while maintaining water levels deeper than 10 feet bgs, additional data collection may indicate that the aquifer permeability measured at monitoring well MW-1 is not representative of overall site conditions. Specifically, additional slug testing at new monitoring wells may indicate that the aquifer is more permeable in other areas of the study area. It is important to note that we do not consider it to be *likely* that the additional data collection will indicate infiltration is feasible (we only consider it to be possible).

Data collected during the Phase III Subsurface Characterization will be used to complete the following tasks to provide additional information about infiltration basin design and feasibility in study area GM1:

- Install two additional monitoring wells and:
  - Measure the depth to groundwater to calculate a horizontal hydraulic gradient (horizontal hydraulic gradient in MOUNDSOLV currently assumes an "initial horizontal hydraulic gradient" calculated based on water levels from monitoring wells in other study areas and water level collected over many years by the Oregon Water Resources Department).
  - Conduct additional slug tests to evaluate heterogeneity in aquifer hydraulic conductivity (aquifer permeability in MOUNDSOLV is currently based on slug tests at a single monitoring well).
- Install a temporary boring to bedrock to directly-measure the aquifer saturated thickness (the MOUNDSOLV model used an "initial aquifer saturated thickness" assumed from nearby water wells).
- Re-run the MOUNDSOLV model to confirm that an infiltration basin at study area GM1 can infiltrate the projected 2045 effluent generation rate.
- Develop a groundwater fate and transport model to evaluate whether constituents in infiltrating wastewater will be sufficiently attenuated to meet DEQ standards.

5. References

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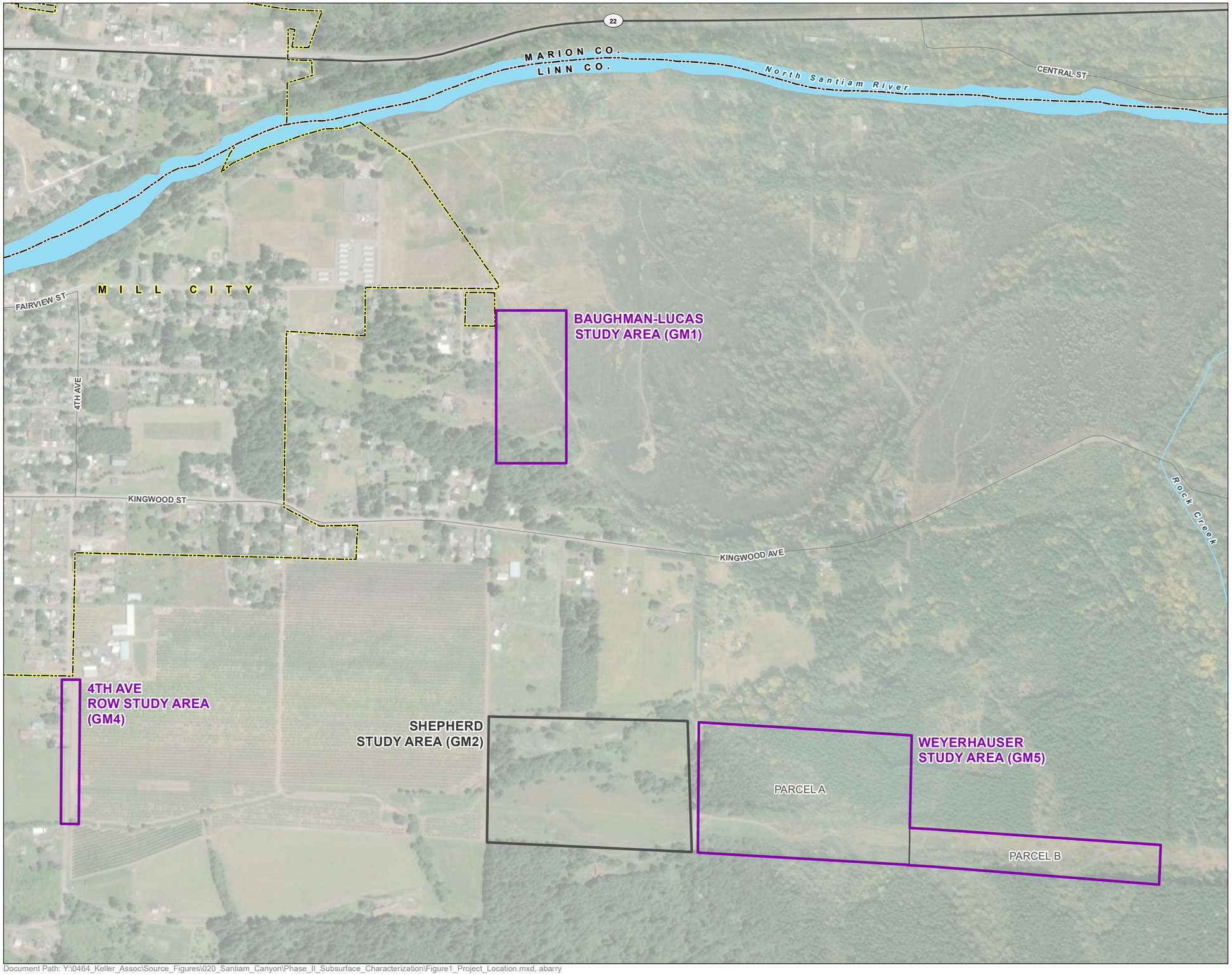
FIGURE 1

Project Location

Gates/Mill City Phase II Subsurface Characterization



LEGEND

- Site Parcel

Study Areas

- Subject of the Phase I Subsurface Characterization
- Subject of the Phase I and Phase II Subsurface Characterization

All Other Features

- City Boundary
- County Boundary
- Major Road
- Watercourse
- Waterbody

N

0 300 600 900

Feet

Date: August 10, 2023
Data Sources: BLM, ESRI, ODOT, USGS, Aerial Photo 2020

GSI Water Solutions, Inc.

Document Path: Y:\0464_Keller_Assoc\Source_Figures\020_Santiam_Canyon\Phase_II_Subsurface_Characterization\Figure1_Project_Location.mxd, abarry

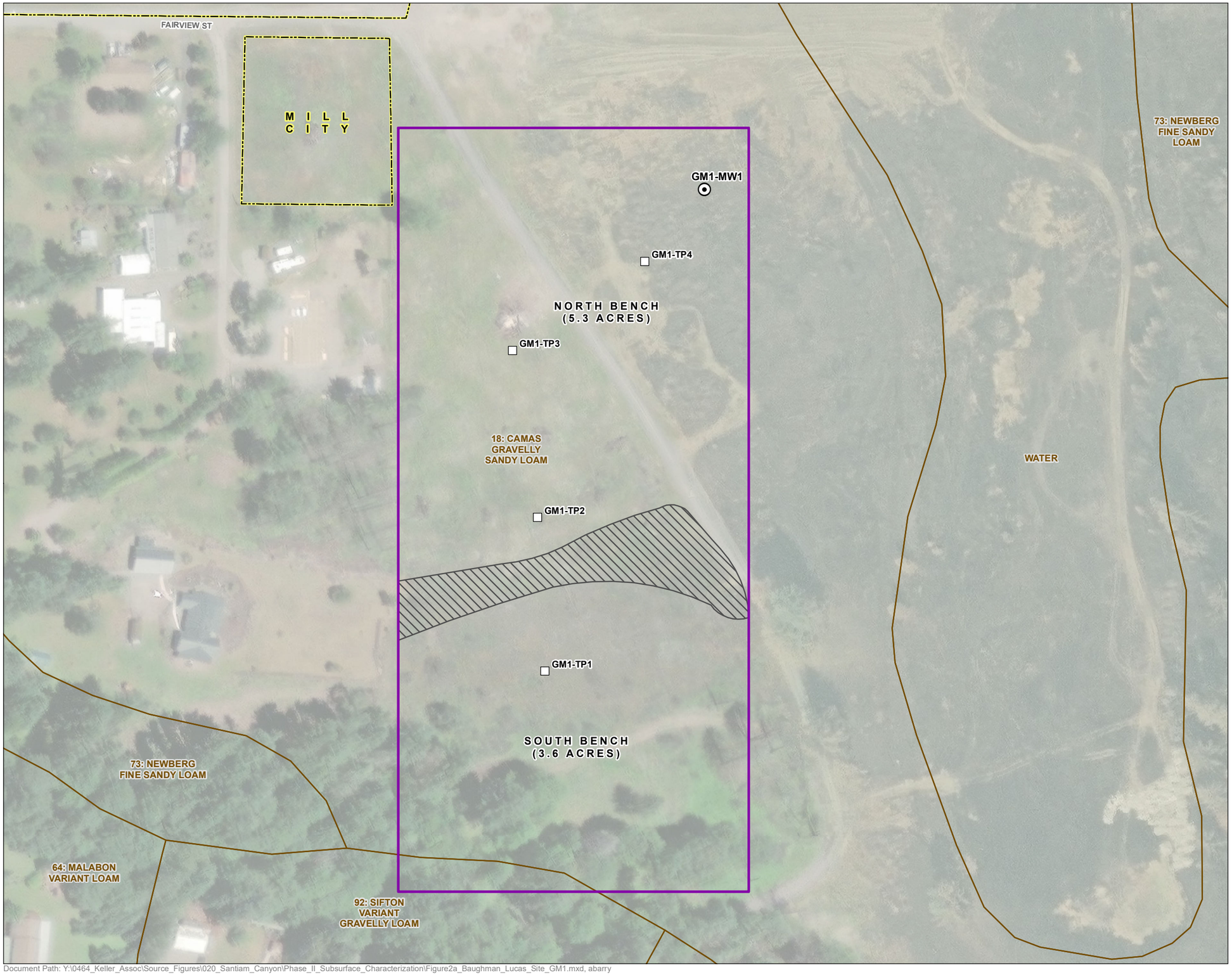


FIGURE 2a

Baughman-Lucas Study Area (GM1)

Gates/Mill City Phase II Subsurface Characterization

LEGEND

- Monitoring Well
- Test Pit (Phase I)
- Study Area
- Steep Slope
- Soils

All Other Features

- City Boundary
- Major Road

N

0 60 120 180

Feet

Date: August 10, 2023
Data Sources: BLM, ESRI, ODOT, USGS, Aerial Photo 2020

GSI Water Solutions, Inc.

Document Path: Y:\0464_Keller_Assoc\Source_Figures\020_Santiam_Canyon\Phase_II_Subsurface_Characterization\Figure2a_Baughman_Lucas_Site_GM1.mxd, abarry

FIGURE 2b

4th Ave ROW Study Area (GM4)

Gates/Mill City Phase II
Subsurface Characterization

LEGEND

- Monitoring Well
- Test Pit
- Powerline Tower
- Powerline
- Study Area
- Soils

All Other Features

- City Boundary
- Major Road

N

0 60 120 180
Feet

Date: August 10, 2023
Data Sources: BLM, ESRI, ODOT, USGS, Aerial Photo 2020

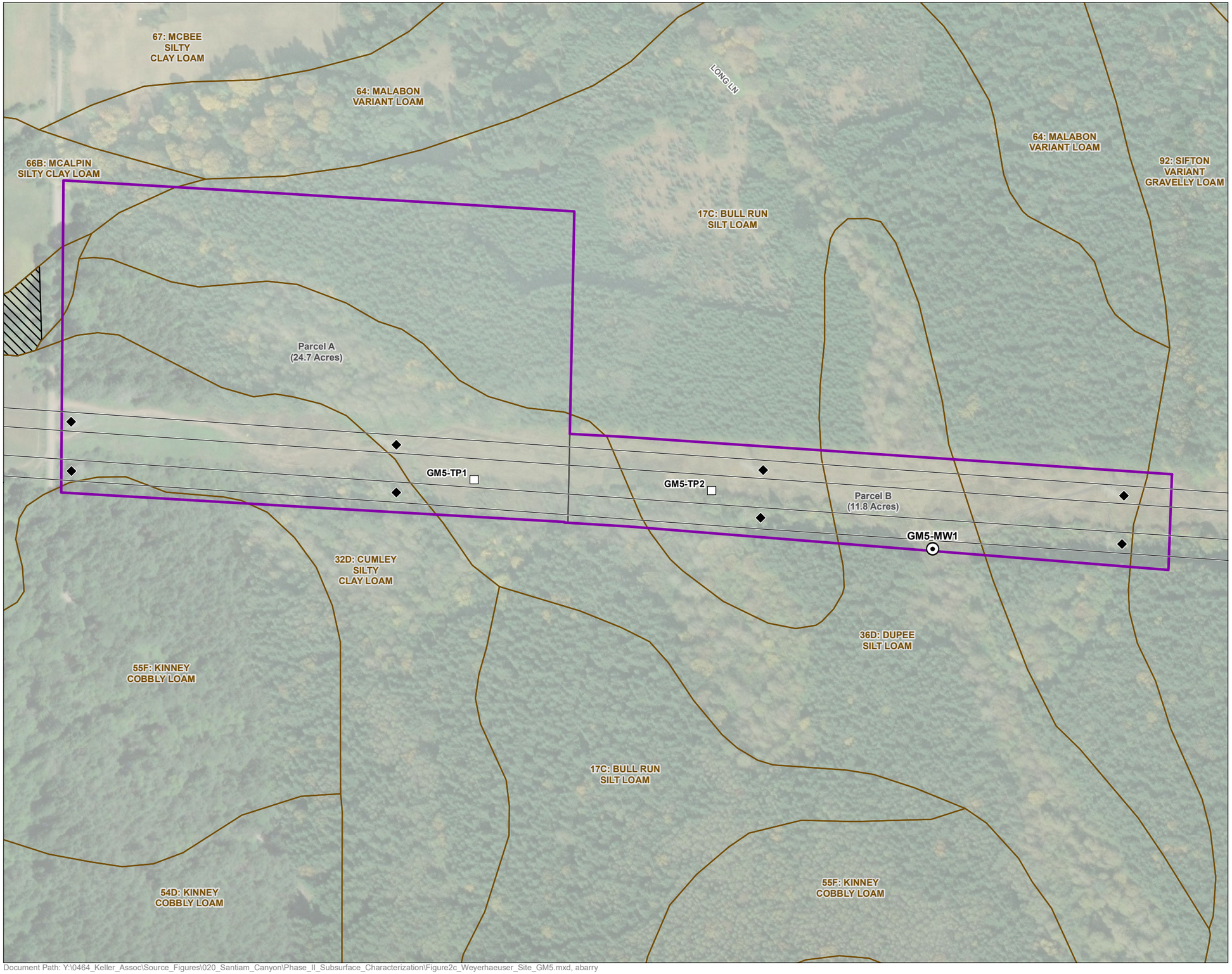
GSI Water Solutions, Inc.

Document Path: Y:\0464_Keller_Assoc\Source_Figures\020_Santiam_Canyon\Phase_II_Subsurface_Characterization\Figure2b_4th_Ave_ROW_Site_GM4.mxd, abarry

FIGURE 2c

Weyerhaeuser Study Area (GM5)

Gates/Mill City Phase II
Subsurface Characterization



LEGEND

- Monitoring Well
- Test Pit
- Powerline Tower
- Powerline
- Study Area
- Site Parcel
- Steep Slope
- Soils

All Other Features

- City Boundary
- Major Road

N

0 125 250 375
Feet

Date: August 10, 2023
Data Sources: BLM, ESRI, ODOT, USGS, Aerial Photo 2020

GSI Water Solutions, Inc.

Document Path: Y:\0464_Keller_Assoc\Source_Figures\020_Santiam_Canyon\Phase_II_Subsurface_Characterization\Figure2c_Weyerhaeuser_Site_GM5.mxd, abarry

ATTACHMENT A

Monitoring Well Boring Logs

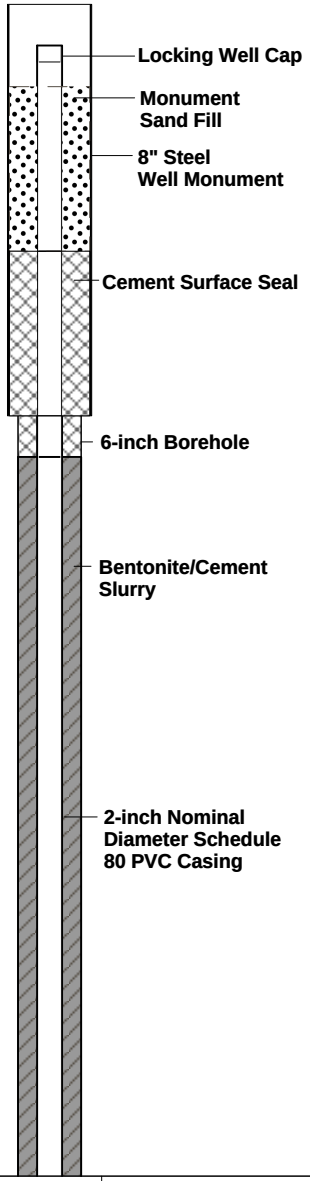
GSI Water Solutions, Inc.

LOG ID: GM1-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 851 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 40		**DATE STARTED:** 5/19/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/22/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 19.5	**COMPLETED:** 14.9
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES
0–1	**GM** 0 - 1.5 ft: Very soft, dark brown, dry, silty GRAVEL with sand (GM), organics, low plasticity, sand is very fine to course, subangular to subrounded, gravel is fine to coarse, subangular to rounded [FILL]	70	<15	15
1–2	**GM** 1.5 - 3.0 ft: Medium stiff, dark brown, moist, silty GRAVEL (GM), organics, medium plasticity, sand is very fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to subrounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	50	<10	40
3–4	**GM** 3.0 - 4.0 ft: Soft, dark brown to black, dry to moist, silty GRAVEL with sand (GM), odor of charcoal, organics, low plasticity, sand is fine to coarse, angular to subrounded, gravel is fine to medium, subangular to subrounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	25	35
4–5	**GW-GM** 4.0 - 5.0 ft; Very soft, dark grey, dry, well graded GRAVEL with silt and sand (GW-GM), low plasticity, sand is very fine to coarse, subangular to rounded, gravel is fine to medium, subangular to subrounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	30	<10
5–6	Gray, dry, increase in coarse gravel/cobbles at 6.5 ft			
7–8	**GW-GM** 5.0 - 12.0 ft: Very soft, brown to dark brown to grey, dry to wet, well graded GRAVEL with silt and sand (GW-GM), low plasticity, sand is very fine to coarse, subangular to rounded, gravel is fine to medium, subangular to subrounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	75	15	<10
10–11	Increase in moisture (moist to wet) at 11 ft			

AS-BUILT WELL CONSTRUCTION



LOG ID: GM1-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 851 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 40		**DATE STARTED:** 5/19/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/22/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 19.5	**COMPLETED:** 14.9
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES	AS-BUILT WELL CONSTRUCTION
12					
13					
14	Wet at 14.0 ft				
15	**GW** 12.0 - 18.0 ft: Very soft, dark brown, moist, well graded GRAVEL with sand (GW), low plasticity, sand is very fine to very coarse, subangular to rounded, gravel is fine to coarse, subangular to rounded, cobbles (< 6 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	80	15	<5	
16					
17	No return from 15 to 20 ft. Recovered with clean-out.				
18					
19	**GW-GM** 18.0 - 20.0 ft: Very soft, dark brown, moist, well graded GRAVEL with silt and sand (GW-GM), low plasticity, sand is very fine to coarse, subangular to rounded, gravel is fine to medium, subangular to subrounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	70	20	10	
20	Wet at 19.5 ft				
21	**NR** 20.0 - 22.5 ft: NO RETURN				
22					
23	**SW** 22.5 - 23.0 ft: Very soft, dark brown, wet, well graded SAND (SW), low plasticity, sand is very fine to very coarse, subangular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	0	100	<5	
	GW 23.0 - 24.0 ft: Very soft, dark brown, moist, well graded GRAVEL with sand (GW), low plasticity, sand is very fine to very coarse, subangular to rounded, gravel is very fine to very coarse, subangular to rounded, cobbles (< 6 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	50	<50	<5	
24	**GW** 24.0 - 25.0 ft: Very soft, dark brown, wet, well graded GRAVEL (GW), low plasticity, gravel is very fine to very coarse, subangular to rounded, cobbles <6 in, subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	100	0	<5	
25	**NR** 25.0 - 26.0 ft: NO RETURN				
26	**SW** 26.0 - 27.5 ft: Very soft, dark brown, wet, well graded SAND (SW), low plasticity, sand is very fine to coarse, subangular to	0	100	<5	**Sodium Bentonite Slurry**
27					

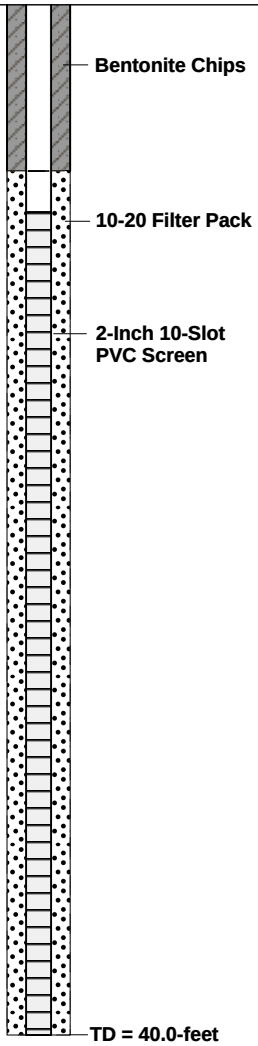
LOG ID: GM1-MW1

GSI Water Solutions, Inc.

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 851 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 40		**DATE STARTED:** 5/19/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/22/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 19.5	**COMPLETED:** 14.9
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES
28	rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]			
29	**GW** 27.5 - 30.0 ft: Very soft, dark brown, wet, well graded GRAVEL (GW), low plasticity, sand is very fine to very coarse, subangular to rounded, gravel is fine to coarse, subangular to rounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	100	0	<5
30	**SW** 30.0 - 31.5 ft: Very soft, dark brown, wet, well graded SAND (SW), low plasticity, sand is very fine to coarse, subangular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	0	100	<5
31				
32	Increase in silt/decrease in gravel at 33.0 ft			
33	**GW** 31.5 - 35.0 ft: Soft, dark brown, wet, well graded GRAVEL with sand (GW), low plasticity, sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to rounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	40	<5
34				
35	**SW-SM** 35.0 - 36.0 ft: Very soft, dark brown to dark gray, wet, well graded SAND with silt (SW-SM), sand is very fine to coarse, subangular to subrounded, gravel is fine to coarse, subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	10	80	10
36	**GW** 36.0 - 37.0 ft: Soft, brown to gray, wet, well graded GRAVEL (GW), gravel is fine to coarse, subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	90	<5	<5
37	Increase in cobbles at 38.0 ft			
38	**GW** 37.0 - 40.0 ft: Soft, dark brown, wet, well graded GRAVEL with sand (GW), low plasticity, sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to rounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	40	<5
39				
40	Total Depth = 40.0 ft			
41				
42				
43				

AS-BUILT WELL CONSTRUCTION

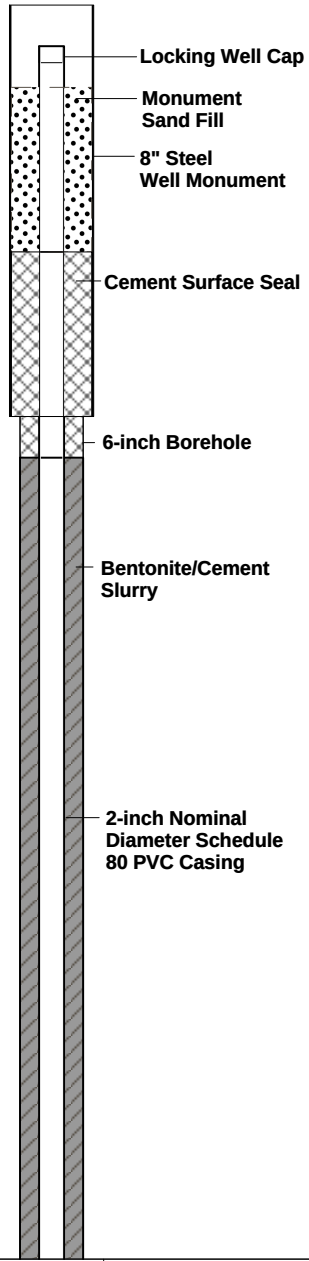


LOG ID: GM4-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 880 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 40		**DATE STARTED:** 5/19/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/19/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 10	**COMPLETED:** 12.1
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES
0–1	ML: 0.0 - 1.5 ft: Soft to medium stiff, dark brown, moist to dry, SILT (ML), organics, rootlets, low plasticity [FILL]	0	0	100
1–4	ML: 1.5 - 4.0 ft: Medium stiff to stiff, dark brown to red, moist, SILT (ML), high plasticity [QUATERNARY MIDDLE TERRACE DEPOSITS]	0	0	100
4–5	GM: 4.0 - 5.0 ft: Medium stiff, dark brown, moist, silty GRAVEL with sand (GM), medium plasticity, sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to rounded, cobbles (< 6 inches) [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	25	35
5–6	ML: 5.0 - 5.5 ft: Medium stiff to stiff, dark brown to red, moist, SILT (ML), high plasticity, gravel is fine to coarse, subangular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	<5	0	100
6–7.5	GW-GM: 5.5 - 7.5 ft: Medium stiff, dark brown, moist, well graded GRAVEL with silt and sand (GW-GM), low to medium plasticity, sand is very fine to coarse, subangular to rounded, gravel is fine to coarse, subangular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	70	20	10
7.5–10	GW: 7.5 - 10.0 ft: Very soft, dark brown to gray, dry to moist, well graded GRAVEL with sand (GW), sand is fine to coarse, gravel is fine to coarse, angular to subrounded, cobbles (<6 inches), low plasticity	80	15	<5
10–12	GM: 10.0 - 12.0 ft: Very soft, wet, dark brown, silty GRAVEL with sand (GM), sand is fine to coarse, gravel is fine to coarse, subangular to subrounded, cobbles (< 6 inches), subrounded to rounded, low plasticity [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	15	25

AS-BUILT WELL CONSTRUCTION



GSI Water Solutions, Inc.

LOG ID: GM4-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 880 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 40		**DATE STARTED:** 5/19/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/19/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 10	**COMPLETED:** 12.1
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES	AS-BUILT WELL CONSTRUCTION
13	GW 12.0 - 14.0 ft: Very soft, dark brown to gray, dry to moist, well graded GRAVEL with sand (GW), sand is fine to coarse, gravel is fine to coarse, angular to subrounded, cobbles (<6 inches), low plasticity	80	15	<5	
14					
15	GM 14.0 - 16.0 ft: Medium soft, moist to dry, dark brown to gray, silty GRAVEL with sand (GM), sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, angular to subrounded, some cobbles (< 8 inches), subrounded to rounded, low plasticity [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	20	20	
16					
17	GW 16.0 - 19.0 ft: Medium stiff, dark brown to gray, moist to wet, well graded GRAVEL (GW), low plasticity, sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to rounded, cobbles (< 8 inches), rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	90	10	<5	
18					
19	GW-GM 19.0 - 20.0 ft: Medium stiff, dry to moist, brown to gray, well graded GRAVEL with silt (GW-GM), low plasticity, very fine to coarse sand, fine to coarse gravel, subangular to rounded gravel, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	80	10	10	
20					
21	GW 20.0 - 23.0 ft: Soft, dark brown, very wet, well graded GRAVEL with sand (GW), low to medium plasticity, sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to subrounded, cobbles (< 6 inches) [QUATERNARY MIDDLE TERRACE DEPOSITS]	80	15	<5	
22					
23					
24	SW 23.0 - 26.0 ft: Very soft, dark brown, moist, well graded SAND with gravel (SW), low plasticity, sand is fine to coarse, gravel is fine to coarse, subrounded to subangular, cobbles (< 4 inches), rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	35	60	<5	
25					
26					
27	GW-GM 26.0 - 28.0 ft: Very stiff, brown to gray, dry to moist, well graded GRAVEL with silt (GW-GM), trace sand, sand is fine to coarse, gravel is subangular to rounded,cobbles (<8 inches), subrounded to rounded, low to medium plasticity [QUATERNARY MIDDLE TERRACE DEPOSITS]	90	<5	10	Bentonite Chips
28	GM 28.0 - 29.0 ft: Very soft, brown to gray, dry, silty GRAVEL				

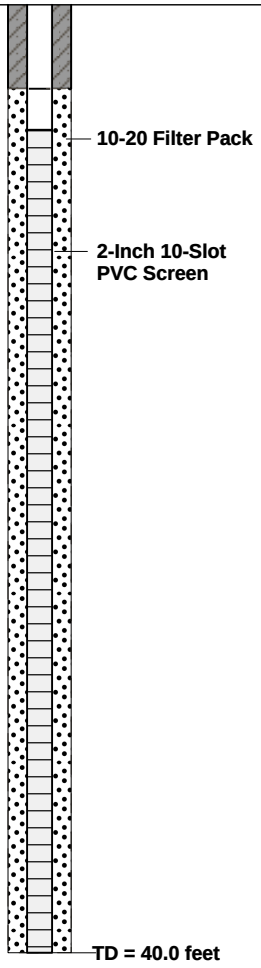
GSI Water Solutions, Inc.

LOG ID: GM4-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 880 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 40		**DATE STARTED:** 5/19/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/19/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 10	**COMPLETED:** 12.1
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES
29	GM with sand (GM), trace ash, sand is fine to coarse, gravel is fine to coarse, subangular to subrounded, cobbles (< 4 inches) [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	20	20
30	SM 29.0 - 30.0 ft: Soft, dark brown, moist, silty SAND with gravel (SM), ash, low to medium plasticity, sand fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to subrounded, cobbles (< 6 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	35	45	20
31	GW-GM 30.0 - 31.0 ft: Soft, dark brown to gray, moist, well graded GRAVEL with silt (GW-GM), low plasticity, sand is fine to coarse, subangular to rounded, gravel is fine to coarse, subangular to subrounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	80	10	10
32	SW-SM 31.0 - 32.5 ft: Soft to stiff, dark brown to gray, dry to moist, well graded SAND with silt and gravel (SW-SM), low to medium plasticity, sand is fine to coarse, gravel is fine to coarse, rounded to angular, cobbles (< 4 inches) [QUATERNARY MIDDLE TERRACE DEPOSITS]	30	60	10
33				
34	ML 32.5 - 35.0 ft: Stiff, gray, moist, SILT with gravel (ML), medium plasticity, sand is fine to coarse, rounded to angular, gravel is fine to coarse, rounded to angular [QUATERNARY MIDDLE TERRACE DEPOSITS]	20	10	70
35				
36	GW-GM 35.0 - 36.0 ft: Stiff, brown to gray, moist to wet, well graded GRAVEL with silt (GW-GM), trace sand, sand is fine to coarse, gravel is subangular to rounded, cobbles (≤ 8 inches), Increase in moisture with depth [QUATERNARY MIDDLE TERRACE DEPOSITS]	90	<5	10
37				
38	GM 36.0 - 40.0 ft: Soft, dark brown, wet, silty GRAVEL with sand (GM), low to medium plasticity, sand is fine to coarse, gravel is fine to coarse, subangular to rounded, cobbles (< 8 inches), rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	50	30	20
39				
40				
41				
42				
43				
44				

Total Depth = 40.0 ft



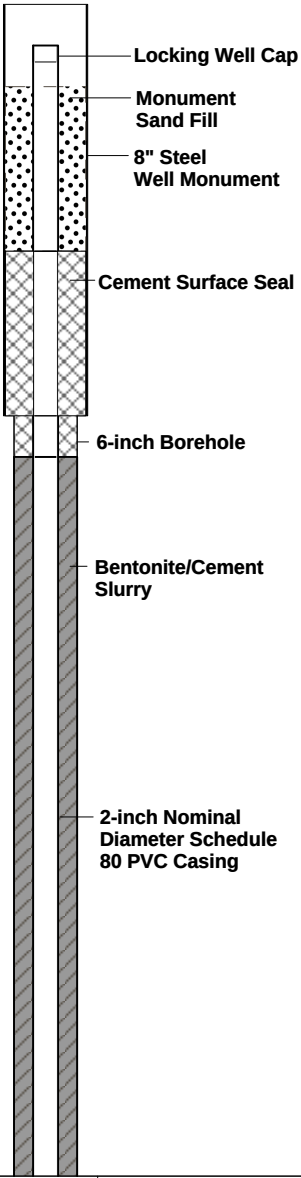
GSI Water Solutions, Inc.

LOG ID: GM5-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 1005 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 76		**DATE STARTED:** 5/15/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/15/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 60	**COMPLETED:** 57.5
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES
0–3.5	ML — 0.0 - 3.5 ft: Medium stiff, dark brown, moist, SILT (ML), medium plasticity, rootlets, trace sand is medium to coarse [FILL]	0	<5	100
3.5–4.5	ML — 3.5 - 4.5 ft: Stiff, dark brown, moist to dry, SILT (ML), low plasticity, rootlets, charcoal, trace sand is medium to coarse, trace gravel is medium to coarse [QUATERNARY MIDDLE TERRACE DEPOSITS]	<5	<5	90
4.5–6.0	ML — 4.5 - 6.0 ft: Stiff, dark brown, moist, gravelly SILT with sand (ML), medium to high plasticity, trace charcoal, few sand, fine to coarse, some gravel is fine to coarse, cobbles (< 6 inches) [QUATERNARY MIDDLE TERRACE DEPOSITS]	20	<10	70
6.0–8.0	ML — 6.0 - 8.0 ft: Stiff, dark brown, moist to dry, gravelly SILT with sand (ML), some sand is fine to coarse, gravel is fine to coarse, rounded to subangular, cobbles (< 6 inches) [QUATERNARY MIDDLE TERRACE DEPOSITS]	25	15	60
8.0–12.0	GM — 8.0 - 12.0 ft: Medium stiff, dark brown, moist, silty GRAVEL with sand (GM), high plasticity, sand is fine to coarse, angular to subrounded, gravel is fine to coarse, angular to subrounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	20	40

AS-BUILT WELL CONSTRUCTION



GSI Water Solutions, Inc.

LOG ID: GM5-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 1005 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 76		**DATE STARTED:** 5/15/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/15/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 60	**COMPLETED:** 57.5
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES	AS-BUILT WELL CONSTRUCTION
12					
13					
14					
15	GM 12.0 - 17.5 ft: Medium stiff to soft, dark brown, moist, silty GRAVEL with sand (GM), medium plasticity, sand is fine to coarse, angular to subangular, gravel is fine to coarse, angular to subangular, cobbles (< 6 inches) [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	40	20	
16					
17					
18	GM 17.5 - 19.5 ft: Medium stiff to soft, dark brown, moist to dry, silty GRAVEL with sand (GM), medium to high plasticity, sand is fine to coarse, subrounded to subangular, gravel is fine to coarse, angular to subrounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	20	20	
19					
20	GM 19.5 - 21.0 ft: Medium stiff, dark brown, moist, silty GRAVEL with sand (GM), high plasticity, sand is fine to coarse, angular to subrounded, gravel is fine to coarse, angular to subrounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	20	40	
21					
22					
23					
24					
25					
26					
27	GM 21.0 - 33.0 ft: Medium stiff to soft, dark brown, moist to dry, silty GRAVEL with sand (GM), medium to high plasticity, sand is fine to coarse, subrounded to subangular, gravel is fine to coarse, angular to subrounded, cobbles (< 8 inches),	60	20	20	

GSI Water Solutions, Inc.

LOG ID: GM5-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 1005 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 76		**DATE STARTED:** 5/15/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/15/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 60	**COMPLETED:** 57.5
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES	AS-BUILT WELL CONSTRUCTION
28	subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS] Large broken cobbles (< 8 inches) at 28.0-feet				
29					
30					
31					
32					
33					
34	GW 33.0 - 36.0 ft: Very soft, dark brown to gray, dry, well graded GRAVEL with sand (GW), sand is fine to coarse, subrounded to angular, gravel is fine to coarse, subrounded to angular, cobbles (< 8 inches), angular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	80	15	<15	
35					
36	GM 36.0 - 37.5 ft: Medium stiff, dark brown, moist, silty GRAVEL with sand (GM), high plasticity, sand is fine to coarse, angular to subrounded, gravel is fine to coarse, angular to subrounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	20	40	
37	NR 37.0 - 37.5 ft: NO RETURN				
38					
39					
40					
41	GW 37.5 - 45.0 ft: Very soft, dark brown to gray, dry, well graded GRAVEL with sand (GW), sand is fine to coarse, subrounded to angular, gravel is fine to coarse, subrounded to angular, cobbles (< 8 inches), angular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	80	15	<15	
42					
43					

GSI Water Solutions, Inc.

LOG ID: GM5-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 1005 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 76		**DATE STARTED:** 5/15/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/15/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 60	**COMPLETED:** 57.5
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES	AS-BUILT WELL CONSTRUCTION
44–47	**GM** 45.0 - 47.5 ft: Soft, dark brown, moist to dry, silty GRAVEL (GM), sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, angular to subrounded, cobbles (< 8 inches), subangular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	<10	30	
48–59	**GW** 47.5 - 62.0 ft: Very soft, dark brown to gray, dry, well graded GRAVEL with sand (GW), sand is fine to coarse, subrounded to angular, gravel is fine to coarse, subrounded to angular, cobbles (< 8 inches), angular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	80	15	<15	Bentonite Chips

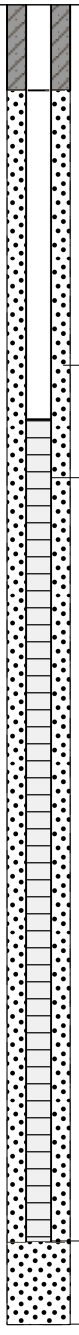
LOG ID: GM5-MW1

GSI Water Solutions, Inc.

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 1005 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 76		**DATE STARTED:** 5/15/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/15/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 60	**COMPLETED:** 57.5
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES
60	Moist to wet at 60.0-feet			
62	62.0 - 65.0 ft: Medium stiff to soft, dark brown, wet, silty GRAVEL with sand (GM), medium plasticity, sand is fine to coarse, subangular to angular, gravel is fine to coarse, subangular to subrounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	<40	20
65	65.0 - 66.5 ft: NO RETURN			
66.5	66.5 - 68.0 ft: Medium stiff to soft, dark brown, wet, silty GRAVEL with sand (GM), medium plasticity, sand is fine to coarse, subangular to angular, gravel is fine to coarse, subangular to subrounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	<40	20
68	68.0 - 70.0 ft: Soft, dark brown, wet, silty SAND with gravel (SM), low to medium plasticity, sand is fine to coarse, angular to subrounded, gravel is fine to coarse, subangular to subrounded, few cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	30	35	35
70	70.0 - 72.0 ft: Very Soft, dark brown, moist to wet, well graded SAND with silt and gravel (SW-SM), sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to subrounded, few cobbles (< 6 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	30	60	<10
72	72.0 - 73.0 ft: Very Soft, gray, dry, well graded GRAVEL with silt and sand (GW), low plasticity, sand is very fine to coarse, subangular to angular, gravel is fine to coarse, subangular to angular [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	25	<15
73	73.0 - 76.0 ft: Very Soft, dark brown, dry, silty GRAVEL (GM), low plasticity, sand is fine to coarse, angular to subangular, gravel is fine to coarse, angular to subrounded, cobbles (< 8 inches), subangular to subrounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	70	<10	20
76	**Total Depth = 76.0-feet**			

AS-BUILT WELL CONSTRUCTION



- **10-20 Filter Pack**
- **2-Inch 10-Slot PVC Screen**
- **Bottom of Screen = 75.0-feet**
- **TD = 76.0-feet**

ATTACHMENT B

GeoSystems Analysis Soil Physical Parameters Memorandum

GeoSystems Analysis, Inc.
Innovations in Hydrology

MEMORANDUM

August 10, 2023

TO: Matt Kohlbecker, GSI Water Solutions, Inc.

FROM: Jason Keller, GeoSystems Analysis, Inc.

RE: Gates – Mill City Borehole Sample Testing

INTRODUCTION

Geosystems Analysis, Inc. (GSA) completed physical and hydraulic testing of borehole samples collected from the Gates and Mill City, Oregon area in support of the treated wastewater infiltration feasibility assessment being completed by GSI Water Solutions (GSI) and Keller and Associates. Boreholes were drilled at three potential infiltration basin locations (Figure 1):

- Baughman Lucas (GM1)
- 4th Ave Right of Way (ROW) (GM4)
- Weyerhaeuser (GM5)

This technical memo provides test methods and results for physical and hydraulic testing performed on sonic core samples by GSA and its subcontractor.

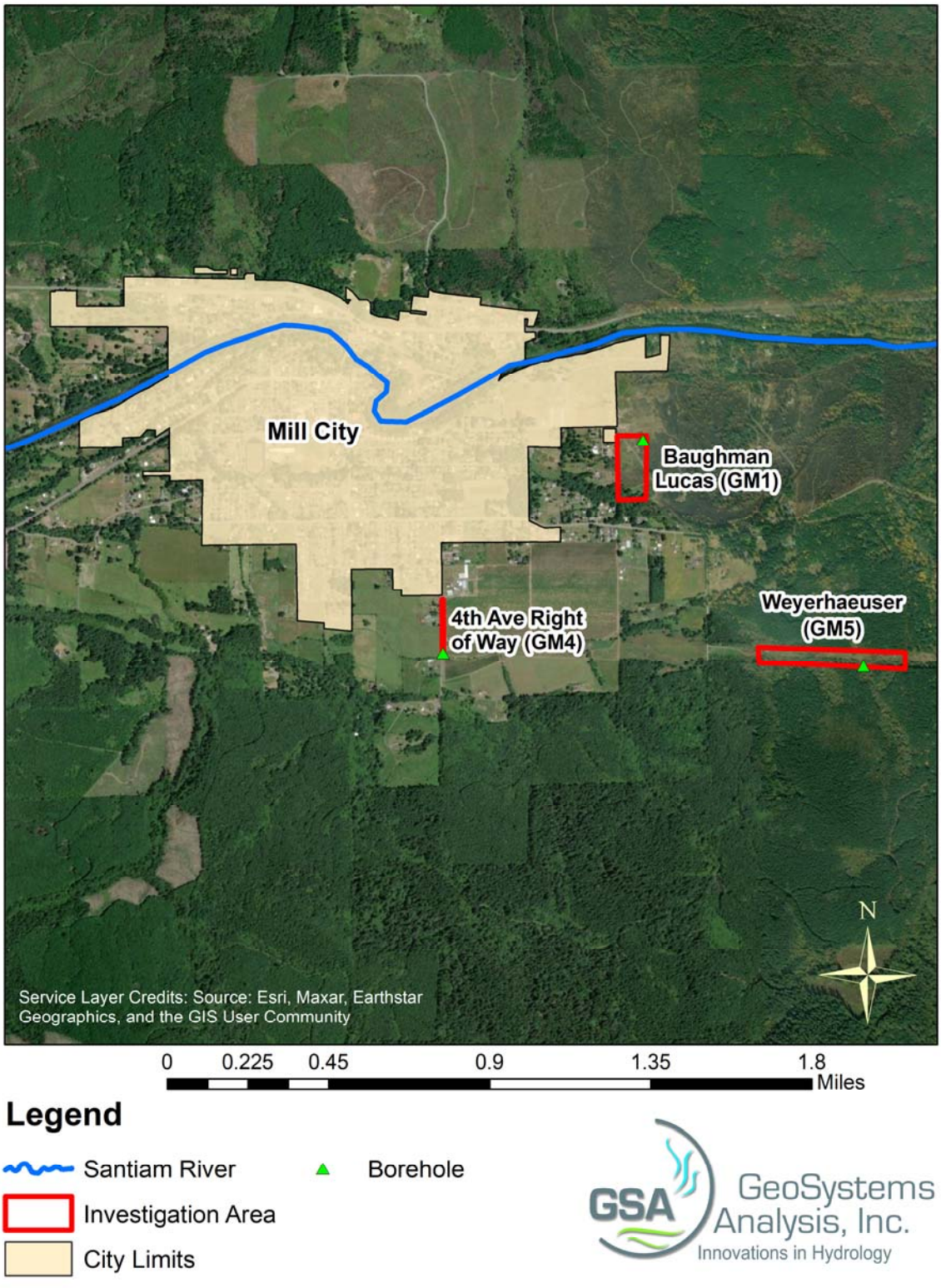


Figure 1. Borehole locations

METHODS

From May 15th through 19th, GSI supervised the drilling of three boreholes near Mill City, Oregon. Borehole locations are shown in Figure 1. Drilling was done by Holt Services Inc. using a track mounted sonic drill rig with a 5-inch inside diameter core barrel and 4.18-inch inside diameter sampler. The boreholes were drilled to the water table and completed as monitoring wells. Additional details of the drilling and monitoring well completion is provided in GSI (2023).

Sonic core were collected in approximately 2.5-ft lengths and placed in plastic sleeves. The length and weight of each 2.5-ft core section was recorded and then the core sample bags were opened, photographed, logged, and sampled. Geologic logging was conducted by GSI on each 2.5-ft core run to estimate major particle size fractions. Borehole logs are presented in GSI (2023).

Sub-samples were collected from horizons with distinct textural, color, and water content properties and placed in a sealed and labeled freezer bag for laboratory testing. Table 1 provides the test type, method, laboratory, and standard for all tests conducted on the samples. Sample testing methods are described below.

Table 1. Laboratory tests conducted

Test Type	Test Method	Testing Laboratory	Test Standard[1]	Samples Tested
Physical	Particle Size Distribution	GSA, Tucson, AZ	ASTM D6913-17 / ASTM D7928-17	GM1 = 2, GM4 = 2, GM5 = 2
	Specific Gravity	GSA, Tucson, AZ	ASTM D854-014	GM1 = 1, GM4 = 1, GM5 = 1
Hydraulic	Gravimetric Water Content	Oregon State University, Corvallis, OR	ASTM D2216-19	GM1 = 10, GM4 = 7, GM5 = 19
	Rigid-Wall Saturated Hydraulic Conductivity	GSA, Tucson, AZ	ASTM D5856-15	GM1 = 3, GM4 = 3, GM5 = 3

[1]American Society for Testing and Materials, Volume 4.08. 2009. West Conshohocken, Pennsylvania

Particle Size Distribution

Particle size distribution (PSD) testing was conducted by GSA on two samples from each borehole. Sand, silt, and clay fractions were determined using wet sieve and hydrometer methods (ASTM D6913-17, ASTM D7928-17).

Particle Density

Particle density measurements were conducted by GSA on one sample from each borehole. The sample was sieved to pass the #10 mesh (2 mm) sieve and 10 grams of sample passing the #10 mesh was used for particle density testing using the pycnometer method (ASTM D854-14).

Gravimetric Water Content

Gravimetric water content measurements were conducted by Oregon State University on a total of 36 samples using the oven dry method (ASTM D2216-19). Approximately 500 grams of each sample was weighed, placed in an oven at 110 degrees Celsius and dried until repeated water content measurements indicate a constant sample mass was achieved.

Saturated Hydraulic Conductivity

Saturated hydraulic conductivity (K_{sat}) tests were conducted by GSA using a 2-inch diameter by 3-inch-high rigid wall cell (ASTM D5856-15). The test cells were packed to a dry bulk density approximating the measured bulk density of the core sample from which the sample was taken. The packed test cells were saturated by upward infiltration with tap water and testing was performed with tap water.

RESULTS

Calculated core sample dry bulk density and laboratory results are summarized below. Complete laboratory results are provided in Appendix A and Appendix B.

Particle Size Distribution (PSD)

PSD testing results are shown in Figure 2. Table 2 provides percentages for gravel (>4.75 mm), sand (4.75 mm to 0.075 mm), silt (0.075 mm to 0.002 mm), and clay (<0.002 mm). All samples had a large gravel fraction of 34% or greater. The GM5 samples were finer textured than the GM4 and GM1 samples, with percent silt plus clay being 16% or greater compared for the GM5 samples, 11.8% or less for the GM1 samples and 9.4% and less for the GM4 samples.

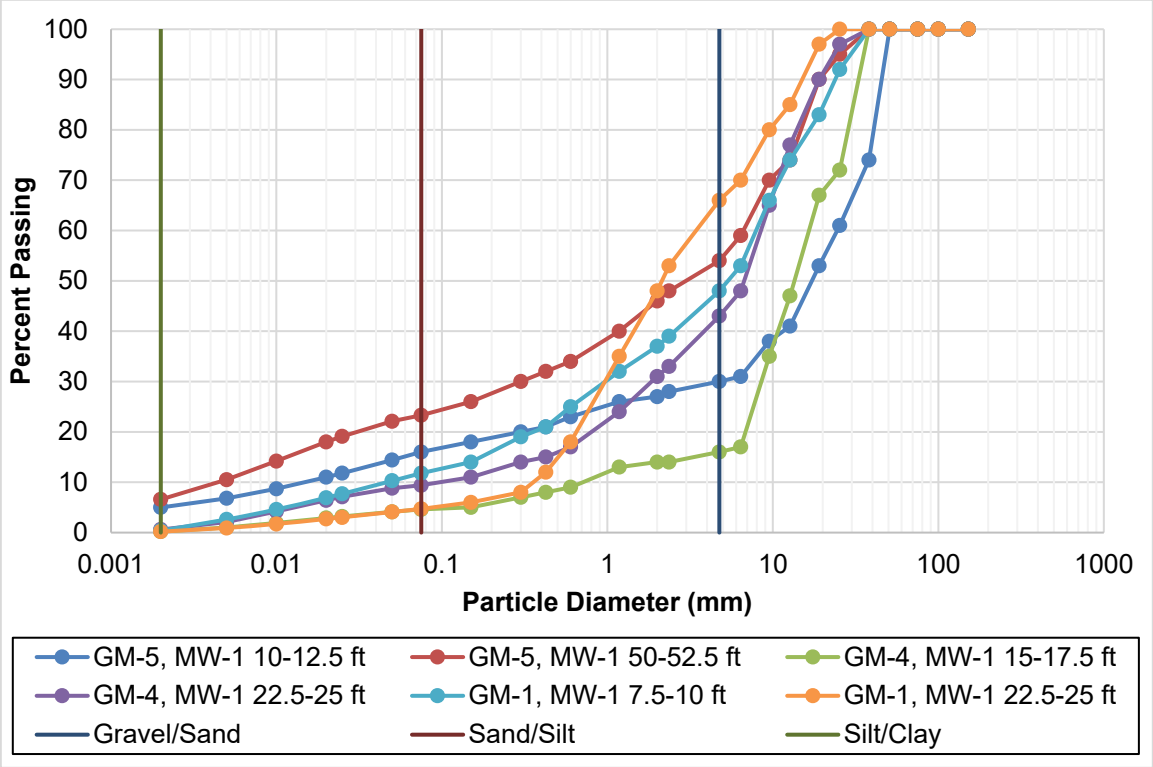


Figure 2. Particle size distribution

Table 2. Percent gravel, sand, silt, and clay

Particle Size	GM5, MW-1 10-12.5 ft	GM5, MW-1 50-52.5 ft	GM4, MW-1 15-17.5 ft	GM4, MW-1 22.5-25 ft	GM1, MW-1 7.5-10 ft	GM1, MW-1 22.5-25 ft
% Gravel (>4.75 mm)	70.0	46.0	84.0	57.0	52.0	34.0
% Sand (4.75 - 0.075 mm)	14.0	30.7	11.4	33.6	36.2	61.3
% Silt (0.075 - 0.002 mm)	11.0	16.7	4.4	8.8	11.4	4.5
% Clay (<0.002 mm)	5.0	6.6	0.2	0.6	0.4	0.2

Particle Density

Error! Reference source not found. provides particle density results. Particle density ranged from 2.67 g/cm^3 to 2.81 g/cm^3.

Table 3. Particle density

Sample	Particle Density (g/cm^3)
GM1 MW1 7.5-10	2.72
GM4 MW1 15-17.5	2.81
GM5 MW1 50-52.5	2.67

Water Content and Bulk Density

Core sample calculated bulk density and measured water content for GM1, GM4, and GM5 are presented in Figure 3, Figure 4, and Figure 5, respectively. The water content was variable and a function of soil texture and whether the sample was collected from below the water table. Finer textured soil layers tend to have greater water content than coarser textured soils. The observed depth to groundwater at GM1, GM4, and GM5 was approximately 21 ft, 14 ft, and 61 ft below ground surface. The large variability in water content at GM5 is likely due to differing layers of fine textured soil overlaying less fine textured soils.

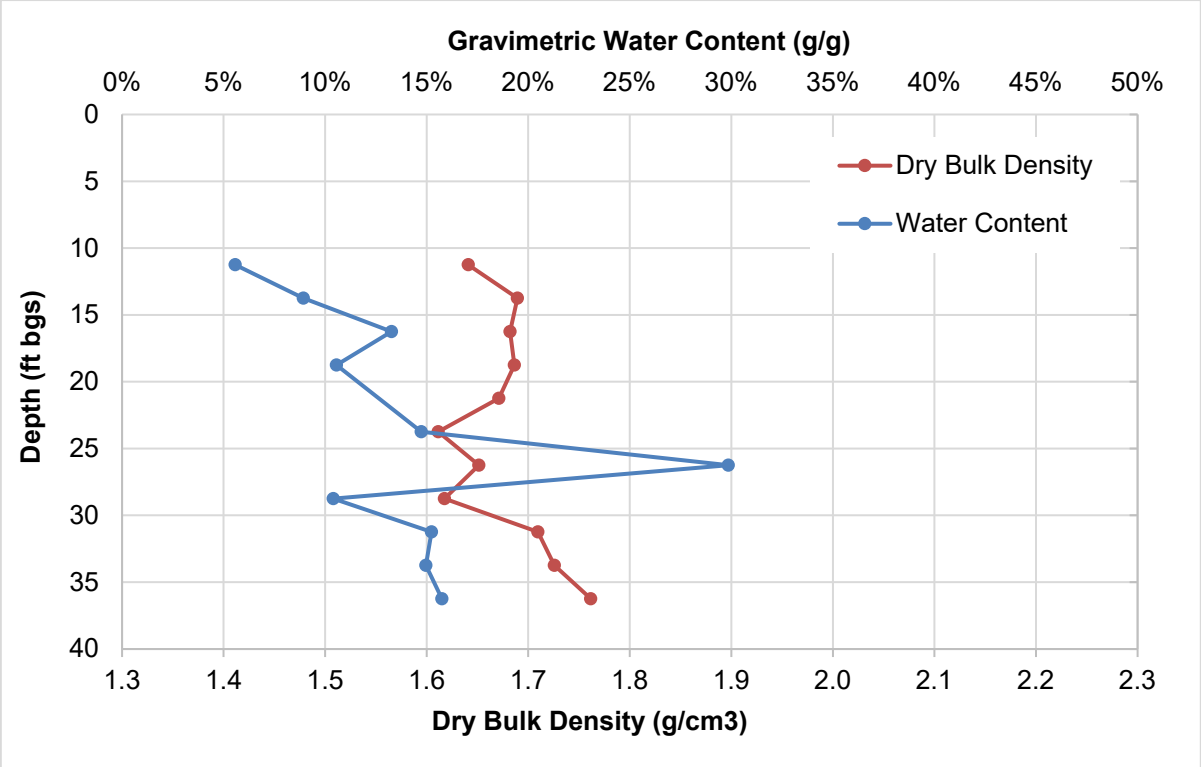


Figure 3. GM1 dry bulk density and water content

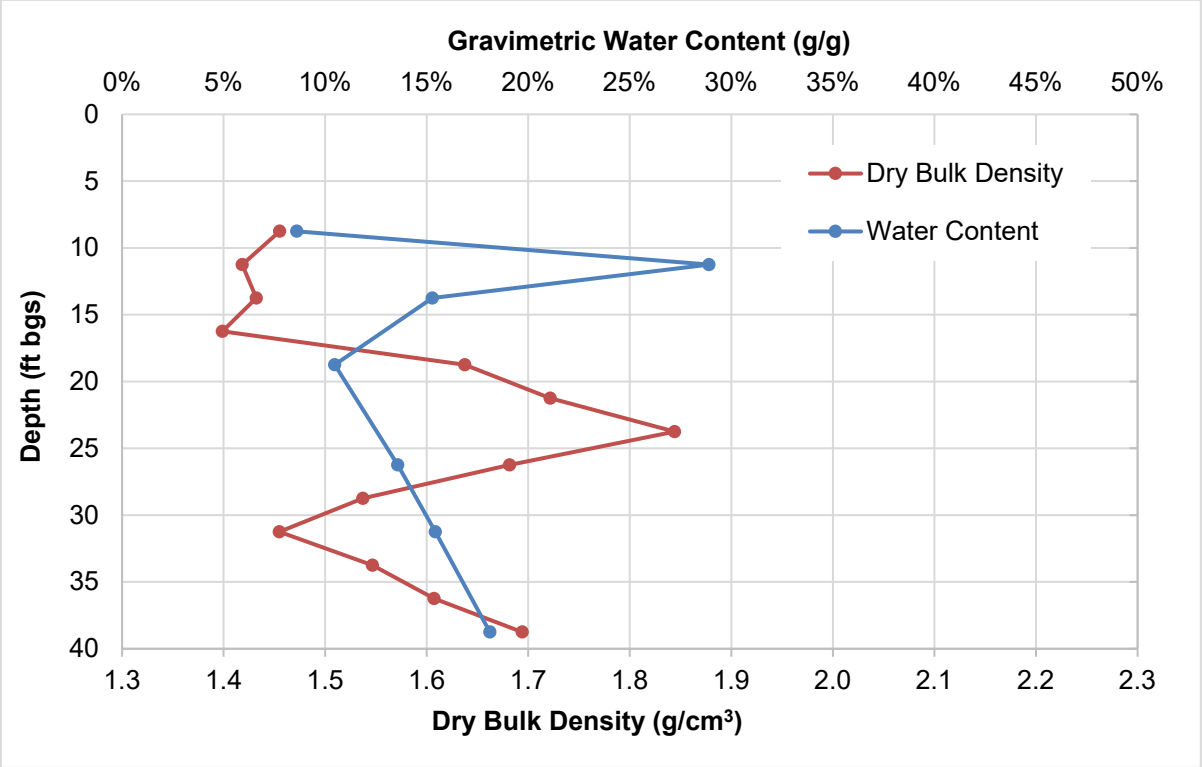


Figure 4. GM4 dry bulk density and water content

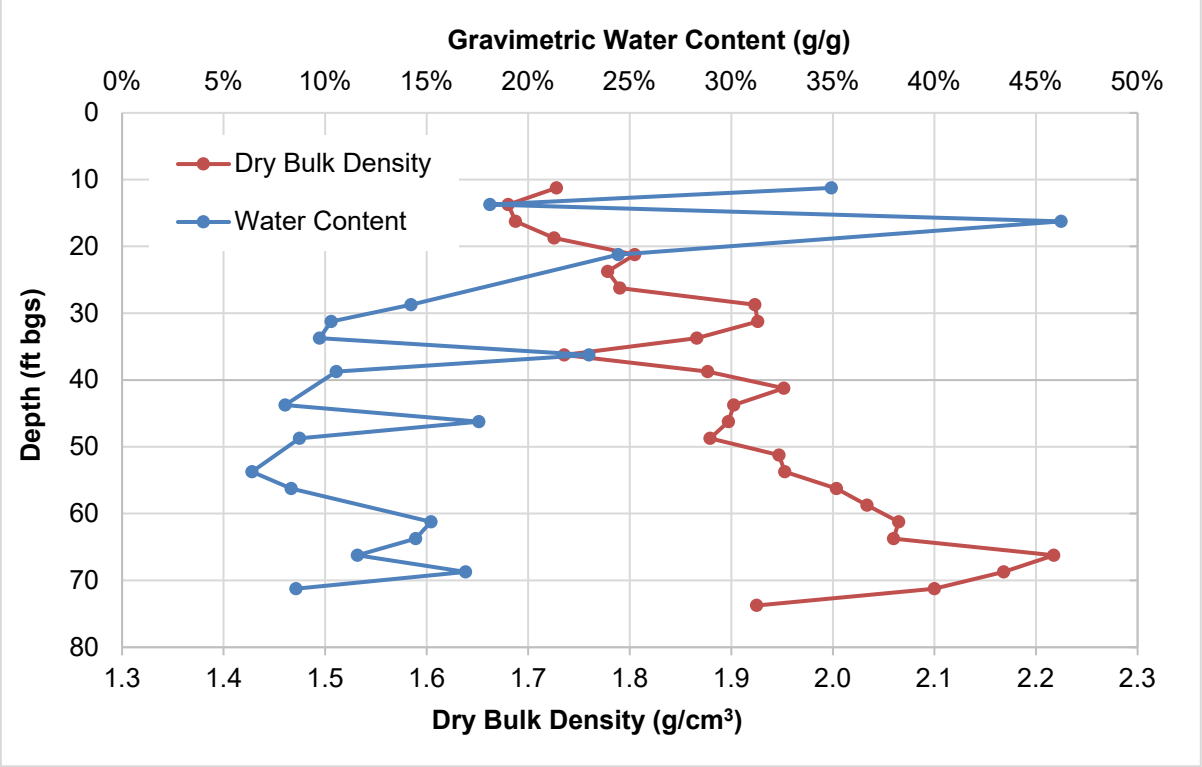


Figure 5. GM5 dry bulk density and water content

Saturated Hydraulic Conductivity

Measured K_{sat}, field measured percent fines (silt plus clay) and sample packing bulk density and porosity are presented in Table 4. Measured K_{sat} of the GM1 and GM4 samples were 9.9×10^{-4} cm/s (2.81 ft/day) or greater whereas measured K_{sat} of the GM5 samples were 5.3×10^{-7} cm/s (0.0015 ft/day) or less. K_{sat} results correspond with field observations of percent fines, with K_{sat} values being less for the finer textured GM5 samples (percent fines of 20% or more). The percent fines of the GM1 and GM4 samples were 10% or less and corresponded to greater measured K_{sat}. The low K_{sat} values for the GM5 samples indicate that the deeper unsaturated zone sediments at GM5 may significantly limit percolation of infiltrated water at this location.

Table 4. Saturated hydraulic conductivity, packing bulk density and porosity, and field estimated percent silt and clay

Sample ID	Field Measured Percent Silt + Clay	Dry Bulk Density (g/cm^3)	Total Porosity (cm^3/cm^3)	Saturated Hydraulic Conductivity	
				(cm/sec)	(ft/day)
GM-1, MW-1 7.5-10 ft	10	1.74	0.36	9.90E-04	2.81
GM-1, MW-1 15-17.5 ft	5	1.63	0.40	1.20E-02	34.02
GM-1, MW-1 22.5-25 ft	5	1.60	0.41	4.30E-03	12.19
GM-4, MW-1 15-17.5 ft	5	1.45	0.48	6.20E-03	17.57
GM-4, MW-1 17.5-20 ft	5	1.54	0.44	2.10E-03	5.95
GM-4, MW-1 22.5-25 ft	5	1.69	0.38	3.10E-03	8.79
GM-5, MW-1 10-12.5 ft	40	1.57	0.43	1.30E-07	0.0004
GM-5, MW-1 20-22.5 ft	20	1.67	0.39	5.30E-07	0.0015
GM-5, MW-1 50-52.5 ft	30	1.80	0.32	6.20E-08	0.0002

CONCLUSIONS

GM5 K_{sat} results of 5.3 x 10-7 cm/s (0.0015 ft/day) or less indicate the finer textured sediments observed in the unsaturated zone at GM5 may limit deep percolation at this location. Additionally, the presence of multiple layers of finer textured material throughout the unsaturated zone at GM5 is supported by the variable elevated water contents at this borehole. Conversely, the measured K_{sat} values at GM1 and GM4 do not indicate potential restrictions to net percolation from deeper unsaturated sediments present at these locations.

REFERENCES

GSI, see GSI Water Solutions, Inc.

GSI Water Solutions, Inc., 2023. Gates/Mill City Deep Soil Characterization and Slug Testing Results, Marion and Linn Counties, Oregon. Technical Memorandum to Chris Einmo, Marion County, dated August XX, 2023

Appendix A.
GSA Laboratory Test Results

GSA GeoSystems Analysis, Inc.
Innovations in Hydrology

3393 N Dodge Blvd
Tucson, AZ 85716
520-628-9330
Fax: 520-628-1122
www.gsanalysis.com

Date: August 8, 2023
Project Number: **92310**
Project Name: **GSI - Mill City Inflitration Site**
Job Description: Lab Testing
Client: GSI Water Solutions, Inc.
Project Contact: Matt Kohlbecker, RG
Billing Address: 55 SW Yamhill St., Suite 300
Portland, OR 97204

Test	*Method*	*Qty*
Specific Gravity of Soils	ASTM D854-14	3
Particle Size Analysis with Hydrometer	ASTM D6913-17 / ASTM C136-14 / ASTM D7928-17	6
Rigid-Wall Saturated Hydraulic Conductivity	ASTM D5856-15	9

Thank you for choosing GeoSystems Analysis for your material testing needs. We look forward to working with you again. If you have any questions or require additional information, please contact us at 1-520-628-9330

Sincerely,

Prepared By: Nate Blevens
Laboratory Project Manager

Reviewed By: Mike Yao
Laboratory Technical Director

GeoSystems Analysis, Inc.
Innovations in Hydrology

3393 N Dodge Blvd
Tucson, AZ 85716
520-628-9330
Fax: 520-628-1122
www.gsanalysis.com

Laboratory Test Results - Soil Particle Density

Date: August 8, 2023
Project Number: **92310**
Project Name: **GSI - Mill City Inflitration Site**
Client: GSI Water Solutions, Inc.

Sample ID	Particle Density (g/cm^3)
GM1 MW1 7.5-10	2.72
GM4 MW1 15-17.5	2.81
GM5 MW1 50-52.5	2.67

GSA GeoSystems Analysis, Inc.
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3393 N Dodge Blvd
Tucson, AZ 85716
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Fax: 520-628-1122
www.gsanalysis.com

Laboratory Test Results - Particle Size Distribution

Date: August 8, 2023
Project Number: **92310**
Project Name: **GSI - Mill City Inflitration Site**
Client: GSI Water Solutions, Inc.

PSD							
		Sample ID					
Sieve		GM-5, MW-1 10-12.5 ft	GM-5, MW-1 50-52.5 ft	GM-4, MW-1 15-17.5 ft	GM-4, MW-1 22.5-25 ft	GM-1, MW-1 7.5-10 ft	GM-1, MW-1 22.5-25 ft
(mm)	US standard	Percent Passing					
152	6"	100	100	100	100	100	100
100	4"	100	100	100	100	100	100
75	3"	100	100	100	100	100	100
50.8	2"	100	100	100	100	100	100
38.1	1.5"	74	100	100	100	100	100
25.4	1"	61	95	72	97	92	100
19.05	3/4"	53	90	67	90	83	97
12.7	1/2"	41	74	47	77	74	85
9.525	3/8"	38	70	35	65	66	80
6.4	1/4"	31	59	17	48	53	70
4.75	#4	30	54	16	43	48	66
2.36	#8	28	48	14	33	39	53
2	#10	27	46	14	31	37	48
1.18	#16	26	40	13	24	32	35
0.6	#30	23	34	9	17	25	18
0.425	#40	21	32	8	15	21	12
0.3	#50	20	30	7	14	19	8
0.15	#100	18	26	5	11	14	6
0.075	#200	16.0	23.3	4.6	9.4	11.8	4.7
0.05	Hydrometer	14.4	22.1	4.1	8.8	10.3	4.1
0.025		11.8	19.1	3.2	7.1	7.7	3.0
0.02		11.0	18.0	2.9	6.4	6.9	2.7
0.01		8.7	14.2	1.9	4.2	4.6	1.7
0.005		6.8	10.5	1.0	2.1	2.6	0.9
0.002		5.0	6.6	0.2	0.6	0.4	0.2

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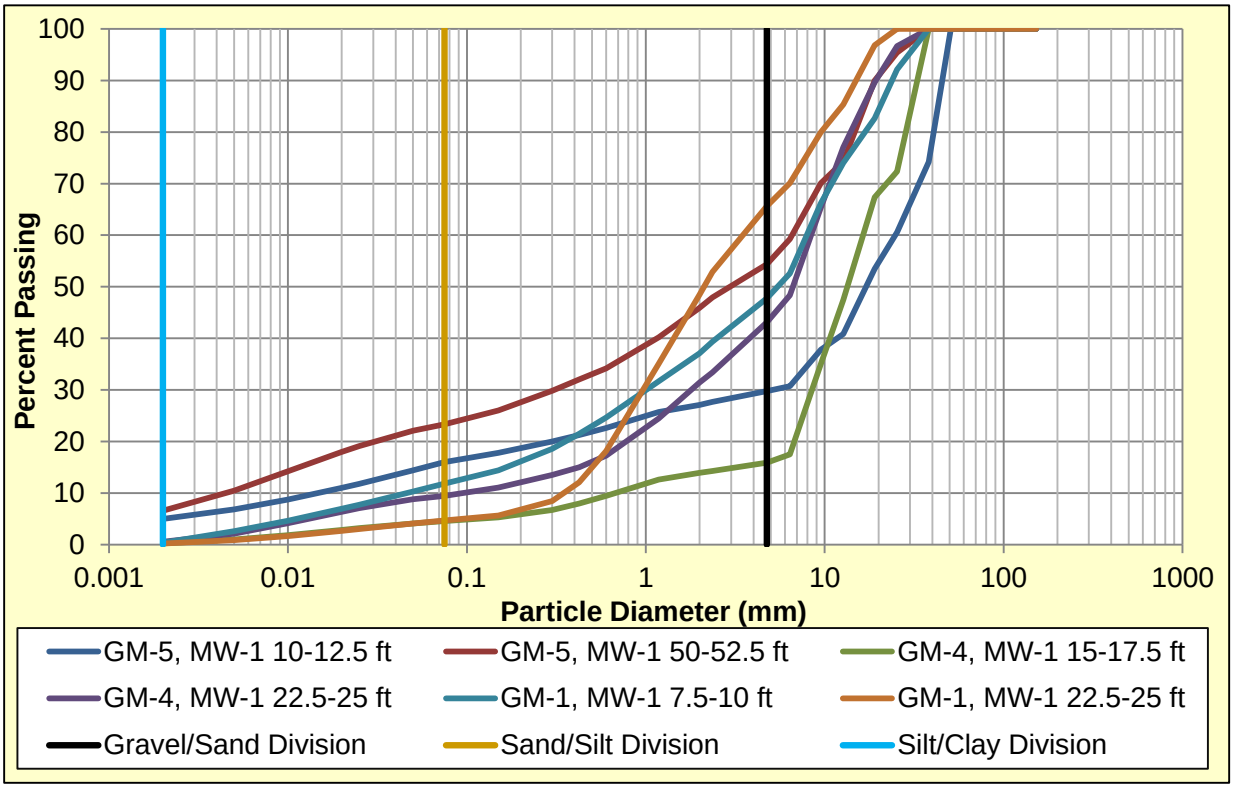
Tucson, AZ 85716
520-628-9330
Fax: 520-628-1122
www.gsanalysis.com

Laboratory Test Results - Particle Size Distribution

Date: August 8, 2023
Project Number: **92310**
Project Name: **GSI - Mill City Inflitration Site**
Client: GSI Water Solutions, Inc.



GSA GeoSystems Analysis, Inc.
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3393 N Dodge Blvd
Tucson, AZ 85716
520-628-9330
Fax: 520-628-1122
www.gsanalysis.com

Laboratory Test Results - Rigid-Wall Saturated Hydraulic Conductivity

Date: August 8, 2023
Project Number: **92310**
Project Name: **GSI - Mill City Inflitration Site**
Client: GSI Water Solutions, Inc.

Rigid-Wall Saturated Hydraulic Conductivity			
Sample ID	Measured		
	Dry Bulk Density (g/cm^3)	Total Porosity (cm^3/cm^3)	Saturated Hydraulic Conductivity (cm/sec)
GM-1, MW-1 7.5-10 ft	1.74	0.36	9.9E-04
GM-1, MW-1 15-17.5 ft*	1.63	0.40	1.2E-02
GM-1, MW-1 22.5-25 ft*	1.60	0.41	4.3E-03
GM-4, MW-1 15-17.5 ft	1.45	0.48	6.2E-03
GM-4, MW-1 17.5-20 ft*	1.54	0.44	2.1E-03
GM-4, MW-1 22.5-25 ft*	1.69	0.38	3.1E-03
GM-5, MW-1 10-12.5 ft*	1.57	0.43	1.3E-07
GM-5, MW-1 20-22.5 ft*	1.67	0.39	5.3E-07
GM-5, MW-1 50-52.5 ft	1.80	0.32	6.2E-08

*Using average particle density for porosity calculation (2.73 g/cm^3)

Appendix B.

OSU Laboratory Test Results

Oregon State University
Soil Health Laboratory
soil.lab@oregonstate.edu 541-737-2187
Crop and Soil Science Department
3079 Ag-Life Sciences Bldg Corvallis, OR 97331

Elemental Analysis Results

Name:	Jason Keller
Organization:	GeoSystems Analysis, Inc.
Contact for results:	jason@gsanalysis.com
Date submitted:	5/26/2023
Date delivered:	5/31/2023
Group number:	223308

Method:

Moisture Gravimetric moisture as sample is received. All other data reported on a dry matter basis

Sample ID		%
Customer ID	Lab ID	Moisture
GM5 10-12.5	1	34.9
GM5 12.5-15	2	18.1
GM5 15-17.5	3	46.2
GM5 20-22	4	24.4
GM5 27.5-30	5	14.2
GM5 30-32.5	6	10.3
GM5 32.5-35	7	9.7
GM5 35-37.5	8	23.0
GM5 37.5-40	9	10.6
GM5 42.5-45	10	8.0
GM5 45-47.5	11	17.6
GM5 47.5-50	12	8.7
GM5 52.5-55	13	6.4
GM5 55-57.5	14	8.3
GM5 60-62.5	15	15.2
GM5 62.5-65	16	14.5
GM5 65-67.5	17	11.6
GM5 67.5-70	18	16.9
GM5 70-72.5	19	8.6
GM1 10-12.5	20	5.6
GM1 12.5-15	21	8.9
GM1 15-17.5	22	13.3
GM1 17.5-20	23	10.6
GM1 25-27.5	24	29.9
GM1 30-32.5	25	15.2
GM1 32.5-35	26	15.0
GM1 35-35.5	27	15.7
GM1 36-37.5	28	15.7
GM1 37.5-40	29	11.9
GM4 7.5-10	30	8.6
GM4 10-12.5	31	28.9
GM4 12.5-15	32	15.3
GM4 17.5-20	33	10.5
GM4 22.5-25	34	14.7
GM4 25-27.5	35	13.6
GM4 27.5-30	36	10.4
GM4 30-32.5	37	15.4
GM4 37.5-40	38	18.1

Sample ID		g	g	g	%
Customer ID	Lab ID	Tin Weight	Weight Before 105 C	Weight After 105 C	Gravimetric moisture
GM5 10-12.5	1	12.6	584.4	436.4	34.9
GM5 12.5-15	2	12.5	720.0	611.5	18.1
GM5 15-17.5	3	12.4	463.1	320.6	46.2
GM5 20-22	4	12.5	444.4	359.6	24.4
GM5 27.5-30	5	12.5	506.1	444.6	14.2
GM5 30-32.5	6	12.4	298.3	271.6	10.3
GM5 32.5-35	7	12.5	370.1	338.4	9.7
GM5 35-37.5	8	12.5	470.5	384.9	23.0
GM5 37.5-40	9	12.4	428.3	388.6	10.6
GM5 42.5-45	10	12.3	432.0	400.8	8.0
GM5 45-47.5	11	12.7	513.2	438.4	17.6
GM5 47.5-50	12	13.3	409.0	377.2	8.7
GM5 52.5-55	13	12.9	446.9	420.8	6.4
GM5 55-57.5	14	12.4	380.4	352.1	8.3
GM5 60-62.5	15	12.4	447.9	390.4	15.2
GM5 62.5-65	16	12.5	685.3	600.3	14.5
GM5 65-67.5	17	12.7	629.8	565.7	11.6
GM5 67.5-70	18	12.7	584.3	501.6	16.9
GM5 70-72.5	19	12.7	509.6	470.4	8.6
GM1 10-12.5	20	12.4	465.2	441.3	5.6
GM1 12.5-15	21	12.5	311.5	287.0	8.9
GM1 15-17.5	22	12.4	543.4	481.2	13.3
GM1 17.5-20	23	12.4	390.4	354.3	10.6
GM1 25-27.5	24	12.6	540.2	418.9	29.9
GM1 30-32.5	25	12.5	439.8	383.3	15.2
GM1 32.5-35	26	12.4	557.9	486.9	15.0
GM1 35-35.5	27	12.4	363.0	315.3	15.7
GM1 36-37.5	28	12.5	574.1	498.1	15.7
GM1 37.5-40	29	12.4	358.1	321.4	11.9
GM4 7.5-10	30	12.4	442.9	408.8	8.6
GM4 10-12.5	31	12.5	451.4	353.0	28.9
GM4 12.5-15	32	12.4	521.0	453.6	15.3
GM4 17.5-20	33	12.3	338.3	307.4	10.5
GM4 22.5-25	34	12.4	436.0	381.6	14.7
GM4 25-27.5	35	12.4	642.3	567.0	13.6
GM4 27.5-30	36	12.4	429.6	390.3	10.4
GM4 30-32.5	37	12.5	511.6	444.9	15.4
GM4 37.5-40	38	12.4	477.4	406.1	18.1

ATTACHMENT C

Slug Test Results

Slug Test Results at GM1

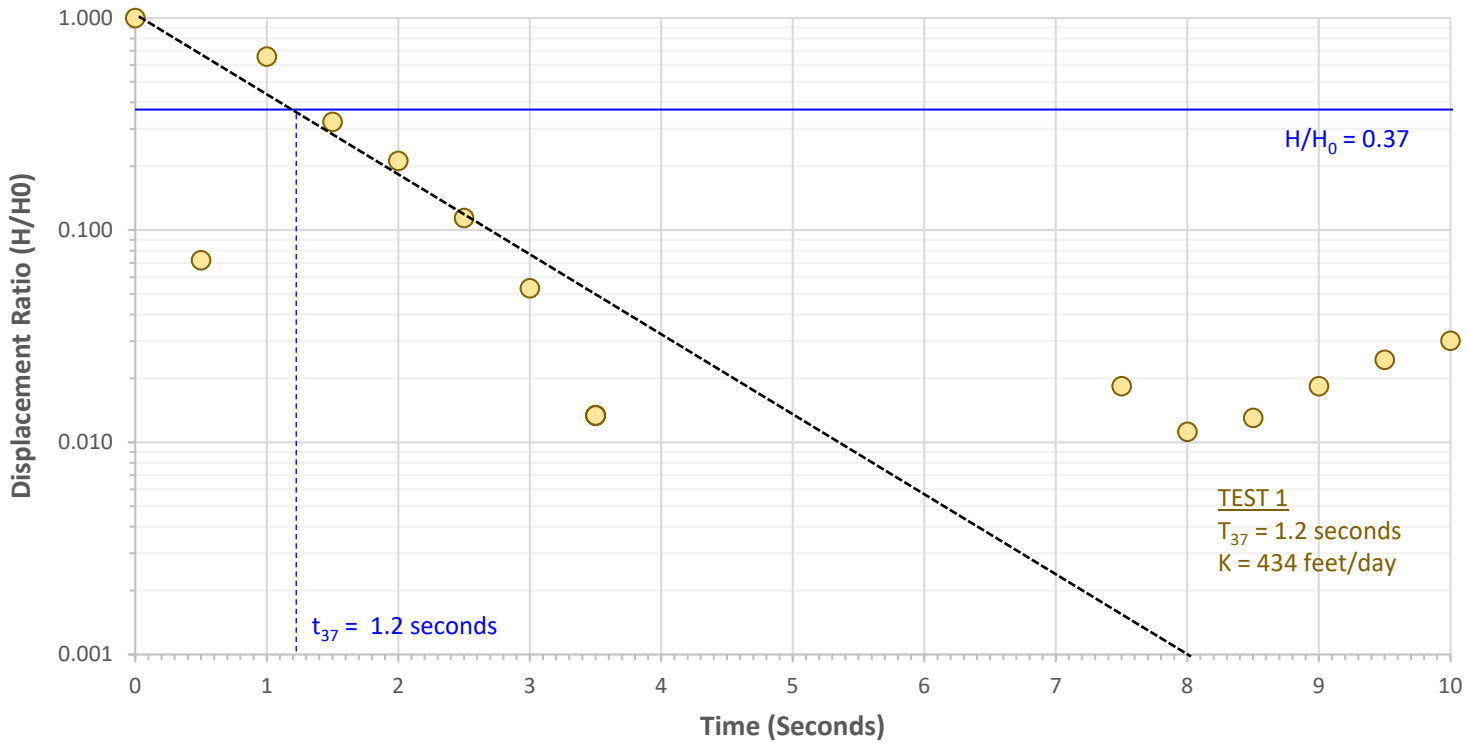
Santiam Canyon Treated Wastewater Infiltration Evaluation

	t_{37} (seconds)	K (feet/day)	Notes
Slug In 1	1.2	434	Hvorslev Method
Slug In 2	0.4	1,302	Hvorslev Method
Slug In 3	--	431	Underdamped response. Analyzed with Springer-Gelhar (1991)
Slug Out 1	1.4	370	Hvorslev Method
Slug Out 2	0.85	613.00	Hvorslev Method
Slug Out 3	--	--	Data too noisy for analysis
	Geomean	560.3	

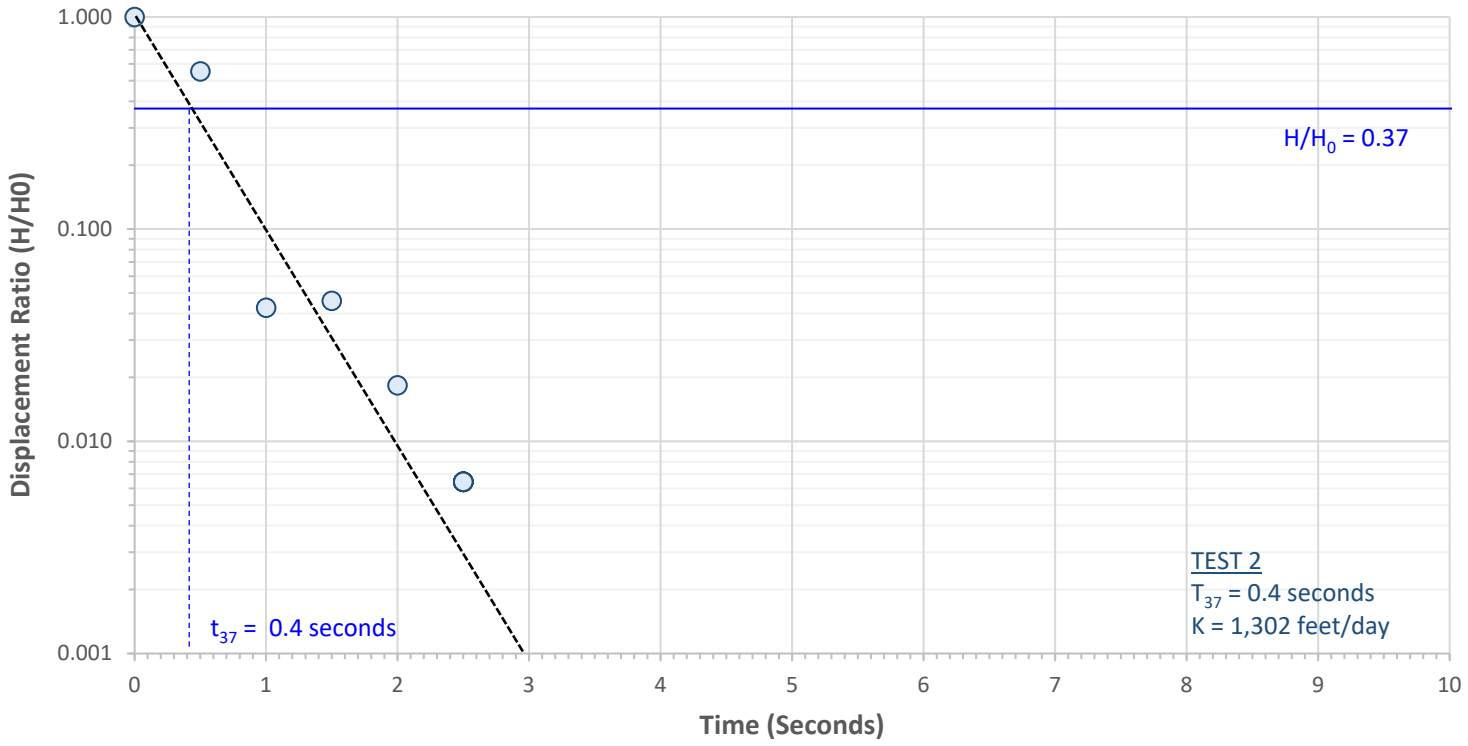
Note:

Site GM1 is characterized by high hydraulic conductivity. Recommend conservatively using the lowest measured value of 370 for MOUNDSOLV analyses for initial basin sizing. Need to recommend a pumping test to dial in final basin design.

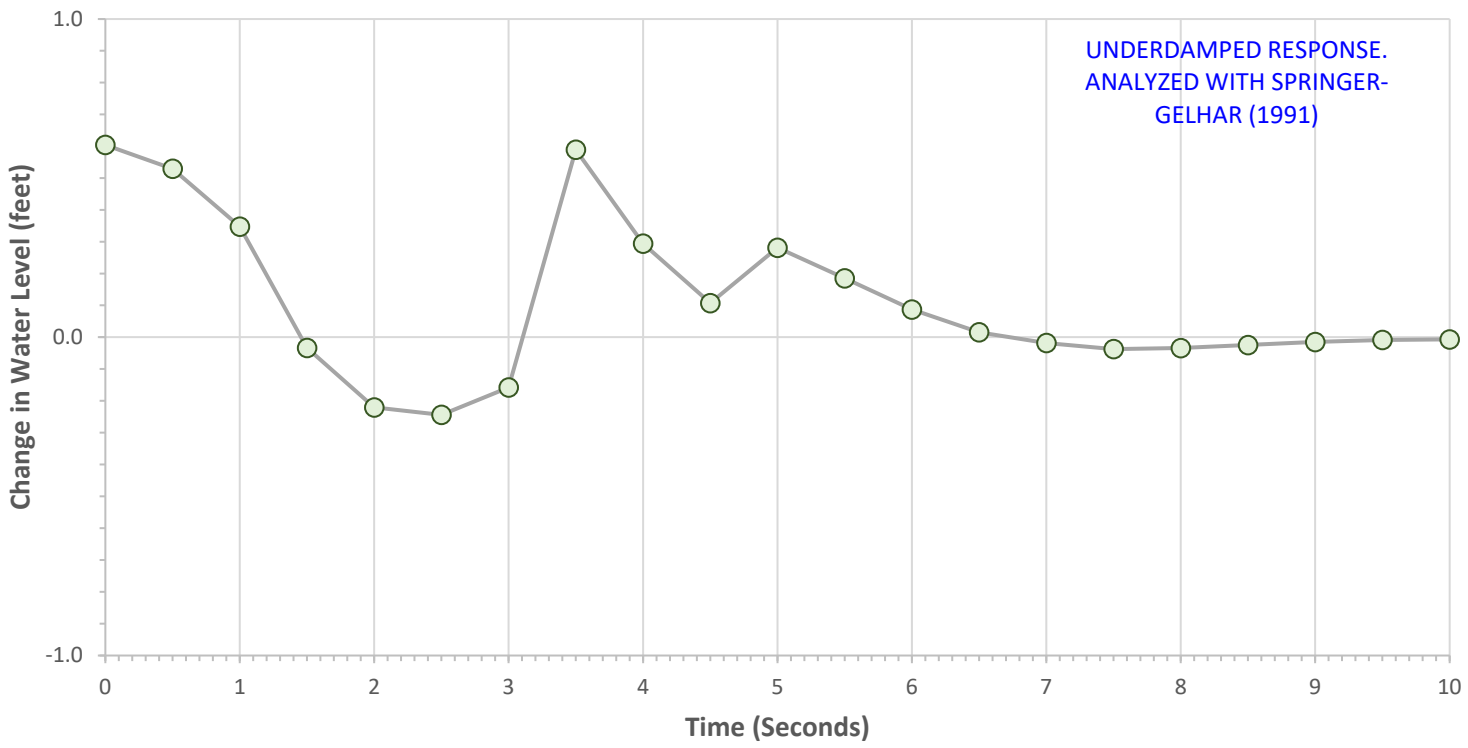
Slug-In Test No. 1



Slug-In Test No. 2

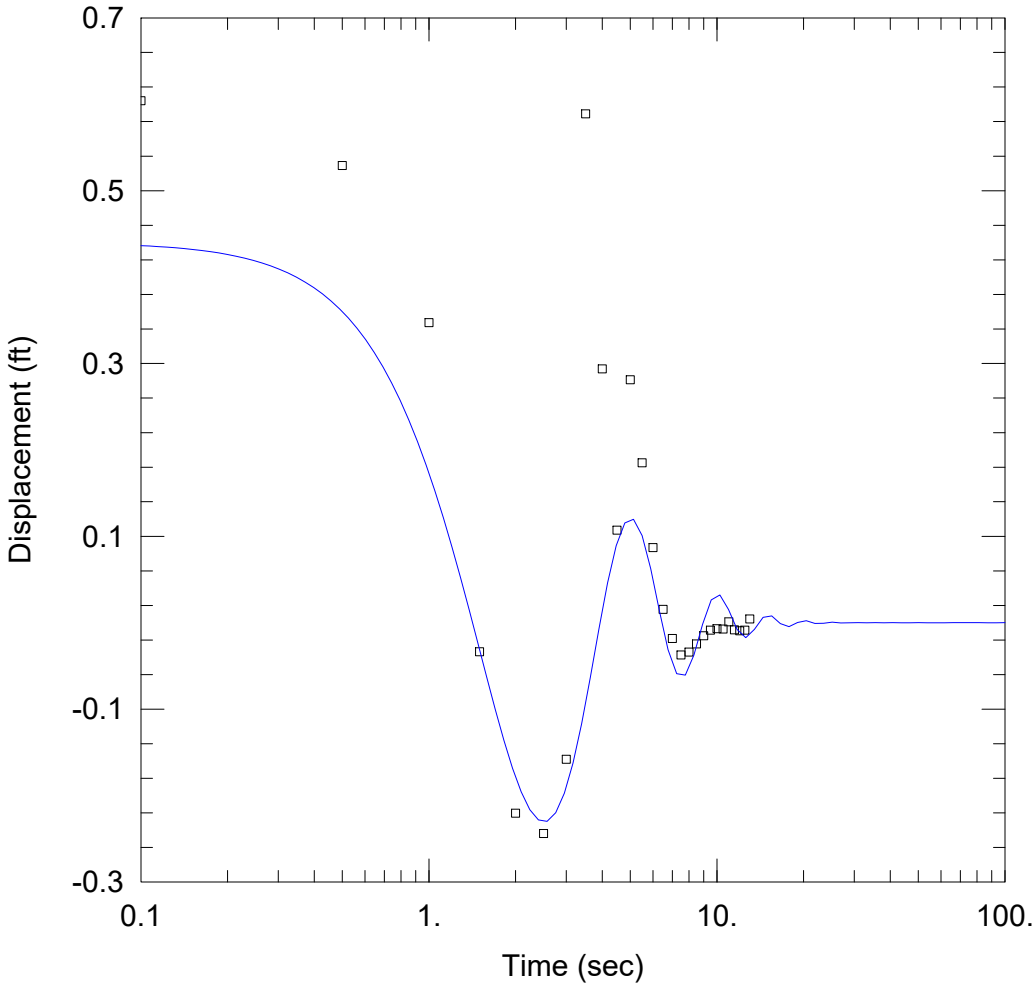


Slug-In Test No. 3



GSI Water Solutions, Inc.

Figure X
GM1-MW1 Slug-In Test Analyses
Santiam Canyon Treated Wastewater Infiltration Evaluation



WELL TEST ANALYSIS

Data Set: P:\...\SlugIn_GM1MW1.aqt
Date: 06/20/23 Time: 12:48:48

PROJECT INFORMATION

Company: Gates Mill City Infiltration
Client: Keller Associates
Project: 464.020
Location: Mill City, Oregon
Test Well: MW-1
Test Date: 6/8/2023

AQUIFER DATA

Saturated Thickness: 25. ft Anisotropy Ratio (Kz/Kr): 1.

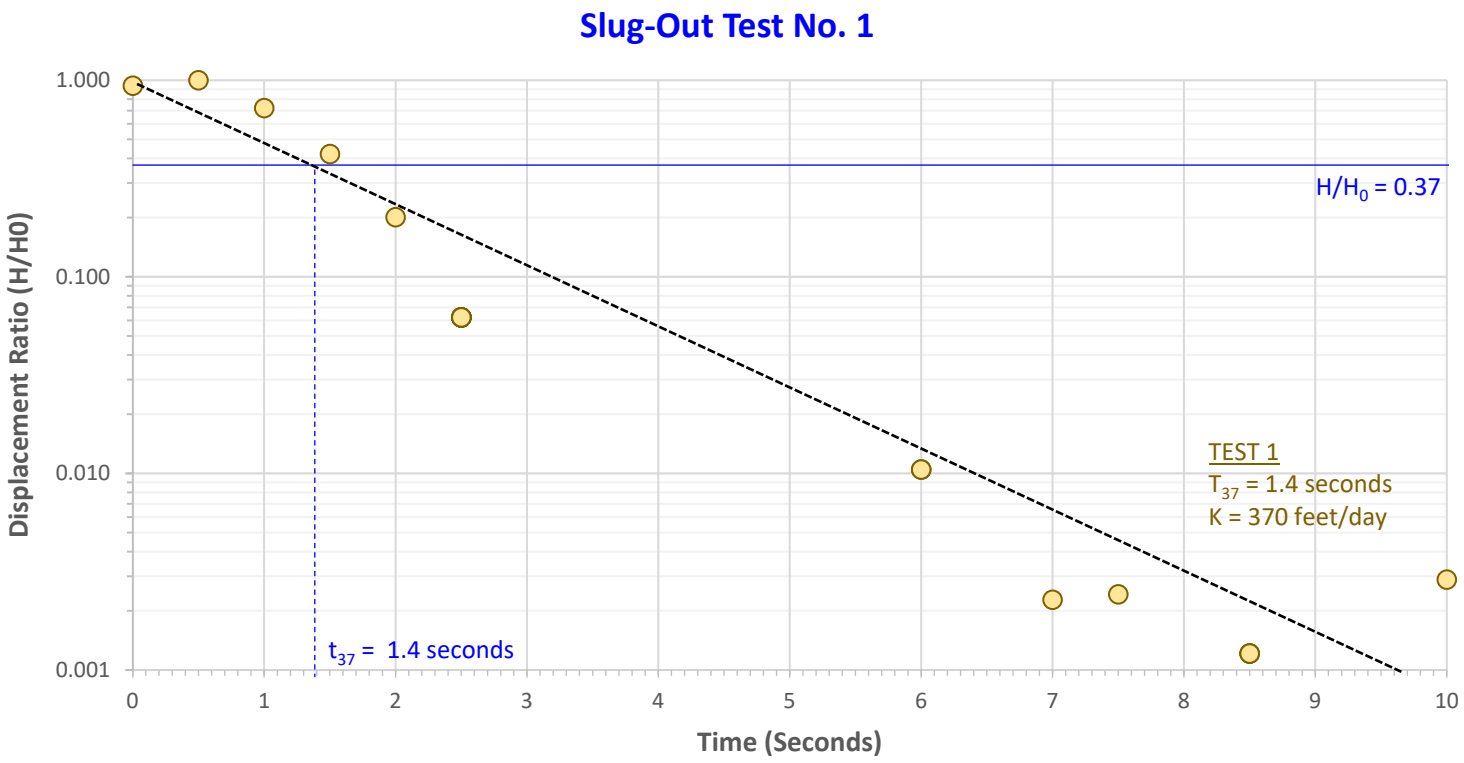
WELL DATA (MW-1)

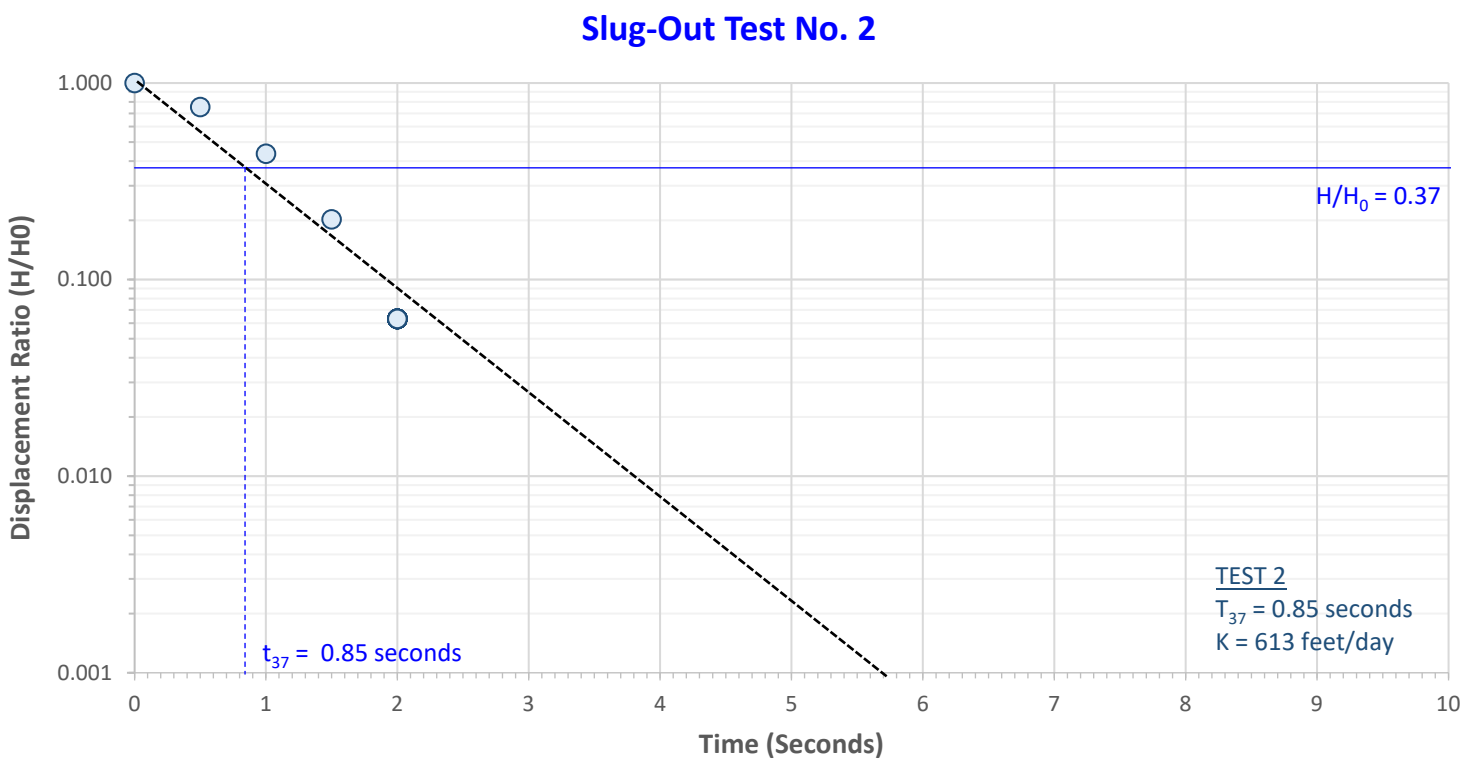
Initial Displacement: 0.44 ft
Total Well Penetration Depth: 40. ft
Casing Radius: 0.083 ft
Static Water Column Height: 25. ft
Screen Length: 10. ft
Well Radius: 0.083 ft
Gravel Pack Porosity: 0.

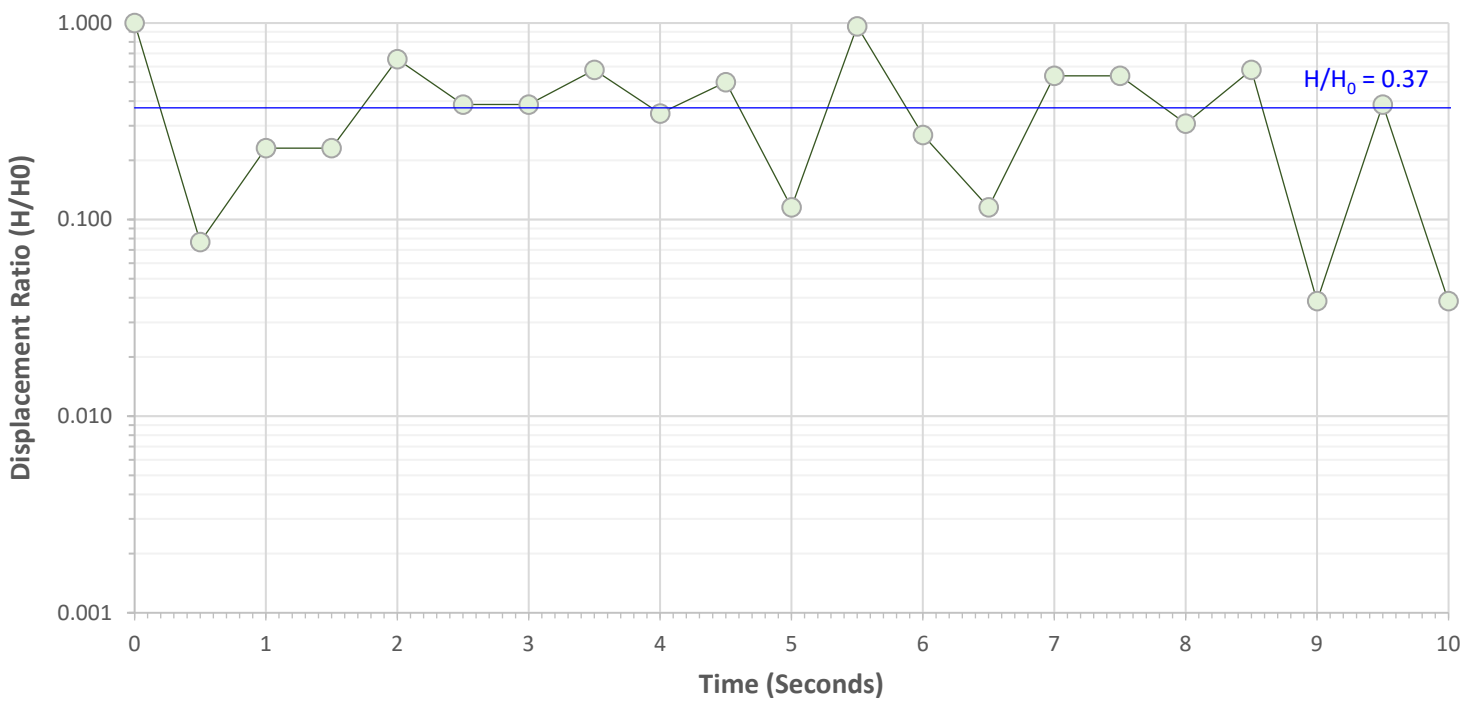
SOLUTION

Aquifer Model: Unconfined Solution Method: Springer-Gelhar

K = 0.004988 ft/sec Le = 19.69 ft







Water Solutions, Inc.

Figure X

GM1-MW1 Slug-Out Test Analyses

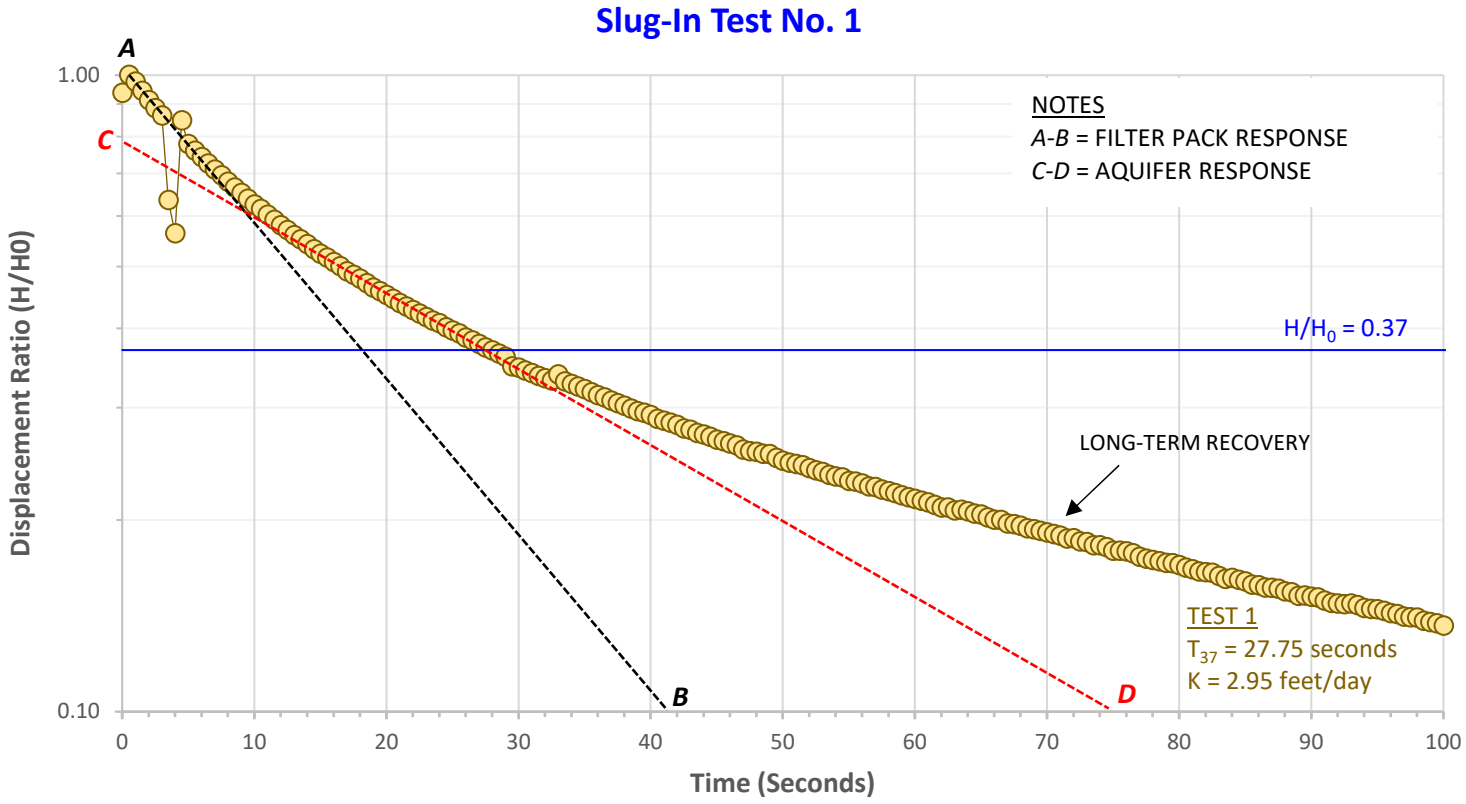
Santiam Canyon Treated Wastewater Infiltration Evaluation

Slug Test Results at GM4

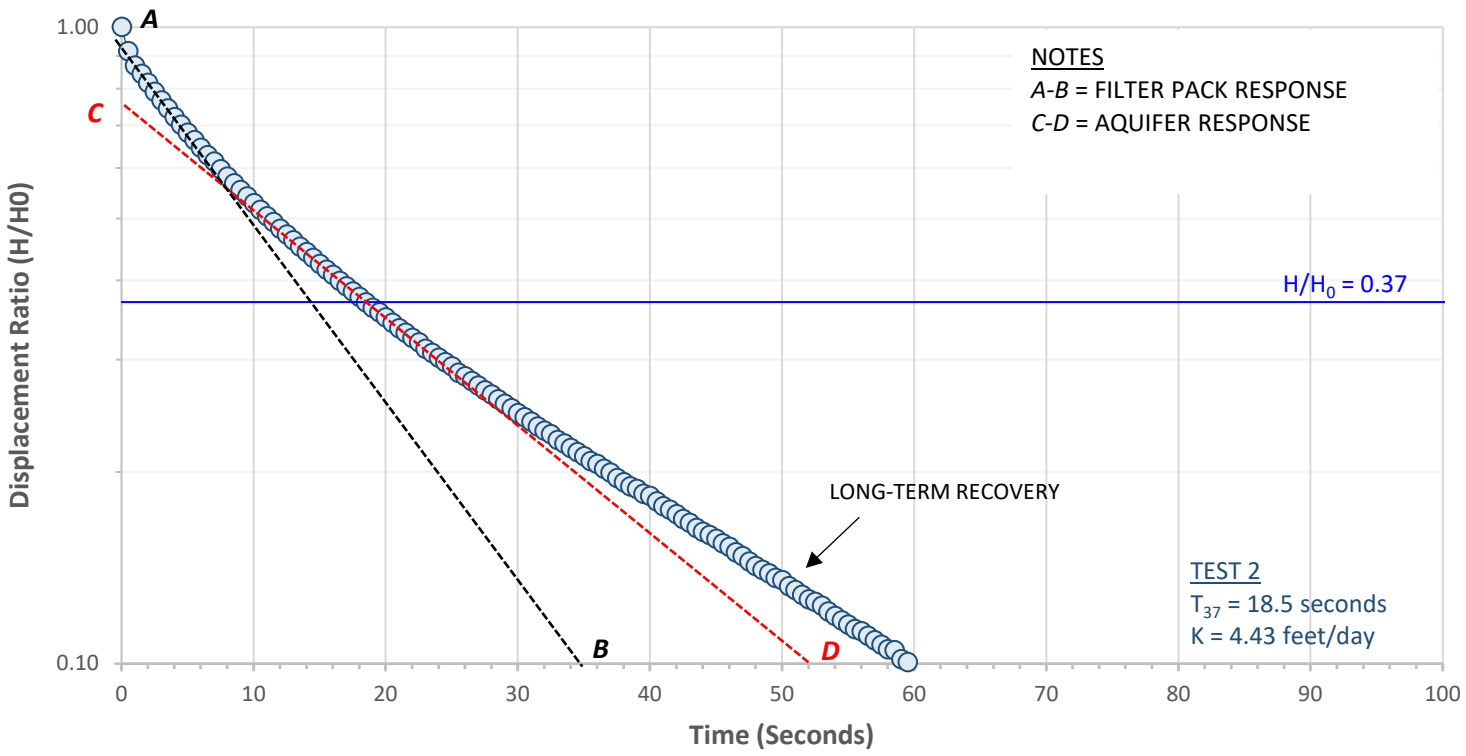
Santiam Canyon Treated Wastewater Infiltration Evaluation

	t_{37} (seconds)	K (feet/day)	Notes
MW-1, Slug In 1	27.75	2.95	Hvorslev Method
MW-1, Slug In 2	18.50	4.43	Hvorslev Method
MW-1, Slug In 3	28.25	2.90	Hvorslev Method
MW-1, Slug Out 1	22.50	3.64	Hvorslev Method
MW-1, Slug Out 2	19.75	4.15	Hvorslev Method
MW-1, Slug Out 3	23.75	3.45	Hvorslev Method. Value of t_{37} may reflect effects from late-term recovery, but effects are not likely to be significant because the hydraulic conductivity from Slug Out 3 is similar to the hydraulic conductivity from the other slug tests.
	Geomean	**3.54**	

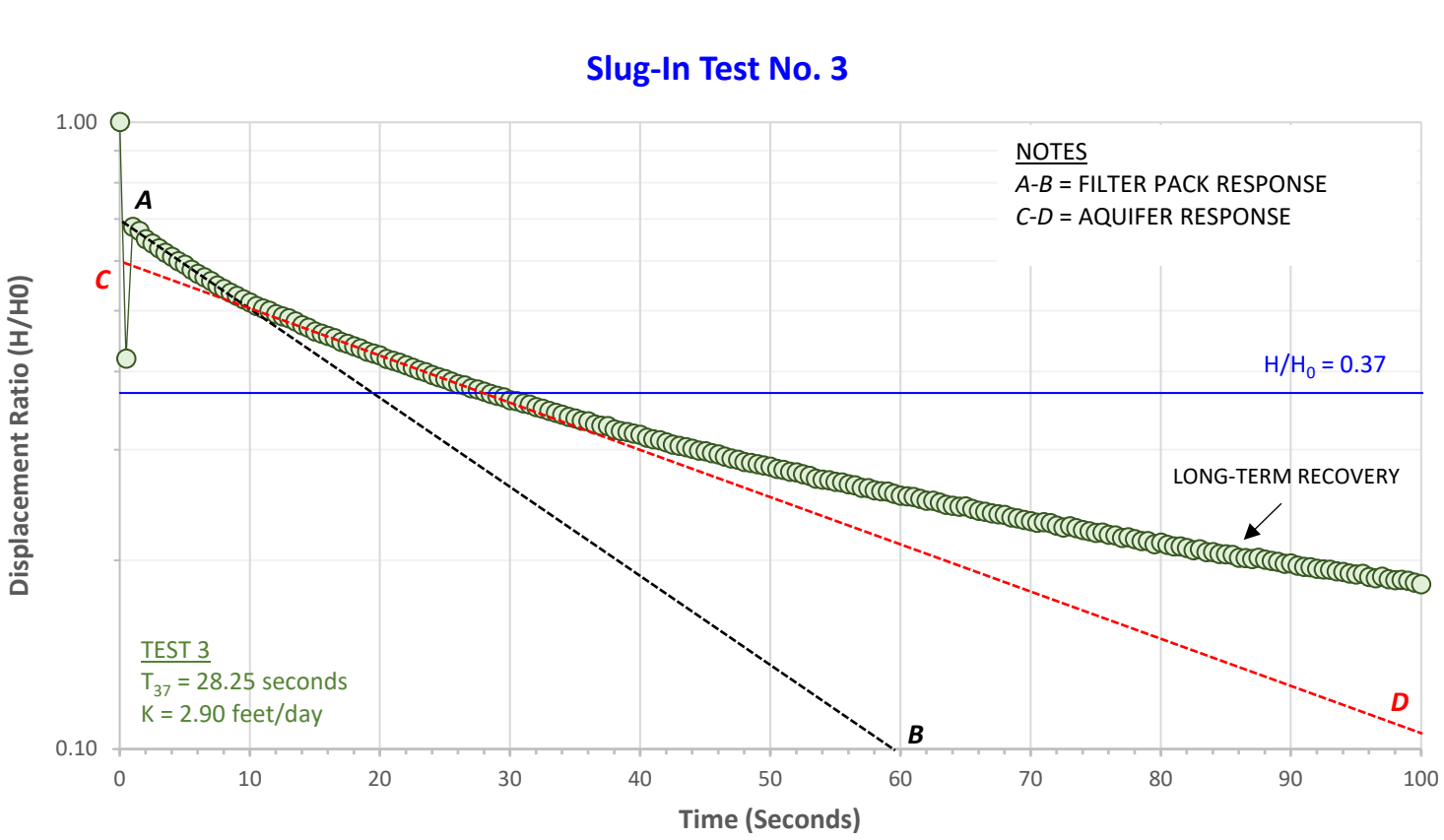
Slug-In Test No. 1



Slug-In Test No. 2



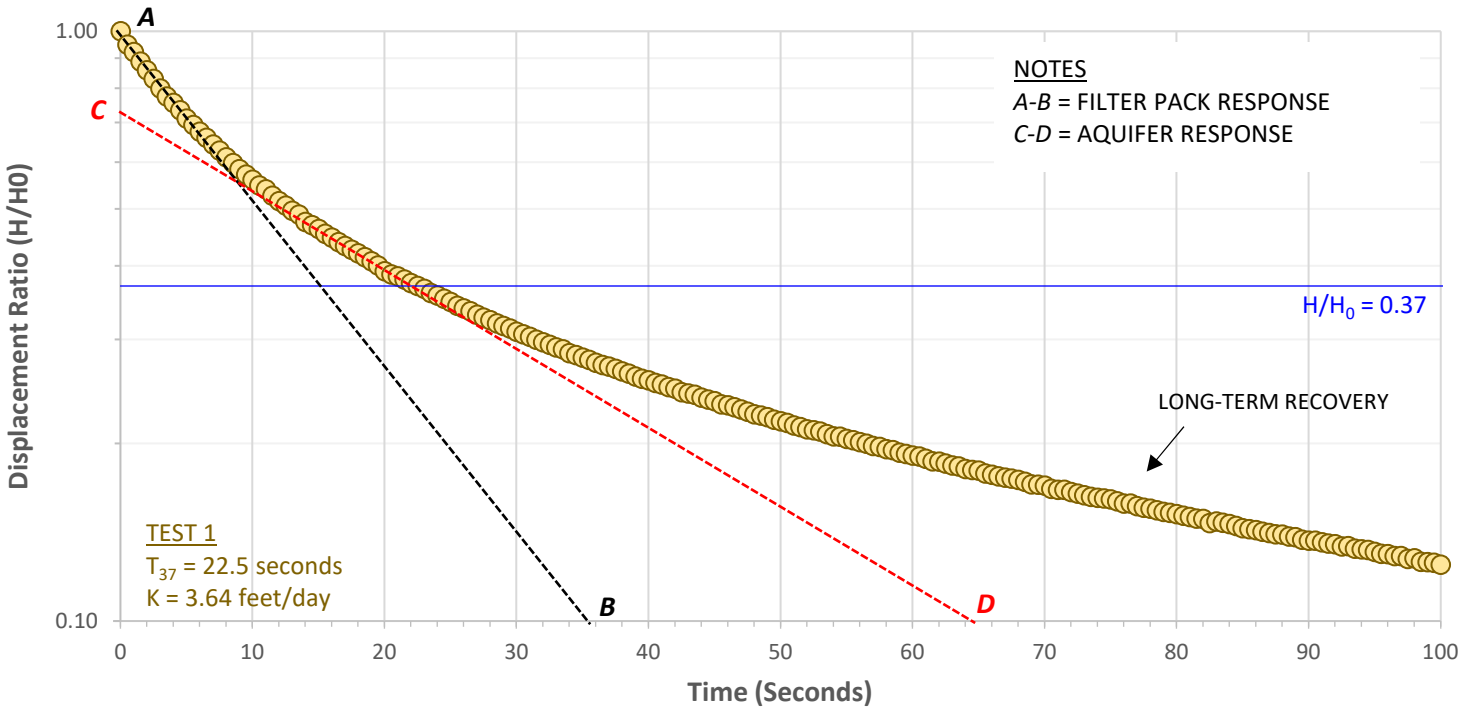
Slug-In Test No. 3



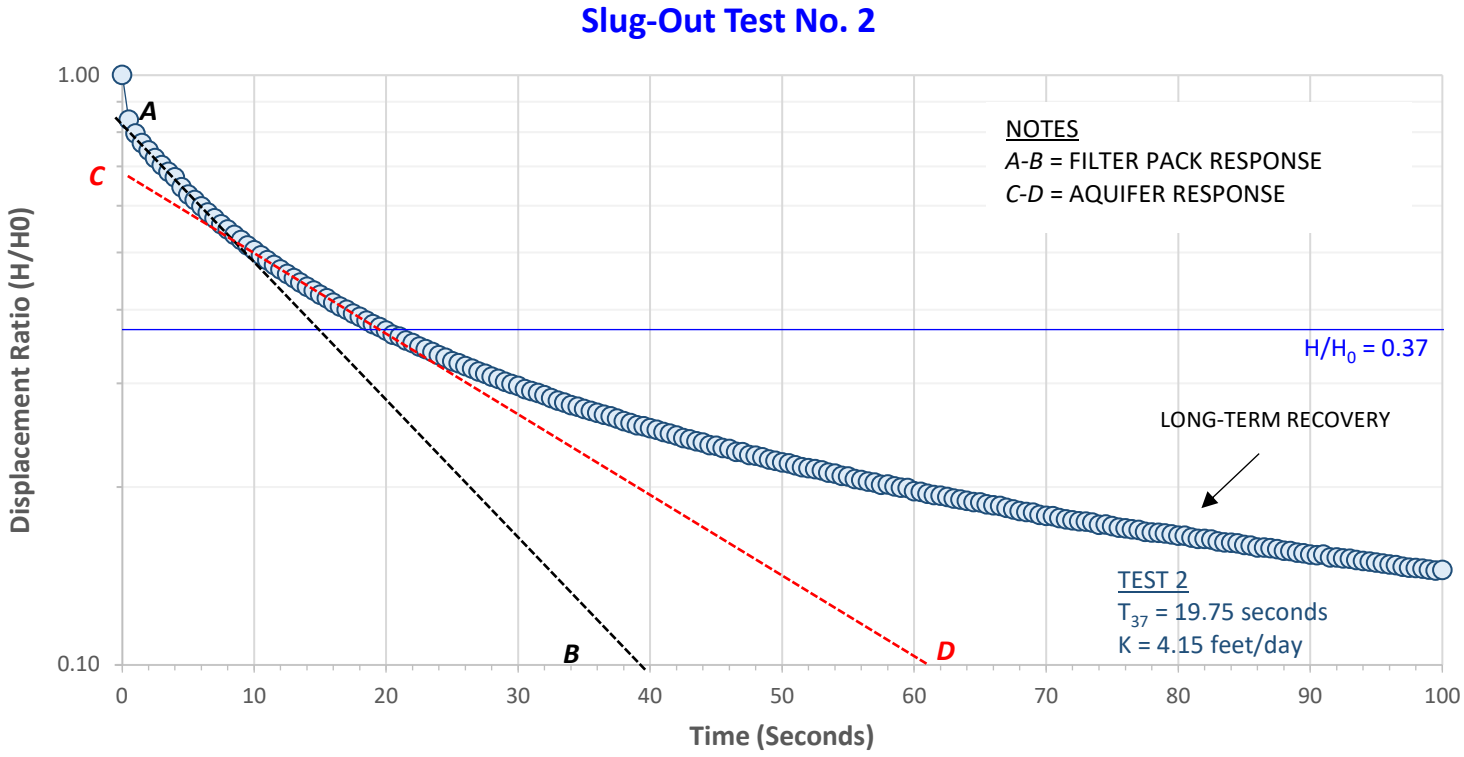
GSI Water Solutions, Inc.

Figure X
GM4-MW1 Slug-In Test Analyses
Santiam Canyon Treated Wastewater Infiltration Evaluation

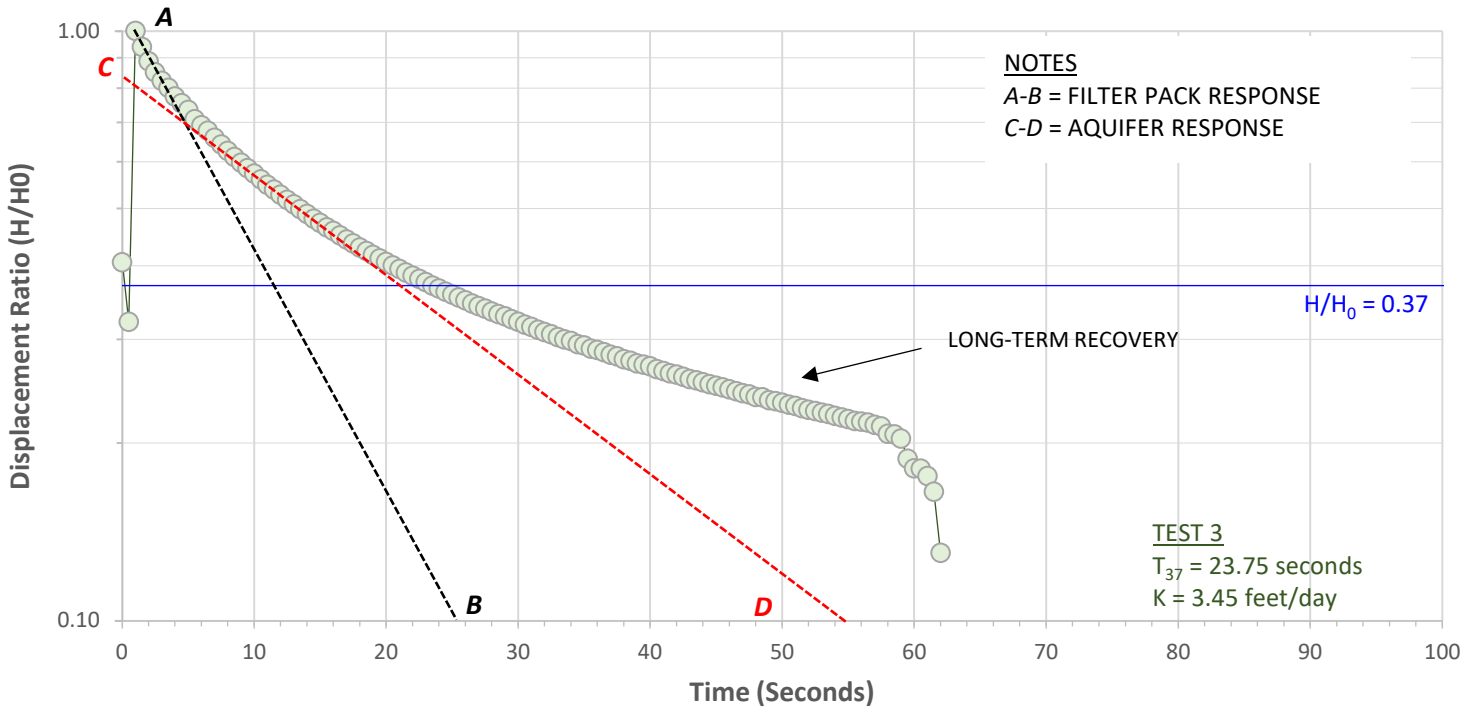
Slug-Out Test No. 1



Slug-Out Test No. 2



Slug-Out Test No. 3



GSI Water Solutions, Inc.

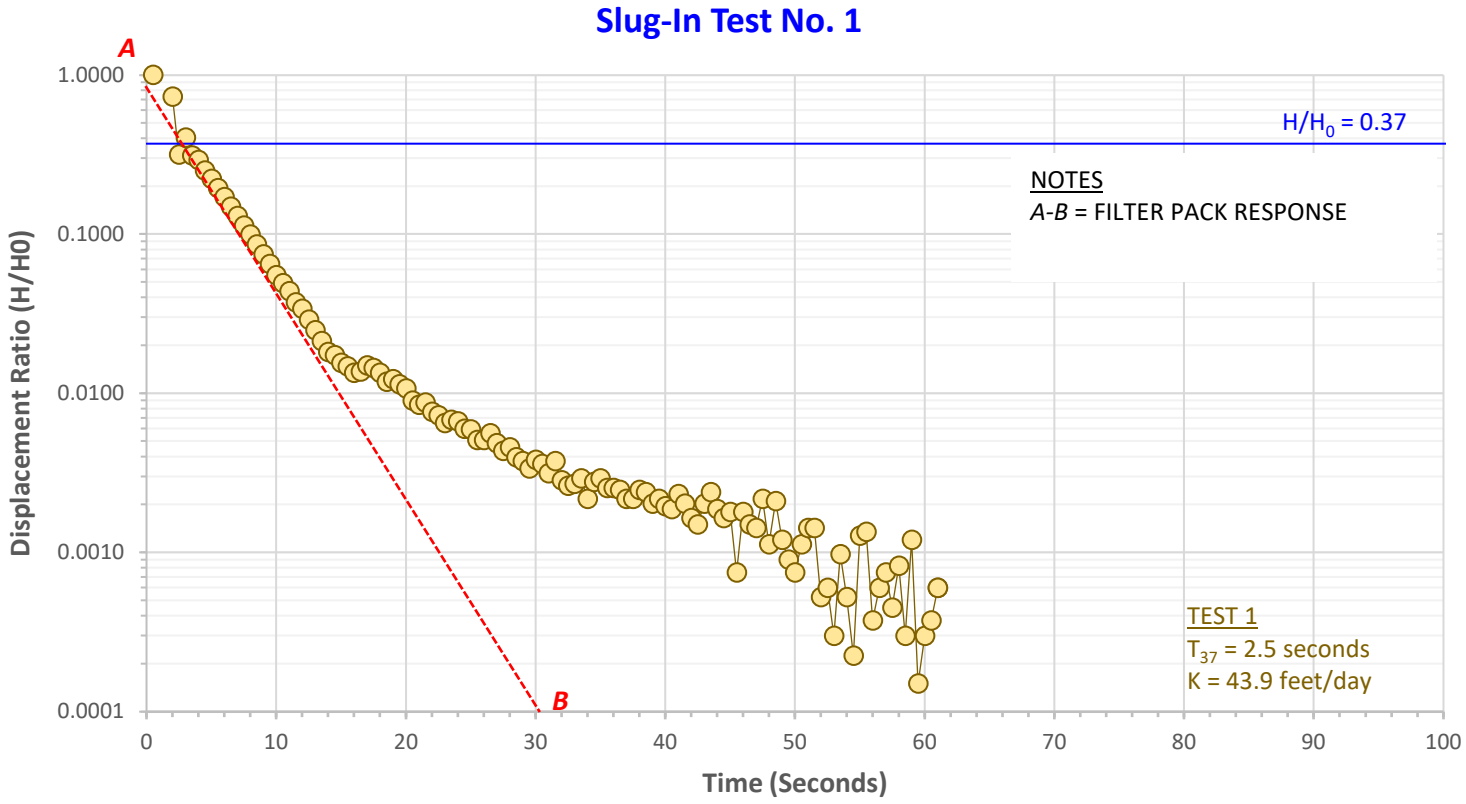
Figure X
GM4-MW1 Slug-Out Test Analyses
Santiam Canyon Treated Wastewater Infiltration Evaluation

Slug Test Results at GM5

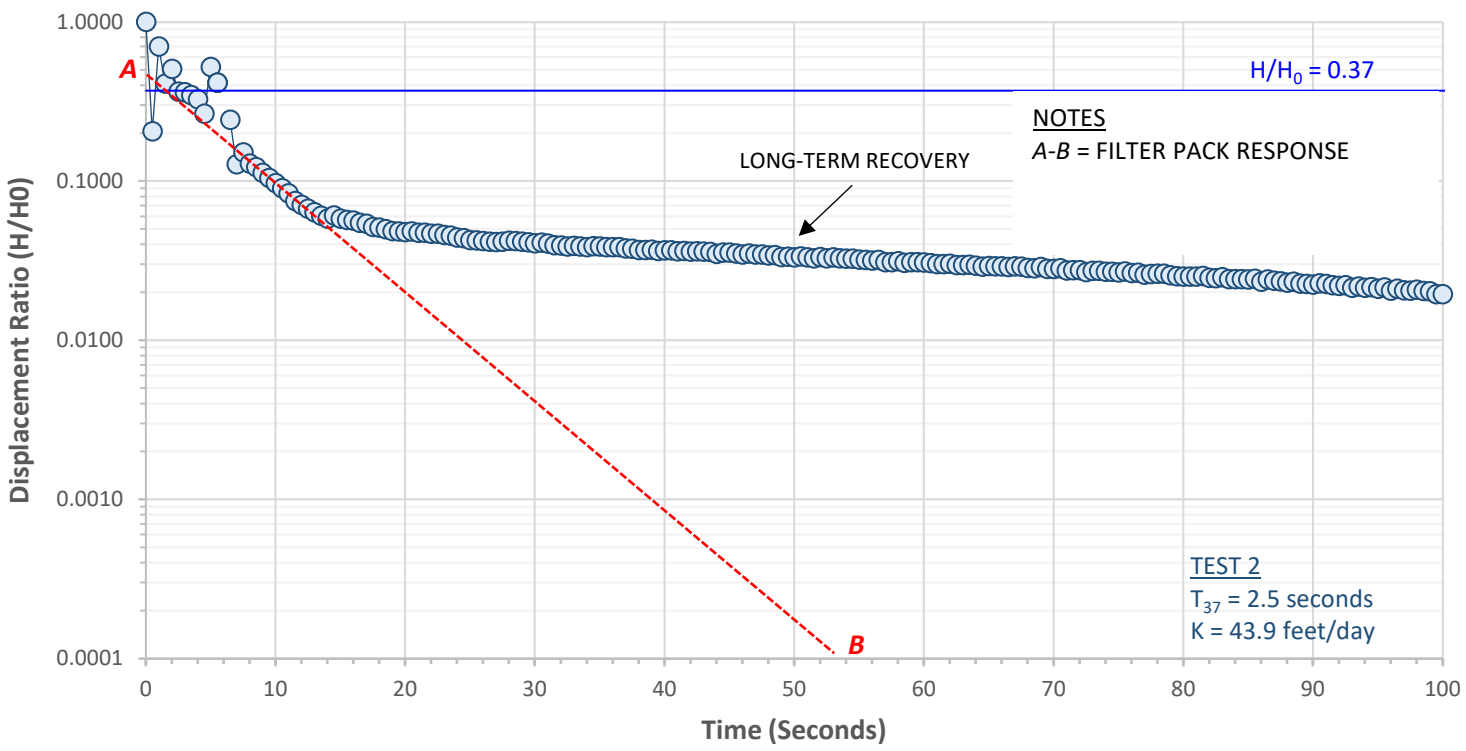
Santiam Canyon Treated Wastewater Infiltration Evaluation

	t_{37} (seconds)	K (feet/day)	Notes
MW-1, Slug In 1	2.5	43.9	Hvorslev Method
MW-1, Slug In 2	2.5	43.9	Hvorslev Method
MW-1, Slug In 3	3.5	31.4	Hvorslev Method
MW-1, Slug Out 1	3.5	31.4	Hvorslev Method
MW-1, Slug Out 2	3.5	31.4	Hvorslev Method
MW-1, Slug Out 3	5.0	22.0	Hvorslev Method
	Geomean	**33.07**	

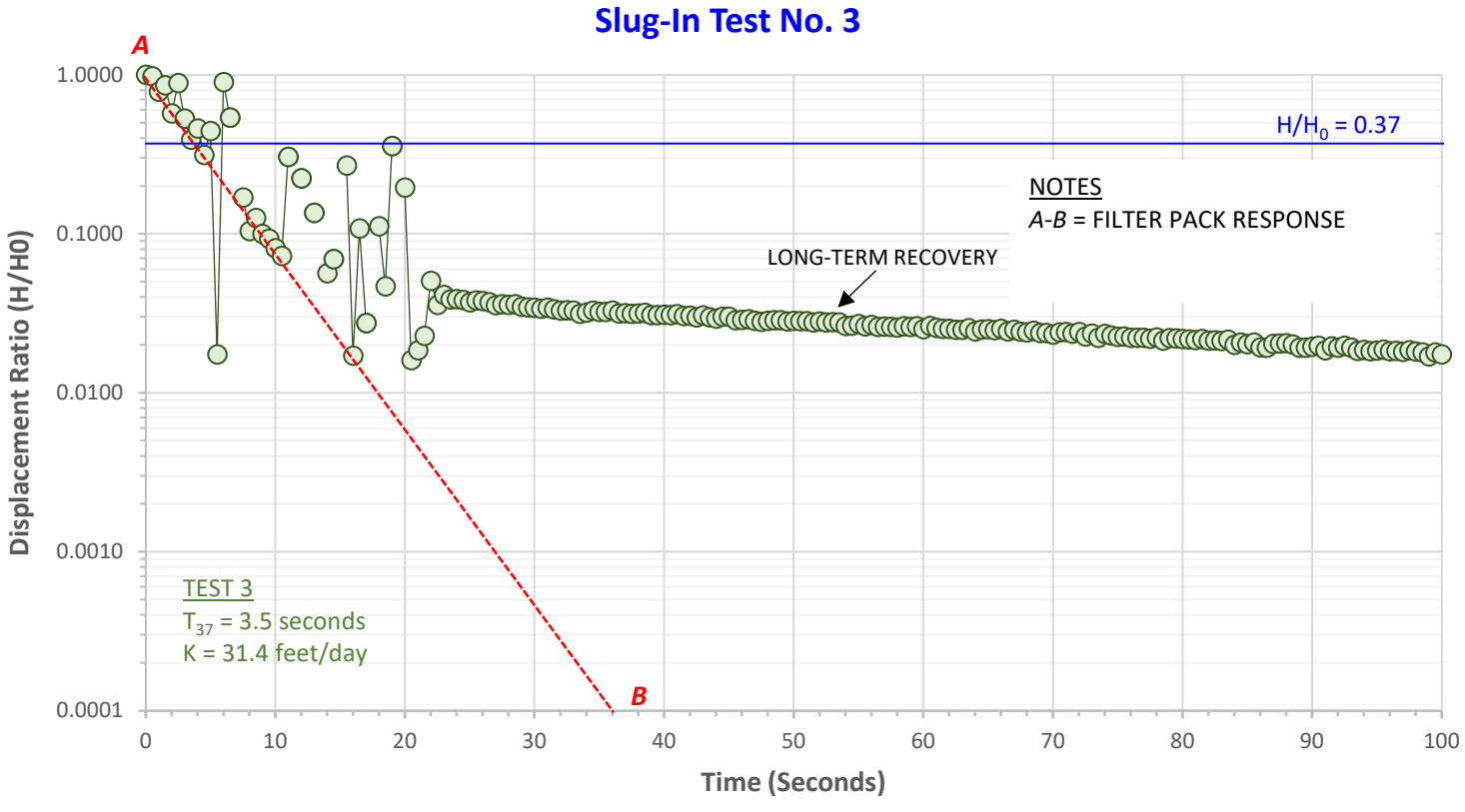
Slug-In Test No. 1



Slug-In Test No. 2



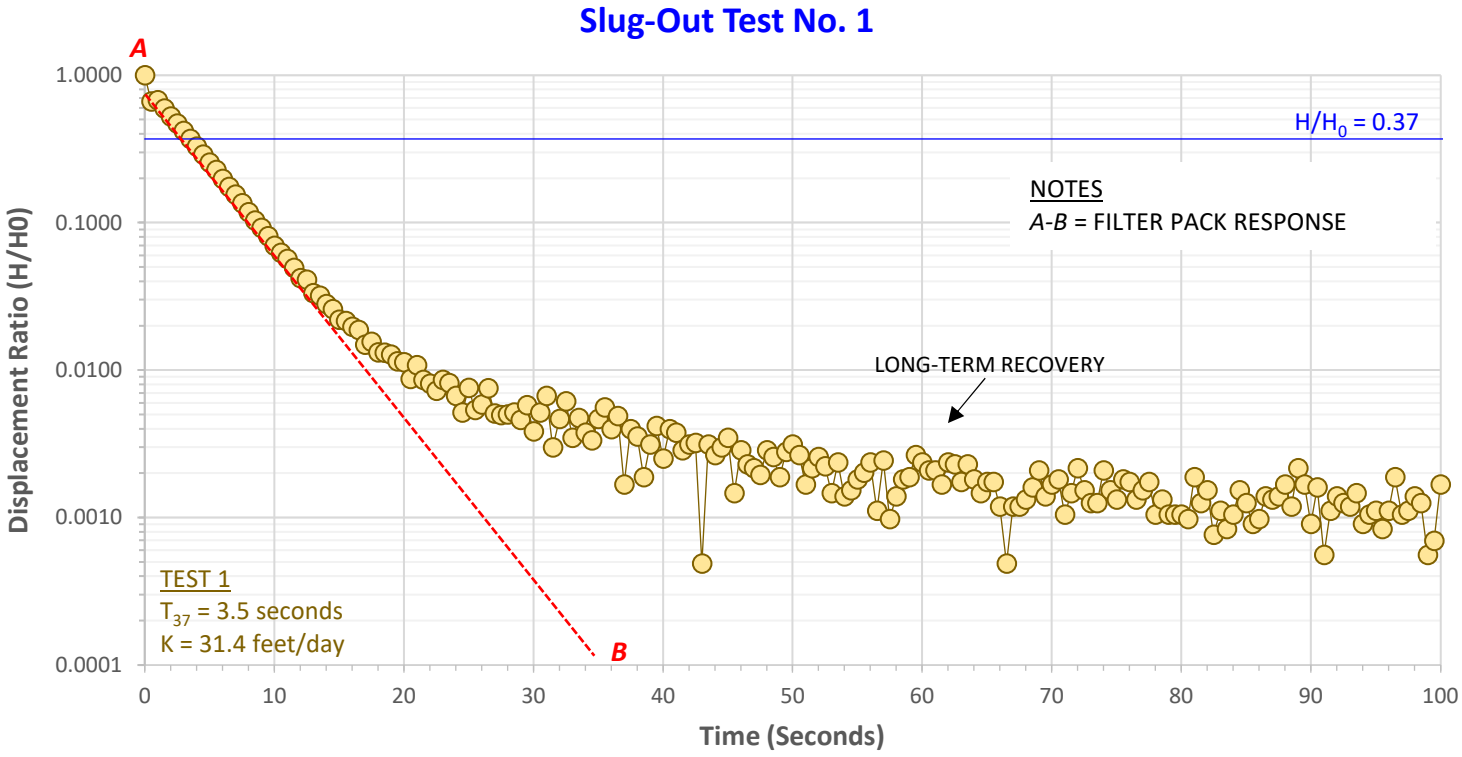
Slug-In Test No. 3



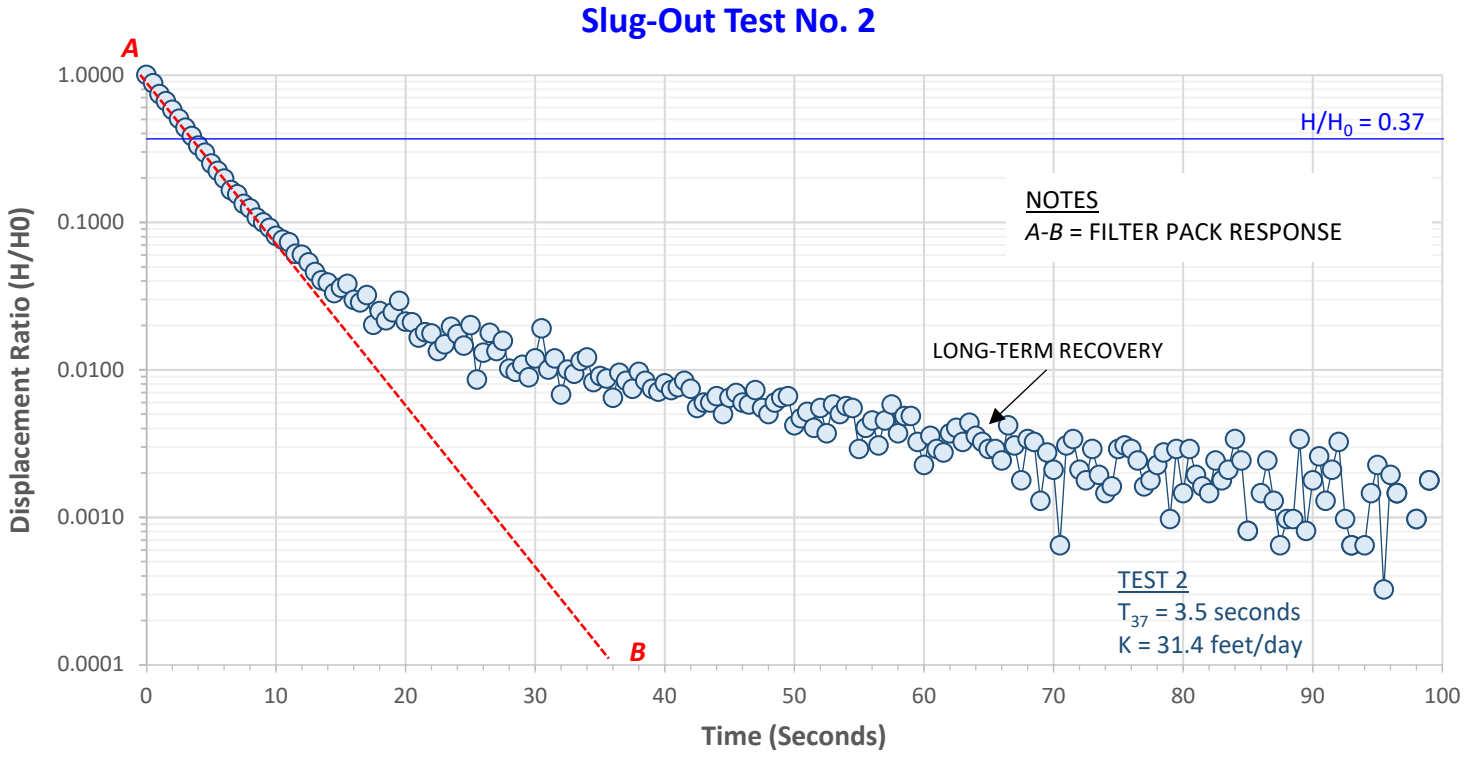
GSI Water Solutions, Inc.

Figure X
GM5-MW1 Slug-In Test Analyses
Santiam Canyon Treated Wastewater Infiltration Evaluation

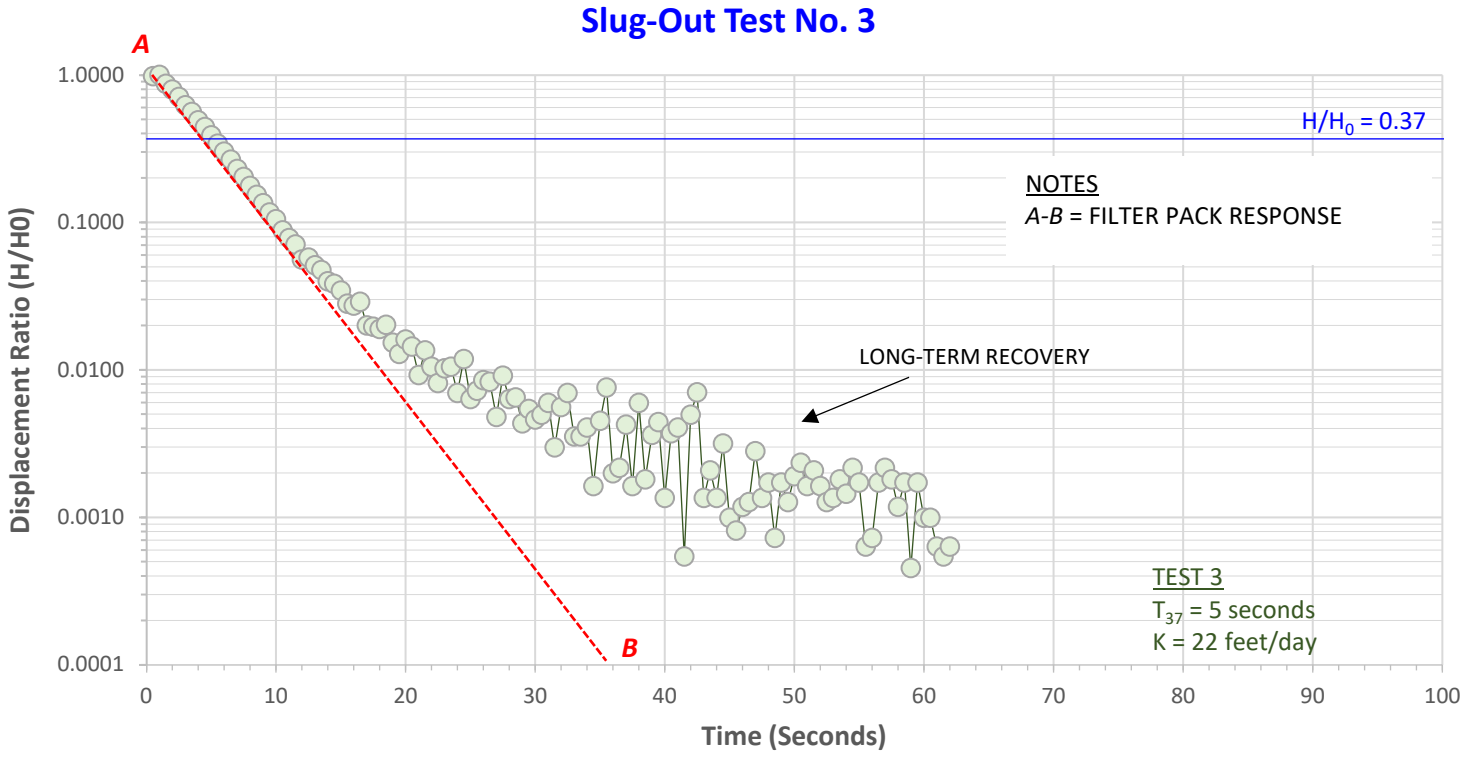
Slug-Out Test No. 1



Slug-Out Test No. 2



Slug-Out Test No. 3



GSI Water Solutions, Inc.

Figure X
GM5-MW1 Slug-Out Test Analyses
Santiam Canyon Treated Wastewater Infiltration Evaluation

ATTACHMENT D

Groundwater SDWA Analysis and Wastewater Influent Testing Laboratory Results

Burlington, WA *Corporate Laboratory (a)*
1620 S Walnut St - Burlington, WA 98233 - **800.755.9295** • 360.757.1400
Bellingham, WA *Microbiology (b)*
805 Orchard Dr Ste 4 - Bellingham, WA 98225 - 360.715.1212
Portland, OR *Microbiology/Chemistry (c)*
9725 SW Commerce Cr Ste A2 - Wilsonville, OR 97070 - 503.682.7802
Corvallis, OR *Microbiology/Chemistry (d)*
1100 NE Circle Blvd, Ste 130 - Corvallis, OR 97330 - 541.753.4946
Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: GSI Water Solutions, Inc.
55 SW Yamhill Street Ste 300
Portland, OR 97204

System Name:
System ID Number:
Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM1MW1
County:

Reference Number: 23-15512
Project: Santiam Canyon 0464.020.001 - (

Sample Number: GM1MW10523
Lab Number: 23_31092
Collect Date: 5/28/23 11:20
Date Received: 5/30/23
Report Date: 7/12/23
Sampled By: Mellisa Girbach
Sampler Phone:
Approved by: anp,bj,mcs,pap,pdk,t
Authorized by:

Thanh B Phan
Lab Manager, Portland

EPA#	ANALYTES	RESULTS	UNITS	LRL	MCL	Analyst	Lab Code*	METHOD	Analyzed	COMMENT
	CORROSIVITY									
1925	HYDROGEN ION (pH)	**6.15 H5**	pH Units			klp	4072 a	SM4500-H+ B	06/08/23 15:58	Temp (C) : 22.1
1067	ALKALINITY	**42.5**	mg CaCO3/	2		klp	4072 a	SM2320 B	06/08/23	
1910	CORROSIVITY	**-2.92**	SI			bj	4072 a	SM203	06/23/23	
	CARBONATE	**ND**	mgCaCO3/L	2		klp	4072 a	SM2320 B	06/08/23	
	BICARBONATE	**42.5**	mg CaCO3/	2		klp	4072 a	SM2320 B	06/08/23	
	HYDROXIDE	**ND**	mg CaCO3/	2		klp	4072 a	SM2320 B	06/08/23	
1067	ALKALINITY	**42.5**	mg CaCO3/	2.0		klp	4072 a	SM2320 B	06/08/23	
1024	CYANIDE	**ND**	mg/L	0.005	**0.2**	tjb	4072 a	D7511-12	06/07/23	
	TOTAL DISSOLVED SOLIDS	**78**	mg/L	10	**500**	mso	4072 a	SM2540 C	06/13/23	
1020	CHROMIUM	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1075	BERYLLIUM	**ND**	mg/L	0.0003		tjb	4072 a	200.8	06/02/23	
1041	NITRITE-N	**ND H3**	mg/L	0.01	**1.0**	anl	OR100063 c	SM4500-NO3 F	05/30/23 16:41	
1005	ARSENIC	**ND**	mg/L	0.0005		tjb	4072 a	200.8	06/02/23	
1045	SELENIUM	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1050	SILVER	**ND**	mg/L	0.0002		tjb	4072 a	200.8	06/02/23	
1015	CADMIUM	**ND**	mg/L	0.00025		tjb	4072 a	200.8	06/02/23	
1074	ANTIMONY	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1040	NITRATE-N	**1.10 H3**	mg/L	0.005	**10**	anl	OR100063 c	SM4500-NO3 F	05/30/23 16:41	
1010	BARIUM	**0.0035**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1030	LEAD	**0.00027 J**	mg/L	0.0005		tjb	4072 a	200.8	06/20/23	
1035	MERCURY	**ND**	mg/L	0.0002		tjb	4072 a	245.1	06/13/23	
	HARDNESS	**39.4**	mg CaCO3/	10		bj	4072 a	200.7	06/05/23	

NOTES:
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting limit (LRL).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.

If you have any questions concerning this report contact us at the above phone number.

FORM: cIOC OR.rpt

ANALYTICAL

Burlington, WA *Corporate Laboratory (a)*
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1100 NE Circle Blvd, Ste 130 - Corvallis, OR 97330 - 541.753.4946

Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: GSI Water Solutions, Inc.
55 SW Yamhill Street Ste 300
Portland, OR 97204

System Name:
System ID Number:
Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM1MW1
County:

Reference Number: 23-15512
Project: Santiam Canyon 0464.020.001 - (

Sample Number: GM1MW10523
Lab Number: 23_31092
Collect Date: 5/28/23 11:20
Date Received: 5/30/23
Report Date: 7/12/23
Sampled By: Mellisa Girbach
Sampler Phone:
Approved by: anp,bj,mcs,pap,pdk,t
Authorized by:

Thanh B Phan
Lab Manager, Portland

EPA#	ANALYTES	RESULTS	UNITS	LRL	MCL	Analyst	Lab Code*	METHOD	Analyzed	COMMENT
	SILICA	**30.0**	mg/L	0.05		bj	4072 a	200.7	06/05/23	
	TOTAL SUSPENDED SOLIDS	**11.5 NN**	mg/L	2		pap	OR100063 c	I-3765-85	06/01/23	
1032	MANGANESE	**0.0776**	mg/L	0.001		bj	4072 a	200.7	06/05/23	
1028	IRON	**0.62**	mg/L	0.050		bj	4072 a	200.7	06/05/23	
1002	ALUMINUM	**0.52**	mg/L	0.010		bj	4072 a	200.7	06/05/23	
1036	NICKEL	**0.00086 J**	mg/L	0.0005		tjb	4072 a	200.8	06/02/23	
1022	COPPER	**0.0020**	mg/L	0.002		tjb	4072 a	200.8	06/02/23	
1095	ZINC	**0.0033**	mg/L	0.0025		tjb	4072 a	200.8	06/02/23	
	FLUORIDE	**ND**	mg/L	0.10	**4**	jwn	4072 a	300.0	06/01/23	
1016	CALCIUM	**10.5**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1052	SODIUM	**3.8**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1031	MAGNESIUM	**3.2**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1042	POTASSIUM	**2.6**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1017	CHLORIDE	**1.4**	mg/L	0.2		jwn	4072 a	300.0	06/01/23	
	MOLYBDENUM	**0.00062**	mg/L	0.001		tjb	4072 a	200.8	06/20/23	
1085	THALLIUM	**ND**	mg/L	0.0001		tjb	4072 a	200.8	06/02/23	
1055	SULFATE	**1.6**	mg/L	0.2		jwn	4072 a	300.0	06/01/23	
	Radiological									
4006	URANIUM	**ND**	mg/L	0.001	**0.030**	tjb	4072 a	200.8	06/02/23	
4000	GROSS ALPHA	**ND**	pCi/L	3	**15**	reh1	156	900.0	06/30/23	Analyzed by PacePA
4100	GROSS BETA	**ND**	pCi/L	4	**50**	reh1	156	900.0	06/30/23	Analyzed by PacePA
	Radium 226	**ND**	pCi/L	1		jlj		903.1	06/28/23	Analyzed by PacePA
	Radium 228	**ND**	pCi/L	1	**5**	val		904.0	06/23/23	Analyzed by PacePA

NOTES:
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting limit (LRL).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.

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FORM: cIOC OR.rpt

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Corvallis, OR *Microbiology/Chemistry (d)*
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Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

ORGANICS IN DRINKING WATER

Client Name: GSI Water Solutions, Inc.
55 SW Yamhill Street Ste 300
Portland, OR 97204

Reference Number: 23-15512
Project: Santiam Canyon 0464.020.001 -

System Name:
System ID Number:
DWP Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Composition:
Sample Location: GM1MW1
County:

Field ID: GM1MW10523
Lab Number: 23_31092
Date Collected: 5/28/23 11:20
Sampled By: Mellisa Girbach
Sampler Phone:
Report Date: 7/12/23
Approved By: nml,pdm

Authorized By:

Thanh B Phan
Lab Manager, Portland

EPA#	COMPOUNDS	RESULTS	UNITS	LRL	MCL	METHOD	Analyst	Lab	Analyzed	COMMENT
	Synthetic Organic Chemicals									
2105	2,4 - D	**ND**	mg/L	0.0001	0.070	515.4	BFR	4072	06/09/23	
2110	2,4,5 - TP (SILVEX)	**ND**	mg/L	0.0001	0.050	515.4	BFR	4072	06/09/23	
2035	DI(2-ETHYLHEXYL)-ADIPATE	**ND**	mg/L	0.00005	0.400	525.2	MA	4072	06/30/23	
2051	ALACHLOR	**ND**	mg/L	0.00005	0.002	525.2	MA	4072	06/30/23	
2050	ATRAZINE	**ND**	mg/L	0.00005	0.003	525.2	MA	4072	06/30/23	
2306	BENZO(A)PYRENE	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2010	LINDANE (BHC - GAMMA)	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2046	CARBOFURAN	**ND**	mg/L	0.001	0.040	531.2	MA	4072	06/21/23	
2959	CHLORDANE	**ND**	mg/L	0.0001	0.002	508.1	MA	4072	06/22/23	
2031	DALAPON	**ND**	mg/L	0.0005	0.200	515.4	BFR	4072	06/09/23	
2931	1,2-DIBROMO-3-CHLOROPROPANE	**ND**	mg/L	0.00002	0.0002	504.1	MA	4072	06/07/23	
2041	DINOSEB	**ND**	mg/L	0.0001	0.007	515.4	BFR	4072	06/09/23	
2032	DIQUAT	**ND**	mg/L	0.0004	0.020	549.2	KRC	4072	06/07/23	
2033	ENDOTHALL	**ND**	mg/L	0.005	0.100	548.1	MA	4072	06/14/23	
2005	ENDRIN	**ND**	mg/L	0.00005	0.002	525.2	MA	4072	06/30/23	
2946	1,2 - DIBROMOETHANE (EDB)	**ND**	mg/L	0.00002	0.00005	504.1	MA	4072	06/07/23	
2034	GLYPHOSATE	**ND**	mg/L	0.005	0.700	547	MA	4072	06/20/23	
2067	HEPTACHLOR EPOXIDE "B"	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2065	HEPTACHLOR	**ND**	mg/L	0.00005	0.0004	525.2	MA	4072	06/30/23	
2274	HEXACHLOROBENZENE	**ND**	mg/L	0.00005	0.001	525.2	MA	4072	06/30/23	
2042	HEXACHLOROCYCLO-PENTADIENE	**ND**	mg/L	0.00005	0.050	525.2	MA	4072	06/30/23	
2015	METHOXYCHLOR	**ND**	mg/L	0.00005	0.040	525.2	MA	4072	06/30/23	
2326	PENTACHLOROPHENOL	**ND**	mg/L	0.00004	0.001	515.4	BFR	4072	06/09/23	
2039	DI(2-ETHYLHEXYL)-PHTHALATE	**ND**	mg/L	0.0001	0.006	525.2	MA	4072	06/30/23	
2040	PICLORAM	**ND**	mg/L	0.0001	0.500	515.4	BFR	4072	06/09/23	
2037	SIMAZINE	**ND**	mg/L	0.00005	0.004	525.2	MA	4072	06/30/23	
2020	TOXAPHENE	**ND**	mg/L	0.001	0.003	508.1	MA	4072	06/22/23	
2036	OXAMYL (VYDATE)	**ND**	mg/L	0.001	0.200	531.2	MA	4072	06/21/23	
2383	PCBS (Total Aroclors)	**ND**	mg/L	0.0002	0.0005	508.1	MA	4072	06/22/23	

NOTES:
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; a blank MCL value indicates a level is not currently established.
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting Limit (LRL).

If you have any questions concerning this report contact Thanh B Phan at the above phone number.
FORM: SOC_OR

EDGE ANALYTICAL

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Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

NELAP ACCREDITED TNI LABORATORY
ORELAP 4072
Idaho WA00097

VOLATILE ORGANIC COMPOUNDS (VOC) REPORT

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

Reference Number: 23-22395
Project: Santiam Canyon Infiltration Eval

System Name:
System ID Number:
DWP Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM1-MW1
County:
Sampled By: Jesse Hall
Sampler Phone:

Field ID: GM1
Lab Number: 23_44385
Date Collected: 7/25/23 11:00
Date Extracted: 524_230728
Date Analyzed: 07/28/23
Report Date: 8/4/23
Analyst: NML
Approved By: pdm

Authorized By:

Thanh B Phan
Lab Manager, Portland

EPA#	COMPOUNDS	RESULTS	UNITS	LRL	MCL	Method	Lab Code*	COMMENT
	EPA/State Regulated							
2977	1,1 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.007	524.2	4072 a	
2981	1,1,1 - TRICHLOROETHANE	**ND**	mg/L	0.0005	0.200	524.2	4072 a	
2985	1,1,2 - TRICHLOROETHANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2980	1,2 - DICHLOROETHANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2983	1,2 - DICHLOROPROPANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2378	1,2,4 - TRICHLOROBENZENE	**ND**	mg/L	0.0005	0.070	524.2	4072 a	
2990	BENZENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2982	CARBON TETRACHLORIDE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2989	CHLOROBENZENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2380	CIS - 1,2 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.070	524.2	4072 a	
2992	ETHYLBENZENE	**ND**	mg/L	0.0005	0.700	524.2	4072 a	
2964	METHYLENE CHLORIDE (Dichlorometha	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2968	O - DICHLOROBENZENE	**ND**	mg/L	0.0005	0.600	524.2	4072 a	
2969	P - DICHLOROBENZENE	**ND**	mg/L	0.0005	0.075	524.2	4072 a	
2996	STYRENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2979	T - 1,2 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2987	TETRACHLOROETHYLENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2991	TOLUENE	**ND**	mg/L	0.0005	1.0	524.2	4072 a	
2955	TOTAL XYLENES	**ND**	mg/L	0.0005	10.0	524.2	4072 a	
2984	TRICHLOROETHYLENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2976	VINYL CHLORIDE	**ND**	mg/L	0.0005	0.002	524.2	4072 a	

NOTES:
If a compound is detected > or = to the Lower Reporting Level, LRL, specified increased monitoring frequencies may occur per PHD.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA. Blank MCL value indicates a level is not currently established.
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting Limit (LRL).
* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.
An * in front of the parameter name indicates it is not NELAP accredited but it is accredited through WSDOH or USEPA Region 10.
These test results meet all the requirements of NELAP, unless otherwise stated in writing, and relate only to these samples. Estimates of uncertainty are not included in this report. If this information is required please contact us at the phone number listed in the report header.
If you have any questions concerning this report contact our office at the above phone number.
FORM: cVOC OR.rpt

EDGE ANALYTICAL

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INORGANIC COMPOUNDS (IOC) REPORT

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

System Name:
System ID Number:
Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM4MW1
County:

Reference Number: 23-15516
Project: Santiam Canyon 0464.020.001 - (

Sample Number: GM4MW10523
Lab Number: 23_31097
Collect Date: 5/29/23 14:55
Date Received: 5/30/23
Report Date: 7/12/23
Sampled By: Mellisa Girbach
Sampler Phone:
Approved by: anp,bj,mcs,pap,pdk,t
Authorized by:

Thanh B Phan
Lab Manager, Portland

EPA#	ANALYTES	RESULTS	UNITS	LRL	MCL	Analyst	Lab Code*	METHOD	Analyzed	COMMENT
	CORROSIVITY									
1925	HYDROGEN ION (pH)	**7.15 H5**	pH Units			klp	4072 a	SM4500-H+ B	06/08/23 16:01	Temp (C) : 22.0
1067	ALKALINITY	**114**	mg CaCO3/	5		klp	4072 a	SM2320 B	06/08/23	
1910	CORROSIVITY	**-1.25**	SI			bj	4072 a	SM203	06/23/23	
	CARBONATE	**ND**	mgCaCO3/L	5		klp	4072 a	SM2320 B	06/08/23	
	BICARBONATE	**114**	mg CaCO3/	5		klp	4072 a	SM2320 B	06/08/23	
	HYDROXIDE	**ND**	mg CaCO3/	5		klp	4072 a	SM2320 B	06/08/23	
1067	ALKALINITY	**114**	mg CaCO3/	5.0		klp	4072 a	SM2320 B	06/08/23	
1024	CYANIDE	**ND**	mg/L	0.005	**0.2**	tjb	4072 a	D7511-12	06/07/23	
	TOTAL DISSOLVED SOLIDS	**147**	mg/L	10	**500**	mso	046 a	SM2540 C	06/13/23	
1020	CHROMIUM	**0.0019**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1075	BERYLLIUM	**ND**	mg/L	0.0003		tjb	4072 a	200.8	06/02/23	
1041	NITRITE-N	**ND**	mg/L	0.01	**1.0**	anl	OR100063 c	SM4500-NO3 F	05/30/23 16:48	
1005	ARSENIC	**0.0017**	mg/L	0.0005		tjb	4072 a	200.8	06/02/23	
1045	SELENIUM	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1050	SILVER	**ND**	mg/L	0.0002		tjb	4072 a	200.8	06/02/23	
1015	CADMIUM	**0.00019 J**	mg/L	0.00025		tjb	4072 a	200.8	06/02/23	
1074	ANTIMONY	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1040	NITRATE-N	**0.02**	mg/L	0.005	**10**	anl	OR100063 c	SM4500-NO3 F	05/30/23 16:48	
1010	BARIUM	**0.0211**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1030	LEAD	**0.00087**	mg/L	0.0005		tjb	4072 a	200.8	06/20/23	
1035	MERCURY	**ND**	mg/L	0.0002		tjb	4072 a	245.1	06/13/23	
	HARDNESS	**99.6**	mg CaCO3/	10		bj	4072 a	200.7	06/05/23	

NOTES:
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting limit (LRL).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.

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FORM: cIOC OR.rpt

EDGE ANALYTICAL

Burlington, WA *Corporate Laboratory (a)*
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Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

System Name:
System ID Number:
Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM4MW1
County:

Reference Number: 23-15516
Project: Santiam Canyon 0464.020.001 - (

Sample Number: GM4MW10523
Lab Number: 23_31097
Collect Date: 5/29/23 14:55
Date Received: 5/30/23
Report Date: 7/12/23
Sampled By: Mellisa Girbach
Sampler Phone:
Approved by: anp,bj,mcs,pap,pdk,t
Authorized by:

Thanh B Phan
Lab Manager, Portland

EPA#	ANALYTES	RESULTS	UNITS	LRL	MCL	Analyst	Lab Code*	METHOD	Analyzed	COMMENT
	SILICA	**58.2**	mg/L	0.05		bj	4072 a	200.7	06/05/23	
	TOTAL SUSPENDED SOLIDS	**84 NN**	mg/L	2		pap		I-3765-85	06/01/23	
1032	MANGANESE	**0.449**	mg/L	0.001		bj	4072 a	200.7	06/05/23	
1028	IRON	**3.63**	mg/L	0.050		bj	4072 a	200.7	06/05/23	
1002	ALUMINUM	**3.80**	mg/L	0.010		bj	4072 a	200.7	06/05/23	
1036	NICKEL	**0.0043**	mg/L	0.0005		tjb	4072 a	200.8	06/02/23	
1022	COPPER	**0.0367**	mg/L	0.002		tjb	4072 a	200.8	06/02/23	
1095	ZINC	**0.0087**	mg/L	0.0025		tjb	4072 a	200.8	06/02/23	
	FLUORIDE	**ND**	mg/L	0.10	**4**	jwn	4072 a	300.0	06/07/23	
1016	CALCIUM	**18.6**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1052	SODIUM	**9.4**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1031	MAGNESIUM	**12.9**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1042	POTASSIUM	**1.8**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1017	CHLORIDE	**2.1**	mg/L	0.2		jwn	4072 a	300.0	06/07/23	
	MOLYBDENUM	**0.00078 J**	mg/L	0.001		tjb	4072 a	200.8	06/20/23	
1085	THALLIUM	**ND**	mg/L	0.0001		tjb	4072 a	200.8	06/02/23	
1055	SULFATE	**0.9**	mg/L	0.4		jwn	4072 a	300.0	06/07/23	
	Radiological									
4006	URANIUM	**ND**	mg/L	0.001	**0.030**	tjb	4072 a	200.8	06/02/23	
4000	GROSS ALPHA	**ND**	pCi/L	3	**15**	reh1	156	900.0	06/30/23	Analyzed by PacePA
4100	GROSS BETA	**ND**	pCi/L	4	**50**	reh1	156	900.0	06/30/23	Analyzed by PacePA
	Radium 226	**ND**	pCi/L	1		jlj		903.1	06/28/23	Analyzed by PacePA
	Radium 228	**ND**	pCi/L	1	**5**	val		904.0	06/23/23	Analyzed by PacePA

NOTES:
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* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.

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FORM: cIOC OR.rpt

ANALYTICAL

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Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

ORGANICS IN DRINKING WATER

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

Reference Number: 23-15516
Project: Santiam Canyon 0464.020.001 -

System Name:
System ID Number:
DWP Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Composition:
Sample Location: GM4MW1
County:

Field ID: GM4MW10523
Lab Number: 23_31097
Date Collected: 5/29/23 14:55
Sampled By: Mellisa Girbach
Sampler Phone:
Report Date: 7/12/23
Approved By: nml,pdm

Authorized By:

Thanh B Phan
Lab Manager, Portland

EPA#	COMPOUNDS	RESULTS	UNITS	LRL	MCL	METHOD	Analyst	Lab	Analyzed	COMMENT
	Synthetic Organic Chemicals									
2105	2,4 - D	**ND**	mg/L	0.0001	0.070	515.4	BFR	4072	06/09/23	
2110	2,4,5 - TP (SILVEX)	**ND**	mg/L	0.0001	0.050	515.4	BFR	4072	06/09/23	
2035	DI(2-ETHYLHEXYL)-ADIPATE	**ND**	mg/L	0.00005	0.400	525.2	MA	4072	06/30/23	
2051	ALACHLOR	**ND**	mg/L	0.00005	0.002	525.2	MA	4072	06/30/23	
2050	ATRAZINE	**ND**	mg/L	0.00005	0.003	525.2	MA	4072	06/30/23	
2306	BENZO(A)PYRENE	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2010	LINDANE (BHC - GAMMA)	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2046	CARBOFURAN	**ND**	mg/L	0.001	0.040	531.2	MA	4072	06/21/23	
2959	CHLORDANE	**ND**	mg/L	0.0001	0.002	508.1	MA	4072	06/22/23	
2031	DALAPON	**ND**	mg/L	0.0005	0.200	515.4	BFR	4072	06/09/23	
2931	1,2-DIBROMO-3-CHLOROPROPANE	**ND**	mg/L	0.00002	0.0002	504.1	MA	4072	06/07/23	
2041	DINOSEB	**ND**	mg/L	0.0001	0.007	515.4	BFR	4072	06/09/23	
2032	DIQUAT	**ND**	mg/L	0.0004	0.020	549.2	KRC	4072	06/07/23	
2033	ENDOTHALL	**ND**	mg/L	0.005	0.100	548.1	MA	4072	06/05/23	
2005	ENDRIN	**ND**	mg/L	0.00005	0.002	525.2	MA	4072	06/30/23	
2946	1,2 - DIBROMOETHANE (EDB)	**ND**	mg/L	0.00002	0.00005	504.1	MA	4072	06/07/23	
2034	GLYPHOSATE	**ND**	mg/L	0.005	0.700	547	MA	4072	07/03/23	
2067	HEPTACHLOR EPOXIDE "B"	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2065	HEPTACHLOR	**ND**	mg/L	0.00005	0.0004	525.2	MA	4072	06/30/23	
2274	HEXACHLOROBENZENE	**ND**	mg/L	0.00005	0.001	525.2	MA	4072	06/30/23	
2042	HEXACHLOROCYCLO-PENTADIENE	**ND**	mg/L	0.00005	0.050	525.2	MA	4072	06/30/23	
2015	METHOXYCHLOR	**ND**	mg/L	0.00005	0.040	525.2	MA	4072	06/30/23	
2326	PENTACHLOROPHENOL	**ND**	mg/L	0.00004	0.001	515.4	BFR	4072	06/09/23	
2039	DI(2-ETHYLHEXYL)-PHTHALATE	**ND**	mg/L	0.0001	0.006	525.2	MA	4072	06/30/23	
2040	PICLORAM	**ND**	mg/L	0.0001	0.500	515.4	BFR	4072	06/09/23	
2037	SIMAZINE	**ND**	mg/L	0.00005	0.004	525.2	MA	4072	06/30/23	
2020	TOXAPHENE	**ND**	mg/L	0.001	0.003	508.1	MA	4072	06/22/23	
2036	OXAMYL (VYDATE)	**ND**	mg/L	0.001	0.200	531.2	MA	4072	06/21/23	
2383	PCBS (Total Aroclors)	**ND**	mg/L	0.0002	0.0005	508.1	MA	4072	06/22/23	

NOTES:
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; a blank MCL value indicates a level is not currently established.
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting Limit (LRL).

If you have any questions concerning this report contact Thanh B Phan at the above phone number.
FORM: SOC_OR

ANALYTICAL

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Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

ORELAP 4072
Idaho WA00097

VOLATILE ORGANIC COMPOUNDS (VOC) REPORT

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

Reference Number: 23-15516
Project: Santiam Canyon 0464.020.001 -

System Name:
System ID Number:
DWP Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM4MW1
County:
Sampled By: Mellisa Girbach
Sampler Phone:

Field ID: GM4MW10523
Lab Number: 23_31097
Date Collected: 5/29/23 14:55
Date Extracted: 524_230605
Date Analyzed: 06/05/23
Report Date: 7/12/23
Analyst: NML
Approved By: pdm

Authorized By:

Thanh B Phan
Lab Manager, Portland

EPA#	COMPOUNDS	RESULTS	UNITS	LRL	MCL	Method	Lab Code*	COMMENT
	EPA/State Regulated							
2977	1,1 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.007	524.2	4072 a	
2981	1,1,1 - TRICHLOROETHANE	**ND**	mg/L	0.0005	0.200	524.2	4072 a	
2985	1,1,2 - TRICHLOROETHANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2980	1,2 - DICHLOROETHANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2983	1,2 - DICHLOROPROPANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2378	1,2,4 - TRICHLOROBENZENE	**ND**	mg/L	0.0005	0.070	524.2	4072 a	
2990	BENZENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2982	CARBON TETRACHLORIDE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2989	CHLOROBENZENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2380	CIS - 1,2 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.070	524.2	4072 a	
2992	ETHYLBENZENE	**ND**	mg/L	0.0005	0.700	524.2	4072 a	
2964	METHYLENE CHLORIDE (Dichlorometha	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2968	O - DICHLOROBENZENE	**ND**	mg/L	0.0005	0.600	524.2	4072 a	
2969	P - DICHLOROBENZENE	**ND**	mg/L	0.0005	0.075	524.2	4072 a	
2996	STYRENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2979	T - 1,2 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2987	TETRACHLOROETHYLENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2991	TOLUENE	**ND**	mg/L	0.0005	1.0	524.2	4072 a	
2955	TOTAL XYLENES	**ND**	mg/L	0.0005	10.0	524.2	4072 a	
2984	TRICHLOROETHYLENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2976	VINYL CHLORIDE	**ND**	mg/L	0.0005	0.002	524.2	4072 a	

NOTES:
If a compound is detected > or = to the Lower Reporting Level, LRL, specified increased monitoring frequencies may occur per PHD.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA. Blank MCL value indicates a level is not currently established.
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting Limit (LRL).
* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.

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INORGANIC COMPOUNDS (IOC) REPORT

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

System Name:
System ID Number:
Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM5MW1
County:

Reference Number: 23-15521
Project: Santiam Canyon 0464.020.001 - (

Sample Number: GM5MW10523
Lab Number: 23_31106
Collect Date: 5/30/23 13:20
Date Received: 5/30/23
Report Date: 7/12/23
Sampled By: Mellisa Girbach
Sampler Phone:
Approved by: anp,bj,mcs,pap,pdk,t
Authorized by:

Thanh B Phan
Lab Manager, Portland

EPA#	ANALYTES	RESULTS	UNITS	LRL	MCL	Analyst	Lab Code*	METHOD	Analyzed	COMMENT
	CORROSIVITY									
1925	HYDROGEN ION (pH)	**7.06 H5**	pH Units			klp	4072 a	SM4500-H+ B	06/08/23 16:04	Temp (C) : 22.7
1067	ALKALINITY	**41.4**	mg CaCO3/	2		klp	4072 a	SM2320 B	06/08/23	
1910	CORROSIVITY	**-2.08**	SI			bj	4072 a	SM203	06/23/23	
	CARBONATE	**ND**	mgCaCO3/L	2		klp	4072 a	SM2320 B	06/08/23	
	BICARBONATE	**41.4**	mg CaCO3/	2		klp	4072 a	SM2320 B	06/08/23	
	HYDROXIDE	**ND**	mg CaCO3/	2		klp	4072 a	SM2320 B	06/08/23	
1067	ALKALINITY	**41.4**	mg CaCO3/	2.0		klp	4072 a	SM2320 B	06/08/23	
1024	CYANIDE	**ND**	mg/L	0.005	**0.2**	tjb	4072 a	D7511-12	06/07/23	
	TOTAL DISSOLVED SOLIDS	**84**	mg/L	10	**500**	mso	4072 a	SM2540 C	06/13/23	
1020	CHROMIUM	**0.0032**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1075	BERYLLIUM	**ND**	mg/L	0.0003		tjb	4072 a	200.8	06/02/23	
1041	NITRITE-N	**ND**	mg/L	0.01	**1.0**	anl	OR100063 c	SM4500-NO3 F	05/30/23 16:49	
1005	ARSENIC	**0.00095**	mg/L	0.0005		tjb	4072 a	200.8	06/02/23	
1045	SELENIUM	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1050	SILVER	**ND**	mg/L	0.0002		tjb	4072 a	200.8	06/02/23	
1015	CADMIUM	**ND**	mg/L	0.00025		tjb	4072 a	200.8	06/02/23	
1074	ANTIMONY	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1040	NITRATE-N	**0.46**	mg/L	0.005	**10**	anl	OR100063 c	SM4500-NO3 F	05/30/23 16:49	
1010	BARIUM	**0.0120**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1030	LEAD	**0.00060**	mg/L	0.0005		tjb	4072 a	200.8	06/20/23	
1035	MERCURY	**ND**	mg/L	0.0002		tjb	4072 a	245.1	06/13/23	
	HARDNESS	**36.3**	mg CaCO3/	10		bj	4072 a	200.7	06/05/23	

NOTES:
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting limit (LRL).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
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INORGANIC COMPOUNDS (IOC) REPORT

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

System Name:
System ID Number:
Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM5MW1
County:

Reference Number: 23-15521
Project: Santiam Canyon 0464.020.001 - (

Sample Number: GM5MW10523
Lab Number: 23_31106
Collect Date: 5/30/23 13:20
Date Received: 5/30/23
Report Date: 7/12/23
Sampled By: Mellisa Girbach
Sampler Phone:
Approved by: anp,bj,mcs,pap,pdk,t
Authorized by:

Thanh B Phan
Lab Manager, Portland

EPA#	ANALYTES	RESULTS	UNITS	LRL	MCL	Analyst	Lab Code*	METHOD	Analyzed	COMMENT
	SILICA	**43.3**	mg/L	0.05		bj	4072 a	200.7	06/05/23	
	TOTAL SUSPENDED SOLIDS	**71 NN**	mg/L	4		pap		I-3765-85	06/01/23	
1032	MANGANESE	**0.106**	mg/L	0.001		bj	4072 a	200.7	06/05/23	
1028	IRON	**2.61**	mg/L	0.050		bj	4072 a	200.7	06/05/23	
1002	ALUMINUM	**2.26**	mg/L	0.010		bj	4072 a	200.7	06/05/23	
1036	NICKEL	**0.0028**	mg/L	0.0005		tjb	4072 a	200.8	06/02/23	
1022	COPPER	**0.0142**	mg/L	0.002		tjb	4072 a	200.8	06/02/23	
1095	ZINC	**0.0059**	mg/L	0.0025		tjb	4072 a	200.8	06/02/23	
	FLUORIDE	**ND**	mg/L	0.10	**4**	jwn	4072 a	300.0	06/02/23	
1016	CALCIUM	**9.1**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1052	SODIUM	**4.8**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1031	MAGNESIUM	**3.3**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1042	POTASSIUM	**1.0**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1017	CHLORIDE	**1.4**	mg/L	0.2		jwn	4072 a	300.0	06/02/23	
	MOLYBDENUM	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/20/23	
1085	THALLIUM	**ND**	mg/L	0.0001		tjb	4072 a	200.8	06/02/23	
1055	SULFATE	**0.3**	mg/L	0.2		jwn	4072 a	300.0	06/02/23	
	Radiological									
4006	URANIUM	**ND**	mg/L	0.001	**0.030**	tjb	4072 a	200.8	06/02/23	
4000	GROSS ALPHA	**ND**	pCi/L	3	**15**	reh1	156	900.0	06/30/23	Analyzed by PacePA
4100	GROSS BETA	**ND**	pCi/L	4	**50**	reh1	156	900.0	06/30/23	Analyzed by PacePA
	Radium 226	**ND**	pCi/L	1		jlj		903.1	06/28/23	Analyzed by PacePA
	Radium 228	**ND**	pCi/L	1	**5**	val		904.0	06/23/23	Analyzed by PacePA

NOTES:
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting limit (LRL).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.

If you have any questions concerning this report contact us at the above phone number.

FORM: cIOC OR.rpt

ANALYTICAL

Burlington, WA *Corporate Laboratory (a)*
1620 S Walnut St - Burlington, WA 98233 - **800.755.9295** • 360.757.1400

Bellingham, WA *Microbiology (b)*
805 Orchard Dr Ste 4 - Bellingham, WA 98225 - 360.715.1212

Portland, OR *Microbiology/Chemistry (c)*
9725 SW Commerce Cr Ste A2 - Wilsonville, OR 97070 - 503.682.7802

Corvallis, OR *Microbiology/Chemistry (d)*
1100 NE Circle Blvd, Ste 130 - Corvallis, OR 97330 - 541.753.4946

Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

ORGANICS IN DRINKING WATER

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

Reference Number: 23-15521
Project: Santiam Canyon 0464.020.001 -

System Name:
System ID Number:
DWP Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Composition:
Sample Location: GM5MW1
County:

Field ID: GM5MW10523
Lab Number: 23_31106
Date Collected: 5/30/23 13:20
Sampled By: Mellisa Girbach
Sampler Phone:
Report Date: 7/12/23
Approved By: nml,pdm

Authorized By:

Thanh B Phan
Lab Manager, Portland

EPA#	COMPOUNDS	RESULTS	UNITS	LRL	MCL	METHOD	Analyst	Lab	Analyzed	COMMENT
	Synthetic Organic Chemicals									
2105	2,4 - D	**ND**	mg/L	0.0001	0.070	515.4	BFR	4072	06/13/23	
2110	2,4,5 - TP (SILVEX)	**ND**	mg/L	0.0001	0.050	515.4	BFR	4072	06/13/23	
2035	DI(2-ETHYLHEXYL)-ADIPATE	**ND**	mg/L	0.00005	0.400	525.2	MA	4072	06/30/23	
2051	ALACHLOR	**ND**	mg/L	0.00005	0.002	525.2	MA	4072	06/30/23	
2050	ATRAZINE	**ND**	mg/L	0.00005	0.003	525.2	MA	4072	06/30/23	
2306	BENZO(A)PYRENE	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2010	LINDANE (BHC - GAMMA)	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2046	CARBOFURAN	**ND**	mg/L	0.001	0.040	531.2	MA	4072	06/21/23	
2959	CHLORDANE	**ND**	mg/L	0.0001	0.002	508.1	MA	4072	06/22/23	
2031	DALAPON	**ND**	mg/L	0.0005	0.200	515.4	BFR	4072	06/13/23	
2931	1,2-DIBROMO-3-CHLOROPROPANE	**ND**	mg/L	0.00002	0.0002	504.1	MA	4072	06/07/23	
2041	DINOSEB	**ND**	mg/L	0.0001	0.007	515.4	BFR	4072	06/13/23	
2032	DIQUAT	**ND**	mg/L	0.0004	0.020	549.2	KRC	4072	06/07/23	
2033	ENDOTHALL	**ND**	mg/L	0.005	0.100	548.1	MA	4072	06/05/23	
2005	ENDRIN	**ND**	mg/L	0.00005	0.002	525.2	MA	4072	06/30/23	
2946	1,2 - DIBROMOETHANE (EDB)	**ND**	mg/L	0.00002	0.00005	504.1	MA	4072	06/07/23	
2034	GLYPHOSATE	**ND**	mg/L	0.005	0.700	547	MA	4072	07/03/23	
2067	HEPTACHLOR EPOXIDE "B"	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2065	HEPTACHLOR	**ND**	mg/L	0.00005	0.0004	525.2	MA	4072	06/30/23	
2274	HEXACHLOROBENZENE	**ND**	mg/L	0.00005	0.001	525.2	MA	4072	06/30/23	
2042	HEXACHLOROCYCLO-PENTADIENE	**ND**	mg/L	0.00005	0.050	525.2	MA	4072	06/30/23	
2015	METHOXYCHLOR	**ND**	mg/L	0.00005	0.040	525.2	MA	4072	06/30/23	
2326	PENTACHLOROPHENOL	**ND**	mg/L	0.00004	0.001	515.4	BFR	4072	06/13/23	
2039	DI(2-ETHYLHEXYL)-PHTHALATE	**ND**	mg/L	0.0001	0.006	525.2	MA	4072	06/30/23	
2040	PICLORAM	**ND**	mg/L	0.0001	0.500	515.4	BFR	4072	06/13/23	
2037	SIMAZINE	**ND**	mg/L	0.00005	0.004	525.2	MA	4072	06/30/23	
2020	TOXAPHENE	**ND**	mg/L	0.001	0.003	508.1	MA	4072	06/22/23	
2036	OXAMYL (VYDATE)	**ND**	mg/L	0.001	0.200	531.2	MA	4072	06/21/23	
2383	PCBS (Total Aroclors)	**ND**	mg/L	0.0002	0.0005	508.1	MA	4072	06/22/23	

NOTES:
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; a blank MCL value indicates a level is not currently established.
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting Limit (LRL).

If you have any questions concerning this report contact Thanh B Phan at the above phone number.
FORM: SOC_OR

ANALYTICAL

Burlington, WA *Corporate Laboratory (a)*
1620 S Walnut St - Burlington, WA 98233 - **800.755.9295** • 360.757.1400

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1100 NE Circle Blvd, Ste 130 - Corvallis, OR 97330 - 541.753.4946

Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

ORELAP 4072
Idaho WA00097

VOLATILE ORGANIC COMPOUNDS (VOC) REPORT

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

Reference Number: 23-15521
Project: Santiam Canyon 0464.020.001 -

System Name:
System ID Number:
DWP Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM5MW1
County:
Sampled By: Mellisa Girbach
Sampler Phone:

Field ID: GM5MW10523
Lab Number: 23_31106
Date Collected: 5/30/23 13:20
Date Extracted: 524_230605
Date Analyzed: 06/05/23
Report Date: 7/12/23
Analyst: NML
Approved By: pdm

Authorized By:

Thanh B Phan
Lab Manager, Portland

EPA#	COMPOUNDS	RESULTS	UNITS	LRL	MCL	Method	Lab Code*	COMMENT
	EPA/State Regulated							
2977	1,1 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.007	524.2	4072 a	
2981	1,1,1 - TRICHLOROETHANE	**ND**	mg/L	0.0005	0.200	524.2	4072 a	
2985	1,1,2 - TRICHLOROETHANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2980	1,2 - DICHLOROETHANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2983	1,2 - DICHLOROPROPANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2378	1,2,4 - TRICHLOROBENZENE	**ND**	mg/L	0.0005	0.070	524.2	4072 a	
2990	BENZENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2982	CARBON TETRACHLORIDE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2989	CHLOROBENZENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2380	CIS - 1,2 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.070	524.2	4072 a	
2992	ETHYLBENZENE	**ND**	mg/L	0.0005	0.700	524.2	4072 a	
2964	METHYLENE CHLORIDE (Dichlorometha	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2968	O - DICHLOROBENZENE	**ND**	mg/L	0.0005	0.600	524.2	4072 a	
2969	P - DICHLOROBENZENE	**ND**	mg/L	0.0005	0.075	524.2	4072 a	
2996	STYRENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2979	T - 1,2 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2987	TETRACHLOROETHYLENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2991	TOLUENE	**ND**	mg/L	0.0005	1.0	524.2	4072 a	
2955	TOTAL XYLENES	**ND**	mg/L	0.0005	10.0	524.2	4072 a	
2984	TRICHLOROETHYLENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2976	VINYL CHLORIDE	**ND**	mg/L	0.0005	0.002	524.2	4072 a	

NOTES:
If a compound is detected > or = to the Lower Reporting Level, LRL, specified increased monitoring frequencies may occur per PHD.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA. Blank MCL value indicates a level is not currently established.
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting Limit (LRL).
* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.

If you have any questions concerning this report contact our office at the above phone number.

WATERLAB CORP.

2603 - 12th Street, SE
Salem, OR 97302
Voice: (503) 363-0473
FAX: (503) 363-8900

TEST REPORT

TO: City of Mill City c/o City Recorder
P. O. Box 256
Mill City, OR 97360

05/09/2023

CITMILC

PO#:

Collection Information

Date: 05/02/2023
Time: 0900
By: Russ
Lab #: 20230502-095
Location: 360 Remine Rd Mill City INF

Lab Receipt Information

05/02/2023
1045
SW

Case Narrative

The analyses were performed according to the guidelines in the WATERLAB Corp Quality Assurance Program. This report contains analytical results for the sample(s) as received by the laboratory.

Analyte	Method	Acc*	Results	Qual	MRL	Units	EPA Limit	Analysis Date Time	Tech
Alkalinity, Total - 1927	SM2320 B		279.		10.	mg/l CaCO3		05/04/2023	AS
Bicarbonate Alkalinity	SM2320B		340.4		10	HC03		05/04/2023	AS
Hardness as CaCO3	SM2340C		86.		10.	mg/l CaCO3	250	05/04/2023	AS

ND- No Detection at @ MRL
SM-"Standard Methods for the Examination of Water & Wastewater",19th ed
EPA- "Methods for Chemical Analysis for Water and Wastes",USEPA
MRL-"Method Reporting Limit"
* Accreditation
A- Waterlab Corporation, ORELAP 100039
The results relate only to the parameters tested or to the sample as received by the laboratory.

Approved by: _____

Customer

WATERLAB CORP.

2603 - 12th Street, SE
Salem, OR 97302
Voice: (503) 363-0473
FAX: (503) 363-8900

TEST REPORT

TO: City of Mill City c/o City Recorder
P. O. Box 256
Mill City, OR 97360

05/22/2023

CITMILC

PO#:

Collection Information

Date: 05/02/2023
Time: 0900
By: Russ
Lab #: 20230502-096
Location: 360 Remine Rd Mill City Inf

Lab Receipt Information

05/02/2023
1045
SW

Case Narrative

The analyses were performed according to the guidelines in the WATERLAB Corp Quality Assurance Program. This report contains analytical results for the sample(s) as received by the laboratory.

Analyte	Method	Acc*	Results	Qual	MRL	Units	Analysis Date Time	Tech
Inorganic Chemicals								
Antimony	SM3113B		ND		0.005	mg/l	05/12/2023	bem
Arsenic	SM3113B		ND		0.002	mg/l	05/08/2023	bem
Barium	SM3113B	B	0.0109		0.0005	mg/l	05/12/2023 1515	cbb
Beryllium	SM3113B		ND		0.001	mg/l	06/05/2023	bem
Cadmium	SM3113B		ND		0.001	mg/l	05/11/2023	bem
Chromium	SM3113B		ND		0.02	mg/l	05/09/2023	bem
Fluoride	EPA300.0		7.41		0.2	mg/l	05/02/2023	bem
Lead	SM3113 B		ND		0.001	mg/l	05/15/2023	bem
Mercury	SM3112B		ND		0.001	mg/l	05/17/2023	bem

ND- No Detection at @ MRL
SM-"Standard Methods for the Examination of Water & Wastewater",19th ed
EPA- "Methods for Chemical Analysis for Water and Wastes",USEPA
MRL-"Method Reporting Limit"
* Accreditation
A- Waterlab Corporation, ORELAP 100039
The results relate only to the parameters tested or to the sample as received by the laboratory.

B=Neilson Research Corporation, ORELAP ID#OR100016

Approved by: _____

WATERLAB CORP.

2603 - 12th Street, SE
Salem, OR 97302
Voice: (503) 363-0473
FAX: (503) 363-8900

TEST REPORT

LAB # : 20230502-096 (Cont) CITMILC

Analyte	Method	Acc*	Results	Qual	MRL	Units	Analysis Date Time		Tech
Nickel	SM3113B		ND		0.05	mg/l	05/09/2023		bem
Nitrogen, Nitrate	EPA300.0		ND		0.2	mg/l N	05/02/2023	1640	as
Nitrogen, Nitrite	EPA300.0		ND		0.2	mg/l N	05/02/2023	1640	as
Selenium	SM3113B		ND		0.005	mg/l	05/12/2023		bem
Sodium	SM3111B		50.2		1.0	mg/l	05/09/2023		as
Thallium	SM3113B		ND		0.001	mg/l	05/11/2023		bem
Aluminum	SM3113B		0.275		0.050	mg/l	05/30/2023		bem
Copper	SM3113 B		ND		0.002	mg/l	05/31/2023		bem
Iron	SM3111B		0.286		0.1	mg/l	05/31/2023		as
Manganese	SM3111B		ND		0.05	mg/l	05/31/2023		as
Silver	SM3113B		ND		0.01	mg/l	05/22/2023		bem
Zinc	SM3111 B		0.0547		0.01	mg/l	05/31/2023		bem

ND- No Detection at @ MRL
SM-"Standard Methods for the Examination of Water & Wastewater",19th ed
EPA- "Methods for Chemical Analysis for Water and Wastes",USEPA
MRL-"Method Reporting Limit"
* Accreditation
A- Waterlab Corporation, ORELAP 100039
The results relate only to the parameters tested or to the sample as received by the laboratory.

B=Neilson Research Corporation, ORELAP ID#OR100016

Approved by: _____

ANALYTICAL SUMMARY REPORT

June 09, 2023

Waterlab Corp
2603 12th St SE
Salem, OR 97302-2154

Work Order: C23050297

Project Name: Mill City WWTP

Energy Laboratories, Inc. Casper WY received the following 1 sample for Waterlab Corp on 5/8/2023 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C23050297-001	20230502-094 Mill City WWTP	05/02/23 8:30	05/08/23	Waste Water	Metals by ICP/ICPMS, Drinking Water Metals Preparation by EPA 200.2 Gross Alpha, Gross Beta, Total Radium 226 + Radium 228, Total Radium 226, Total Radium 228, Total

The analyses presented in this report were performed by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601, unless otherwise noted. Any exceptions or problems with the analyses are noted in the report package. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these test results, please contact your Project Manager .

Report Approved By:

Ashley L. Wilson
Project Manager

Digitally signed by
Ashley L. Wilson
Date: 2023.06.09 14:46:22 -06:00

CLIENT: Waterlab Corp
Project: Mill City WWTP
Work Order: C23050297

Report Date: 06/09/23

CASE NARRATIVE

ENERGY LABORATORIES, INC. - CASPER,WY certifies that certain method selections contained in this report meet requirements as set forth by the above accrediting authorities. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative. Please verify ELI's certification coverage by visiting www.energylab.com.

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Waterlab Corp
Project: Mill City WWTP
Lab ID: C23050297-001
Client Sample ID: 20230502-094 Mill City WWTP

Report Date: 06/09/23
Collection Date: 05/02/23 08:30
DateReceived: 05/08/23
Matrix: Waste Water

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Uranium	ND	mg/L		0.0003	0.03	E200.8	05/17/23 04:23 / eli-b
Uranium, Activity	ND	pCi/L		0.2		E200.8	05/17/23 04:23 / eli-b
RADIONUCLIDES, TOTAL							
Gross Alpha	-5	pCi/L	U			E900.0	05/27/23 02:30 / haw
Gross Alpha precision (±)	1.7	pCi/L				E900.0	05/27/23 02:30 / haw
Gross Alpha MDC	3.1	pCi/L				E900.0	05/27/23 02:30 / haw
Gross Beta	14.8	pCi/L				E900.0	05/27/23 02:30 / haw
Gross Beta precision (±)	3.1	pCi/L				E900.0	05/27/23 02:30 / haw
Gross Beta MDC	3.9	pCi/L				E900.0	05/27/23 02:30 / haw
Radium 226	-0.05	pCi/L	U			E903.0	05/23/23 11:12 / kdk
Radium 226 precision (±)	0.2	pCi/L				E903.0	05/23/23 11:12 / kdk
Radium 226 MDC	0.3	pCi/L				E903.0	05/23/23 11:12 / kdk
Radium 228	2.5	pCi/L				RA-05	05/18/23 13:08 / trs
Radium 228 precision (±)	1.1	pCi/L				RA-05	05/18/23 13:08 / trs
Radium 228 MDC	1.6	pCi/L				RA-05	05/18/23 13:08 / trs
Radium 226 + Radium 228	2.6	pCi/L				A7500-RA	05/24/23 12:54 / dmf
Radium 226 + Radium 228 precision (±)	1.1	pCi/L				A7500-RA	05/24/23 12:54 / dmf
Radium 226 + Radium 228 MDC	1.6	pCi/L				A7500-RA	05/24/23 12:54 / dmf

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
U - Not detected at Minimum Detectable Concentration (MDC)
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Waterlab Corp **Work Order:** C23050297 **Report Date:** 05/17/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8									Analytical Run: ICPMS207-B_230515A	
Lab ID: QCS		Initial Calibration Verification Standard							05/17/23 02:09	
Uranium		0.0476	mg/L	0.00030	95	90	110			
Lab ID: CCV		Continuing Calibration Verification Standard							05/17/23 03:40	
Uranium		0.0476	mg/L	0.00030	95	90	110			
Method: E200.8									Batch: 178689	
Lab ID: MB-178689	2	Method Blank				Run: ICPMS207-B_230515A			05/17/23 02:58	
Uranium		0.00003	mg/L	0.00002						
Uranium, Activity		0.02	pCi/L	0.01						
Lab ID: LCS4-178689		Laboratory Control Sample				Run: ICPMS207-B_230515A			05/17/23 03:04	
Uranium		0.0932	mg/L	0.00030	93	85	115			
Lab ID: B23050597-001AMS4		Sample Matrix Spike				Run: ICPMS207-B_230515A			05/17/23 03:58	
Uranium		0.0960	mg/L	0.00030	95	70	130			
Lab ID: B23050597-001AMSD		Sample Matrix Spike Duplicate				Run: ICPMS207-B_230515A			05/17/23 04:04	
Uranium		0.102	mg/L	0.00030	101	70	130	6.0	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Waterlab Corp **Work Order:** C23050297 **Report Date:** 06/01/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E900.0										Batch: GrAB-3184
Lab ID: Th230-GrAB-3184	3	Laboratory Control Sample			Run: G542M-2_230523A					05/27/23 02:30
Gross Alpha		98	pCi/L		98	70	130			
Gross Alpha precision (±)		20	pCi/L							
Gross Alpha MDC		3.8	pCi/L							
Lab ID: Sr90-GrAB-3184	3	Laboratory Control Sample			Run: G542M-2_230523A					05/27/23 02:30
Gross Beta		550	pCi/L		115	70	130			
Gross Beta precision (±)		56	pCi/L							
Gross Beta MDC		3.6	pCi/L							
Lab ID: MB-GrAB-3184	6	Method Blank			Run: G542M-2_230523A					05/27/23 02:30
Gross Alpha		-5	pCi/L							U
Gross Alpha precision (±)		2	pCi/L							
Gross Alpha MDC		3	pCi/L							
Gross Beta		-4	pCi/L							U
Gross Beta precision (±)		2	pCi/L							
Gross Beta MDC		4	pCi/L							
Lab ID: C23050241-001AMS	3	Sample Matrix Spike			Run: G542M-2_230523A					05/27/23 02:30
Gross Alpha		350	pCi/L		87	70	130			
Gross Alpha precision (±)		72	pCi/L							
Gross Alpha MDC		16	pCi/L							
Lab ID: C23050241-001AMSD	3	Sample Matrix Spike Duplicate			Run: G542M-2_230523A					05/27/23 02:30
Gross Alpha		400	pCi/L		99	70	130	12	30	
Gross Alpha precision (±)		81	pCi/L							
Gross Alpha MDC		18	pCi/L							
- The RER result is 0.42.										
Lab ID: C23050585-010AMS1	3	Sample Matrix Spike			Run: G542M-2_230523A					05/31/23 08:46
Gross Beta		3800	pCi/L		118	70	130			
Gross Beta precision (±)		380	pCi/L							
Gross Beta MDC		19	pCi/L							
Lab ID: C23050585-010AMSD	3	Sample Matrix Spike Duplicate			Run: G542M-2_230523A					05/31/23 08:46
Gross Beta		3700	pCi/L		115	70	130	3.1	30	
Gross Beta precision (±)		370	pCi/L							
Gross Beta MDC		20	pCi/L							
- The RER result is 0.22.										

Qualifiers:

RL - Analyte Reporting Limit

U - Not detected at Minimum Detectable Concentration (MDC)

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Waterlab Corp **Work Order:** C23050297 **Report Date:** 06/01/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E903.0									Batch: RA226-10894	
Lab ID: LCS-RA226-10894	3	Laboratory Control Sample			Run: TENNELEC-3_230512B				05/23/23 11:12	
Radium 226		11	pCi/L		114	70	130			
Radium 226 precision (±)		2.3	pCi/L							
Radium 226 MDC		0.22	pCi/L							
Lab ID: MB-RA226-10894	3	Method Blank			Run: TENNELEC-3_230512B				05/23/23 11:12	
Radium 226		0.1	pCi/L							U
Radium 226 precision (±)		0.2	pCi/L							
Radium 226 MDC		0.2	pCi/L							
Lab ID: C23050423-001FDUP	3	Sample Duplicate			Run: TENNELEC-3_230512B				05/23/23 11:12	
Radium 226		1.9	pCi/L					5.6	30	
Radium 226 precision (±)		0.48	pCi/L							
Radium 226 MDC		0.23	pCi/L							

- The RER result is 0.15.

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

U - Not detected at Minimum Detectable Concentration (MDC)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Waterlab Corp **Work Order:** C23050297 **Report Date:** 06/01/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: RA-05										Batch: RA228-7094
Lab ID: LCS-228-RA226-10894	3	Laboratory Control Sample				Run: TENNELEC-3_230512A				05/18/23 13:08
Radium 228		5.7	pCi/L		81	70	130			
Radium 228 precision (±)		1.4	pCi/L							
Radium 228 MDC		1.2	pCi/L							
Lab ID: MB-RA226-10894	3	Method Blank				Run: TENNELEC-3_230512A				05/18/23 13:08
Radium 228		2	pCi/L							
Radium 228 precision (±)		0.8	pCi/L							
Radium 228 MDC		1	pCi/L							
Lab ID: C23050423-001FDUP	3	Sample Duplicate				Run: TENNELEC-3_230512A				05/18/23 13:08
Radium 228		2.2	pCi/L					11	30	
Radium 228 precision (±)		0.91	pCi/L							
Radium 228 MDC		1.3	pCi/L							

- The RER result is 0.19.

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

Work Order Receipt Checklist

Waterlab Corp

C23050297

Login completed by: Hannah R. Johnson
Date Received: 5/8/2023

Reviewed by: cjohnson
Received by: cch

Reviewed Date: 5/10/2023
Carrier name: UPS

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☐	No ☑	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☐	No ☑	Not Applicable ☐
Container/Temp Blank temperature:	12.8°C No Ice		
Containers requiring zero headspace have no headspace or bubble that is <6mm (1/4").	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

The reference date for Radon analysis is the sample collection date. The reference date for all other Radiochemical analyses is the analysis date. Radiochemical precision results represent a 2-sigma Total Measurement Uncertainty.

Contact and Corrective Action Comments:

The sample collection time indicated on the COC is 09:00, the collection time listed on the sample bottles is 08:30, Beth requested we use the collection time on the sample bottles-Chantel S. Johnson

Chain of Custody & Analytical Request Record

ENERGY LABORATORIES — Trust our People. Trust our Data.

www.energylab.com

Account Information (Billing Information)

Company/Name	Waterlab Corp
Contact	Beth Myers
Phone	503-363-0473
Mailing Address	2603 12th St SE
City, State, Zip	Salem, OR 97302
Email	beth@waterlabcorp.com
Receive Invoice	☐ Hard Copy ☒ Email
Receive Report	☐ Hard Copy ☒ Email
Purchase Order	
Quote	
Bottle Order	

Report Information (if different than Account Information)

Company/Name	
Contact	Beth Myers
Phone	
Mailing Address	
City, State, Zip	
Email	beth@waterlabcorp.com
Receive Report	☐ Hard Copy ☒ Email
Special Report/Formats	☐ LEVEL IV ☒ NELAC ☐ EDD/EDT (contact laboratory) ☐ Other

Comments

Please do not return cooler !!!!!!!!

Project Information

Project Name, PWSID, Permit, etc.	Mill City WWTP
Sampler Name	
Sampler Phone	(503) 363-0473
Sample Origin State	Oregon
EPA/State Compliance	☐ Yes ☒ No

MINING CLIENTS, please indicate sample type.
*If ore has been processed or refined, call before sending.
☐ Byproduct 11 (e)2 material ☐ Unprocessed ore (NOT ground or refined)*

Matrix Codes: A - Air; W - Water; S - Soils/Solids; V - Vegetation; B - Biossay; O - Other; DW - Drinking Water

All turnaround times are standard unless marked as RUSH.
Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers	Matrix (See Codes Above)	Gross Alpha	Radium 226/228	Uranium	Gross Beta	See Attached	RUSH TAT	EL LAB ID (Laboratory Use Only)
1	20230502-094 Mill City WWTP	5/2/23	9:00 am	4	W	✓	✓	✓	✓			
2												
3												
4												
5												
6												
7												
8												
9												
10												

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	April Stratton	5/2/23 11:00	April Stratton			
	Relinquished by (print)	Date/Time	Signature	Received by Laboratory (print)	Date/Time	Signature
				Chance Hancock	5-8-23 9am	

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals Y N C B	Intact Y N	Receipt Temp °C	Temp Blank Y N	On Ice Y N	Payment Type CC Cash Check	Amount $	Receipt Number (cash/check only)

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

WATERLAB CORP.

2603 - 12th Street, SE
Salem, OR 97302
Voice: (503) 363-0473
FAX: (503) 363-8900

TEST REPORT

TO: City of Mill City c/o City Recorder
P. O. Box 256
Mill City, OR 97360

05/22/2023

CITMILC

PO#:

Collection Information

Date: 05/02/2023
Time: 0900
By: Russ
Lab #: 20230502-097
Location: 360 Remine Rd. Mills City/ Influent

Lab Receipt Information

05/02/2023
1045
SW

Case Narrative

The analyses were performed according to the guidelines in the WATERLAB Corp Quality Assurance Program. This report contains analytical results for the sample(s) as received by the laboratory.

Analyte	Method	Acc*	Results	Qual	MRL	Units	Analysis Date	Time	Tech
Synthetic Organic Contaminants									
Synthetic Organics, Regulated									
1,2-Dibromo-3-chloropropane	EPA 504.1	B	ND		0.0000	mg/liter	05/04/2023	2017	TJW
Ethylene Dibromide	EPA 504.1	B	ND		0.0000	mg/liter	05/04/2023	2017	TJW
Chlordane	EPA 508	B	ND		0.0002	mg/liter	05/10/2023	0806	TJW
Endrin	EPA 508	B	ND		0.00001	mg/liter	05/10/2023	0806	TJW
BHC-Gamma Lindane	EPA 508	B	ND		0.00001	mg/liter	05/10/2023	0806	TJW

ND- No Detection at @ MRL
SM-"Standard Methods for the Examination of Water & Wastewater",19th ed
EPA- "Methods for Chemical Analysis for Water and Wastes",USEPA
MRL-"Method Reporting Limit"
* Accreditation
A- Waterlab Corporation, ORELAP 100039
The results relate only to the parameters tested or to the sample as received by the laboratory.

B=Neilson Research Corporation, ORELAP ID#OR100016

Approved by: _____

WATERLAB CORP.

2603 - 12th Street, SE
Salem, OR 97302
Voice: (503) 363-0473
FAX: (503) 363-8900

TEST REPORT

LAB # : 20230502-097 (Cont) CITMILC

Analyte	Method	Acc*	Results	Qual	MRL	Units	Analysis Date Time		Tech
Heptachlor	EPA 508	B	ND		0.00001	mg/liter	05/10/2023	0806	TJW
Heptachlor Epoxide	EPA 508	B	ND		0.00001	mg/liter	05/10/2023	0806	TJW
Methoxychlor	EPA 508	B	ND		0.0000	mg/liter	05/10/2023	0806	TJW
Polychlorinated Biphenyls	EPA 508	B	ND		0.0002	mg/liter	05/10/2023	0806	TJW
Toxaphene	EPA 508	B	ND		0.0003	mg/liter	05/10/2023	0806	TJW
2,4,5-TP Silvex	EPA 515.3	B	ND		0.005	mg/liter	05/16/2023	0026	TJW
Dalapon	EPA 515.3	B	ND		0.005	mg/liter	05/16/2023	0026	TJW
Dinoseb	EPA 515.3	B	ND		0.001	mg/liter	05/16/2023	0026	TJW
Pentachlorophenol	EPA 515.3	B	ND		0.0005	mg/liter	05/16/2023	0026	TJW
Picloram	EPA 515.3	B	ND		0.005	mg/liter	05/16/2023	0026	TJW
Alachlor	EPA 525.2	B	ND		0.0002	mg/liter	05/18/2023	1628	TJW
Atrazine	EPA 525.2	B	ND		0.0003	mg/liter	05/18/2023	1628	TJW
Benzo(a)pyrene	EPA 525.2	B	ND		0.0001	mg/liter	05/18/2023	1628	TJW
Bis(2-ethylhexyl)phthalate	EPA 525.2	B	0.00901		0.002	mg/liter	05/18/2023	1628	TJW
Bis(2-ethylhexyl)adipate	EPA 525.2	B	ND		0.004	mg/liter	05/18/2023	1628	TJW
Hexachlorobenzene	EPA 525.2	B	ND		0.0003	mg/liter	05/18/2023	1628	TJW
Hexachlorocyclopentadiene	EPA 525.2	B	ND		0.005	mg/liter	05/18/2023	1628	TJW
Simazine	EPA 525.2	B	ND		0.0004	mg/liter	05/18/2023	1628	TJW
Carbofuran	EPA 531.2	B	ND		0.004	mg/liter	05/03/2023	1809	TJW
Vydate	EPA 531.2	B	ND		0.004	mg/liter	05/03/2023	1809	TJW
Endothall	EPA 548.1	B	ND		0.01	mg/liter	05/17/2023	1726	TJW
Diquat	EPA 549.2	B	ND		0.01	mg/liter	05/11/2023	1548	TJW
2,4-D	EPA 515.3	B	ND		0.002	mg/liter	05/16/2023	0026	TJW

ND- No Detection at @ MRL
SM-"Standard Methods for the Examination of Water & Wastewater",19th ed
EPA- "Methods for Chemical Analysis for Water and Wastes",USEPA
MRL-"Method Reporting Limit"
* Accreditation
A- Waterlab Corporation, ORELAP 100039
The results relate only to the parameters tested or to the sample as received by the laboratory.

B=Neilson Research Corporation, ORELAP ID#OR100016

Approved by: _____

WATERLAB CORP.

2603 - 12th Street, SE
Salem, OR 97302
Voice: (503) 363-0473
FAX: (503) 363-8900

TEST REPORT

LAB # : 20230502-097 (Cont) CITMILC

Analyte	Method	Acc*	Results	Qual	MRL	Units	Analysis Date Time		Tech
Glyphosate	EPA 547	B	ND		0.05	mg/liter	05/08/2023	1220	TJW

ND- No Detection at @ MRL
SM-"Standard Methods for the Examination of Water & Wastewater",19th ed
EPA- "Methods for Chemical Analysis for Water and Wastes",USEPA
MRL-"Method Reporting Limit"
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Approved by: _____

WATERLAB CORP.

2603 - 12th Street, SE
Salem, OR 97302
Voice: (503) 363-0473
FAX: (503) 363-8900

TEST REPORT

TO: City of Mill City c/o City Recorder
P. O. Box 256
Mill City, OR 97360

05/22/2023

CITMILC

PO#:

Collection Information

Date: 05/02/2023
Time: 0900
By: Russ

Lab #: 20230502-098
Location: 360 Remine Rd. Mills City/ Influent

Lab Receipt Information

05/02/2023
1045
SW

Case Narrative

The analyses were performed according to the guidelines in the WATERLAB Corp Quality Assurance Program. This report contains analytical results for the sample(s) as received by the laboratory.

Analyte	Method	Acc*	Results	Qual	MRL	Units	Analysis Date Time		Tech
Volatile Organics, Regulated									
1,1,1-Trichloroethane	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
1,1,2-Trichloroethane	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
1,1-Dichloroethylene	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
1,2,4-Trichlorobenzene	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
1,2-Dichloroethane	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
1,2-Dichloropropane	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
Benzene	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW

ND- No Detection at @ MRL
SM-"Standard Methods for the Examination of Water & Wastewater",19th ed
EPA- "Methods for Chemical Analysis for Water and Wastes",USEPA
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* Accreditation
A- Waterlab Corporation, ORELAP 100039
The results relate only to the parameters tested or to the sample as received by the laboratory.

B=Neilson Research Corporation, ORELAP ID#OR100016

Approved by: Bobbi E. Myers

WATERLAB CORP.

2603 - 12th Street, SE
Salem, OR 97302
Voice: (503) 363-0473
FAX: (503) 363-8900

TEST REPORT

LAB # : 20230502-098 (Cont) CITMILC Page: 2

Analyte	Method	Acc*	Results	Qual	MRL	Units	Analysis Date Time		Tech
Carbon Tetrachloride	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
cis-1,2-Dichloroethylene	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
Dichloromethane	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
Ethylbenzene	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
Monochlorobenzene	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
o-Dichlorobenzene	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
p-Dichlorobenzene	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
Styrene	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
Tetrachloroethylene (PCE)	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
Toluene	E524.2	B	0.0496		0.0005	mg/liter	05/05/2023	0024	TJW
trans-1,2-Dichloroethylene	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
Trichloroethylene (TCE)	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
Vinyl Chloride	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
Xylenes, Total	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW

ND- No Detection at @ MRL
SM-"Standard Methods for the Examination of Water & Wastewater",19th ed
EPA- "Methods for Chemical Analysis for Water and Wastes",USEPA
MRL-"Method Reporting Limit"
* Accreditation
A- Waterlab Corporation, ORELAP 100039
The results relate only to the parameters tested or to the sample as received by the laboratory.

B=Neilson Research Corporation, ORELAP ID#OR100016

Approved by: Bobbi E. Myers

ATTACHMENT E

Groundwater Sampling Field Forms

Groundwater Sampling Field Log

Mill City, Oregon

Groundwater Sampling

Date: 5/29/23

Well ID: GM1 MW1

Total Depth: 40.2 (ft)	17.9 (-) DTW: (ft) (stickup 0.5' from TOC)	945 Time	22.3 =	(X) 0.16 (X) 0.65 gal/feet	3.6 = Well Casing Volume

Field Conditions: 60F, sunny

Decontamination: Alconox + tap wash; Tap rinse; DI rinse

PURGE INFORMATION

✓	Purge Method: Waterra Hydrolift Pump
	Purge Method:
✓	Refer to calibration log this date, YSI # 4

Pump Suction Depth (ft BTOC): ~34.2 — Purge water disposal: Drums

Type of Flow Through Cell:		10 oz cup	X	YSI ProQuattro Flow Through Cell

Comments/Exceptions to SAP:

Time	Purge Volume (gallons)	Temp. (°C)	SC (uS/cm)	DO (mg/L)	pH	ORP (mV)	Purge Rate (mL/min)	DTW (ft BTOC)	Pump Speed/*Clarity/ Color/Remarks (NTU)
Stabilization Criteria		± 0.2	±3% (SC>100) ±5% (SC≤100)	± 0.3	± 0.1	± 10	--	--	<100 NTU ideal
10:35	Pump On, Water Reaches the Purge Bucket							Initial	
10:40	0.5	12.0	94.9	7.40	6.76	139.9	0.75	18.0	med/32.3 NTU/ No color
10:50	2.5	11.7	94.8	7.11	6.62	92.6	"	"	"
10:55	4.0	11.8	94.0	6.95	6.63	90.5	"	"	"
11:05	4.5	11.6	93.7	6.25	6.48	91.6	"	"	med/24.5 NTU/No color
11:10	5.5	11.7	93.3	6.24	6.66	92.9	"	"	"
11:15	6.5	11.7	93.4	6.13	6.53	93.4	"	"	"
11:20	7.5	11.7	93.3	6.02	6.52	93.8	"	"	"
:									
:									
:									
11:20	Start Sampling								
11:25	End Sampling								

* **VC**=Very cloudy **Cl**=Cloudy **SC**=Slightly Cloudy **VSC**=Very Slightly Cloudy **AC**=Almost Clear **C**=Clear **CC**=Crystal Clear

Laboratory Analytical Program

Mill City, Oregon

Groundwater Sampling

Date: 5 / 29 / 23	**Time:** 11 : 20				
Sampling Method (circle one):	(A) B	dedicated purge tube disconnected from flow through cell other:			
Sample I.D. GWI MW10523 GWXMWXMMYY	Number of sample containers (circle)	Volume of each container	Container Type	Pres.	Analytical Method
QAQC: **Sample ID & Time--->** Dup = MW-14-MMYY	Rotate dup location				

Sampling Criteria (circle one):

Collect anytime: stabile parameters over 15 minutes(4 readings) with controlled drawdown	(1)
After 3 well casing volumes: stabile parameters but uncontrolled/falling water level	2
After 5 well casing volumes: unstabile parameters with or without drawdown control	3
Pump dry: return anytime if there is adequate volume for containers within 24 hours	4

Comments:

COC: Client = Keller, Sampler = GSI, 650 NE Holladay Street, Portland, OR 97232

Lab: Edge Analytical (Wilsonville), 9725 SW Commerce Cir Suite A2, Willsonville, OR 97070

Groundwater Sampling Field Log

Mill City, Oregon

Groundwater Sampling

Date: 5/29/23

Well ID: GMS MW1

Total Depth: 75.7 (ft)	60.0 (-) DTW: (ft)	1220 Time	15.7 =	(X) 0.16 (X) 0.65 gal/feet	2.5 = Well Casing Volume

Field Conditions:

Decontamination: Alconox + tap wash; Tap rinse; DI rinse

PURGE INFORMATION

✓	Purge Method: Waterra Hydrolift Pump
	Purge Method:
✓	Refer to calibration log this date, YSI # 4

Pump Suction Depth (ft BTOC): Purge water disposal: Drums

Type of Flow Through Cell:		10 oz cup	X	YSI ProQuattro Flow Through Cell

Comments/Exceptions to SAP:

Time	Purge Volume (gallons)	Temp. (°C)	SC (uS/cm)	DO (mg/L)	pH	ORP (mV)	Purge Rate (mL/min)	DTW (ft BTOC)	Pump Speed/*Clarity/ Color/Remarks (NTU)
Stabilization Criteria		± 0.2	±3% (SC>100) ±5% (SC≤100)	± 0.3	± 0.1	± 10	--	--	<100 NTU ideal
12:30	Pump On, Water Reaches the Purge Bucket							Initial	
12:40	0.25	12.6	83.1	9.30	7.47	-27.2	0.16	"	lowmed/351 NTU/brown
12:45	1.5	14.6	79.9	8.77	7.49	-26.6	"	"	med/330 NTU/brown
12:57	3.0	11.7	80.2	8.99	7.35	-4.8	0.19	"	"
13:02	4.0	14.8	74.6	6.93	7.35	-4.3	"	"	"
13:14	5.75	11.4	80.1	9.22	7.44	4.3	"	"	" / 130 NTU / "
13:18	7.0	11.0	80.2	9.36	7.40	4.5	"	"	"
13:23	8.5	10.9	80.5	9.55	7.36	6.1	"	"	" / 125 NTU / "
13:27	10.0	11.1	80.3	9.42	7.32	6.7	"	"	" / 124 NTU / "
:									
:									
13:27	Start Sampling								
13:30	End Sampling								

* **VC**=Very cloudy **Cl**=Cloudy **SC**=Slightly Cloudy **VSC**=Very Slightly Cloudy **AC**=Almost Clear **C**=Clear **CC**=Crystal Clear

Laboratory Analytical Program

Mill City, Oregon

Groundwater Sampling

Date: 5/29/23	**Time:** 13:30				
Sampling Method (circle one):	(A) dedicated purge tube disconnected from flow through cell				
	B other:				
Sample I.D. GMS MW1 0523 GWXMWXMMYY	Number of sample containers (circle)	Volume of each container	Container Type	Pres.	Analytical Method
QAQC: **Sample ID & Time--->** Dup = MW-14-MMYY	Rotate dup location				

Sampling Criteria (circle one):

Collect anytime: stabile parameters over 15 minutes(4 readings) with controlled drawdown	(1)
After 3 well casing volumes: stabile parameters but uncontrolled/falling water level	2
After 5 well casing volumes: unstabile parameters with or without drawdown control	3
Pump dry: return anytime if there is adequate volume for containers within 24 hours	4

Comments:

COC: Client = Keller, Sampler = GSI, 650 NE Holladay Street, Portland, OR 97232

Lab: Edge Analytical (Wilsonville), 9725 SW Commerce Cir Suite A2, Willsonville, OR 97070

Groundwater Sampling Field Log

Mill City, Oregon

Groundwater Sampling

Date: 5/29/23

Well ID: GM4 MW1

Total Depth: 41.6 (ft)	15.0 (-) DTW: (ft)	1415 Time	26.6 =	(X) 0.16 (X) 0.65 gal/feet	4.3 = Well Casing Volume

Field Conditions: 65F sunny

Decontamination: Alconox + tap wash; Tap rinse; DI rinse

PURGE INFORMATION

✓	Purge Method: Waterra Hydrolift Pump
	Purge Method:
✓	Refer to calibration log this date, YSI # 4

Pump Suction Depth (ft BTOC): Purge water disposal: Drums

Type of Flow Through Cell:		10 oz cup	X	YSI ProQuattro Flow Through Cell

Comments/Exceptions to SAP:

Time	Purge Volume (gallons)	Temp. (°C)	SC (uS/cm)	DO (mg/L)	pH	ORP (mV)	Purge Rate (mL/min)	DTW (ft BTOC)	Pump Speed/*Clarity/ Color/Remarks (NTU)
Stabilization Criteria		± 0.2	±3% (SC>100) ±5% (SC≤100)	± 0.3	± 0.1	± 10	--	--	<100 NTU ideal
14:20	Pump On, Water Reaches the Purge Bucket							Initial	
14:25	2.0	13.9	206.8	0.93	7.60	-145.7	0.5	"	med/397 NTU/brown-gray
14:30	5.0	13.7	207.2	0.88	7.40	-184.5	"	"	" /272 NTU/ "
14:35	7.0	13.8	205.6	0.87	7.54	-204.7	"	"	" /183 NTU/ "
14:40	10.0	13.8	204.5	0.82	7.51	-206.8	"	"	" /132 NTU/ "
14:45	12.5	13.7	204.1	0.81	7.50	-207.4	"	"	" /125 NTU/ "
14:50	16.0	13.7	204.2	0.80	7.48	-200.5	"	"	" /86.6 NTU/ "
:									
:									
:									
:									
14:50	Start Sampling								
14:55	End Sampling								

* **VC**=Very cloudy **Cl**=Cloudy **SC**=Slightly Cloudy **VSC**=Very Slightly Cloudy **AC**=Almost Clear **C**=Clear **CC**=Crystal Clear

Laboratory Analytical Program
Mill City, Oregon
Groundwater Sampling

Date: 5 / 29 / 23	Time: 14 : 55				
Sampling Method (circle one):	(A) B	dedicated purge tube disconnected from flow through cell other:			
Sample I.D. GM4MW1 0523 GWXMWXMMYY	Number of sample containers (circle)	Volume of each container	Container Type	Pres.	Analytical Method
QAQC: **Sample ID & Time--->** Dup = MW-14-MMYY	Rotate dup location				

Sampling Criteria (circle one):	
Collect anytime: stabile parameters over 15 minutes(4 readings) with controlled drawdown	(1)
After 3 well casing volumes: stabile parameters but uncontrolled/falling water level	2
After 5 well casing volumes: unstabile parameters with or without drawdown control	3
Pump dry: return anytime if there is adequate volume for containers within 24 hours	4

Comments:

COC: Client = Keller, Sampler = GSI, 650 NE Holladay Street, Portland, OR 97232

Lab: Edge Analytical (Wilsonville), 9725 SW Commerce Cir Suite A2, Willsonville, OR 97070

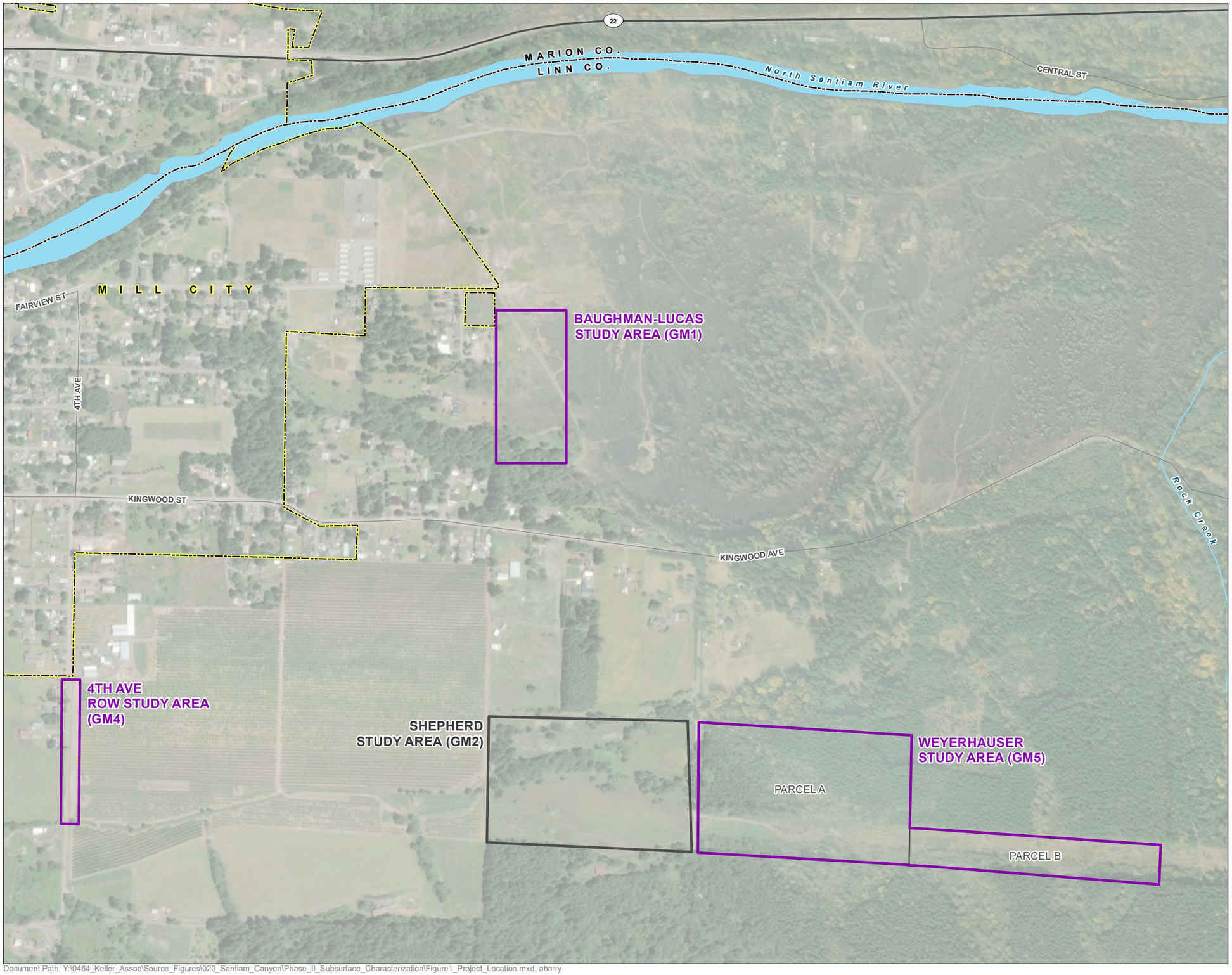
ATTACHMENT F

MOUNDSOLV Model Results

FIGURE 1

Project Location

Gates/Mill City Phase II Subsurface Characterization



LEGEND

- Site Parcel

Study Areas

- Subject of the Phase I Subsurface Characterization
- Subject of the Phase I and Phase II Subsurface Characterization

All Other Features

- City Boundary
- County Boundary
- Major Road
- Watercourse
- Waterbody

N

0 300 600 900

Feet

Date: August 10, 2023
Data Sources: BLM, ESRI, ODOT, USGS, Aerial Photo 2020

GSI Water Solutions, Inc.

Document Path: Y:\0464_Keller_Assoc\Source_Figures\020_Santiam_Canyon\Phase_II_Subsurface_Characterization\Figure1_Project_Location.mxd, abarry

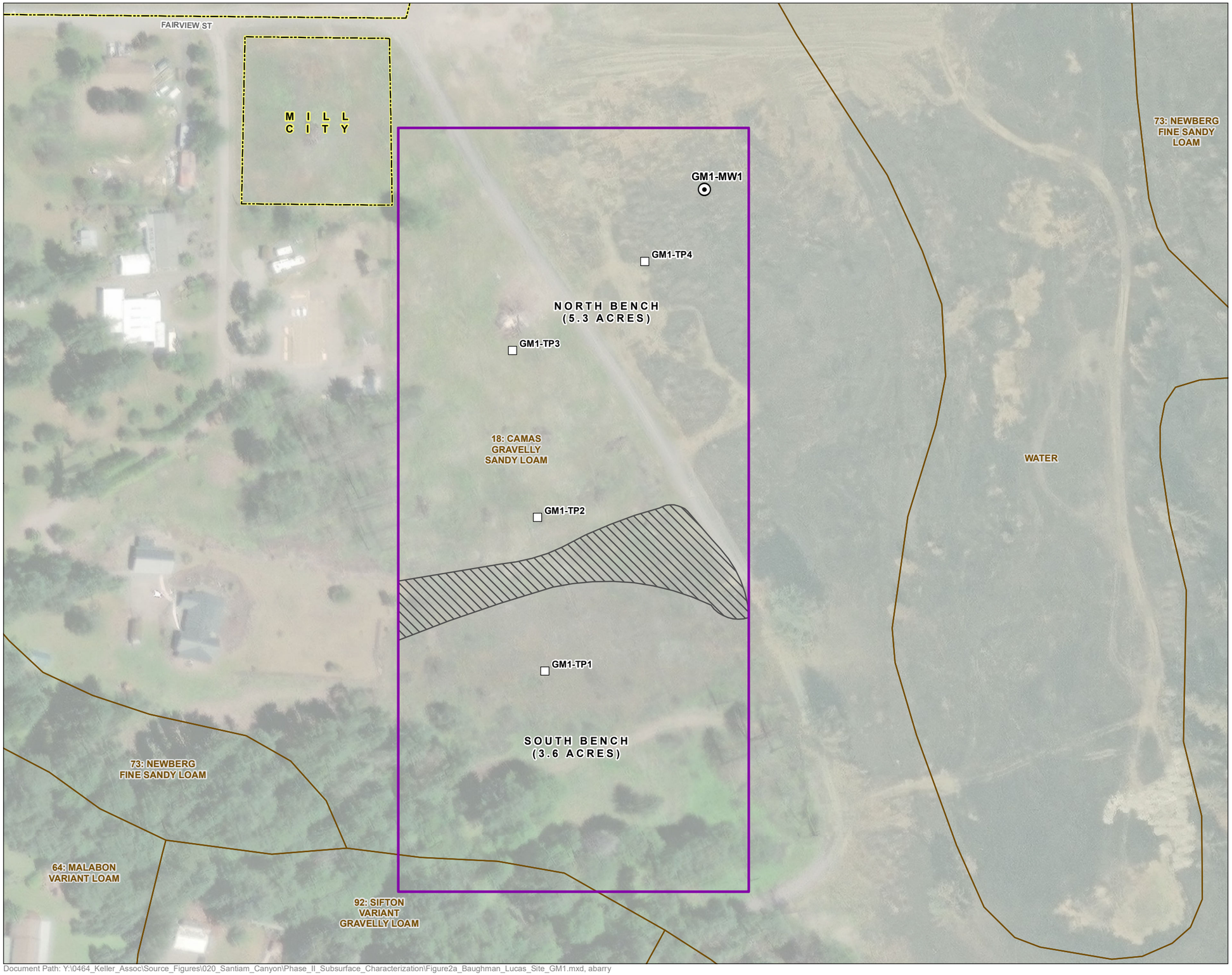


FIGURE 2a

Baughman-Lucas Study Area (GM1)

Gates/Mill City Phase II Subsurface Characterization

LEGEND

- Monitoring Well
- Test Pit (Phase I)
- Study Area
- Steep Slope
- Soils

All Other Features

- City Boundary
- Major Road

N

0 60 120 180

Feet

Date: August 10, 2023
Data Sources: BLM, ESRI, ODOT, USGS, Aerial Photo 2020

GSI Water Solutions, Inc.

Document Path: Y:\0464_Keller_Assoc\Source_Figures\020_Santiam_Canyon\Phase_II_Subsurface_Characterization\Figure2a_Baughman_Lucas_Site_GM1.mxd, abarry

FIGURE 2b

4th Ave ROW Study Area (GM4)

Gates/Mill City Phase II
Subsurface Characterization

LEGEND

- Monitoring Well
- Test Pit
- Powerline Tower
- Powerline
- Study Area
- Soils

All Other Features

- City Boundary
- Major Road

N

0 60 120 180
Feet

Date: August 10, 2023
Data Sources: BLM, ESRI, ODOT, USGS, Aerial Photo 2020

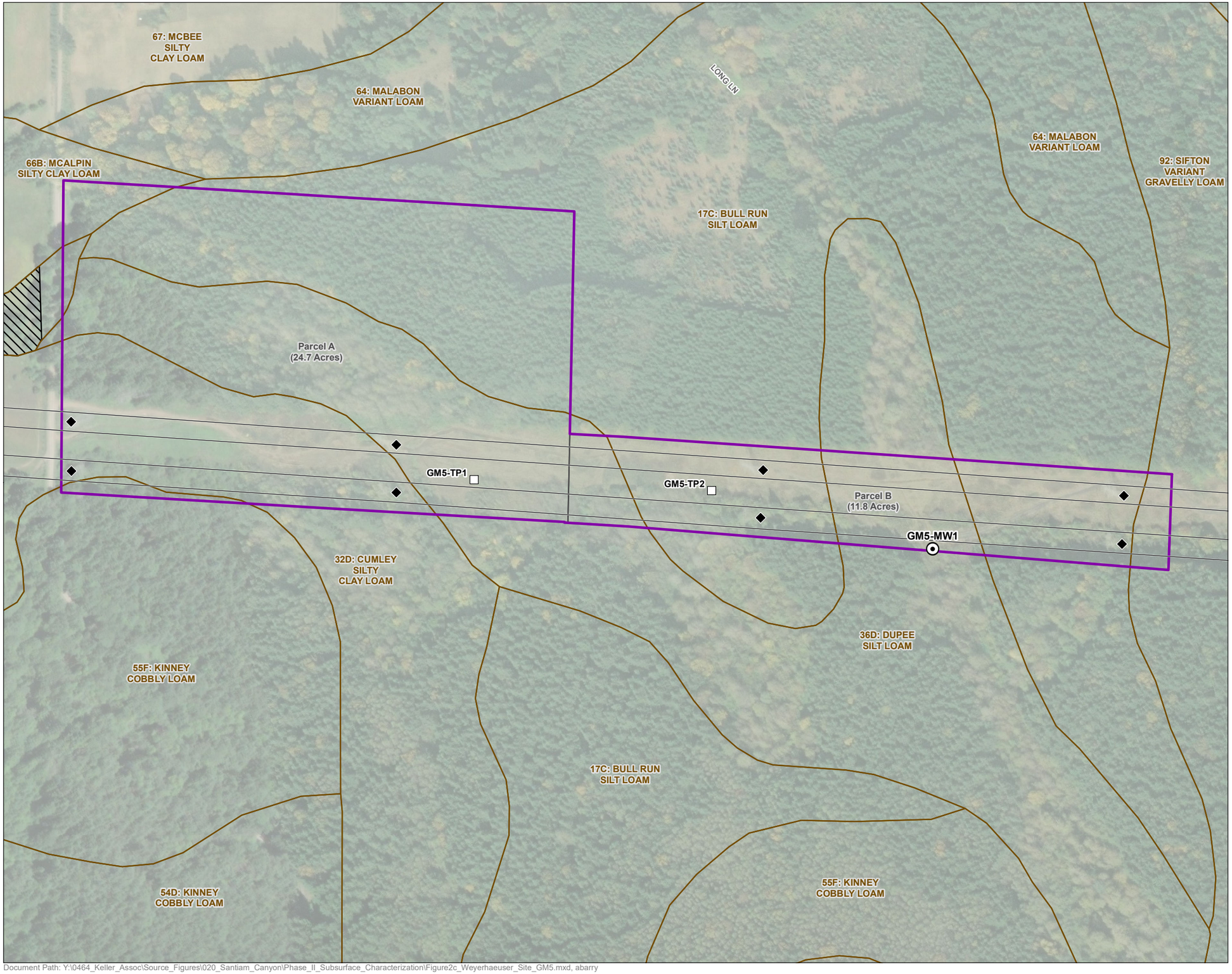
GSI Water Solutions, Inc.

Document Path: Y:\0464_Keller_Assoc\Source_Figures\020_Santiam_Canyon\Phase_II_Subsurface_Characterization\Figure2b_4th_Ave_ROW_Site_GM4.mxd, abarry

FIGURE 2c

Weyerhaeuser Study Area (GM5)

Gates/Mill City Phase II
Subsurface Characterization



LEGEND

- Monitoring Well
- Test Pit
- Powerline Tower
- Powerline
- Study Area
- Site Parcel
- Steep Slope
- Soils

All Other Features

- City Boundary
- Major Road

N

0 125 250 375
Feet

Date: August 10, 2023
Data Sources: BLM, ESRI, ODOT, USGS, Aerial Photo 2020

GSI Water Solutions, Inc.

Document Path: Y:\0464_Keller_Assoc\Source_Figures\020_Santiam_Canyon\Phase_II_Subsurface_Characterization\Figure2c_Weyerhaeuser_Site_GM5.mxd, abarry

ATTACHMENT A

Monitoring Well Boring Logs

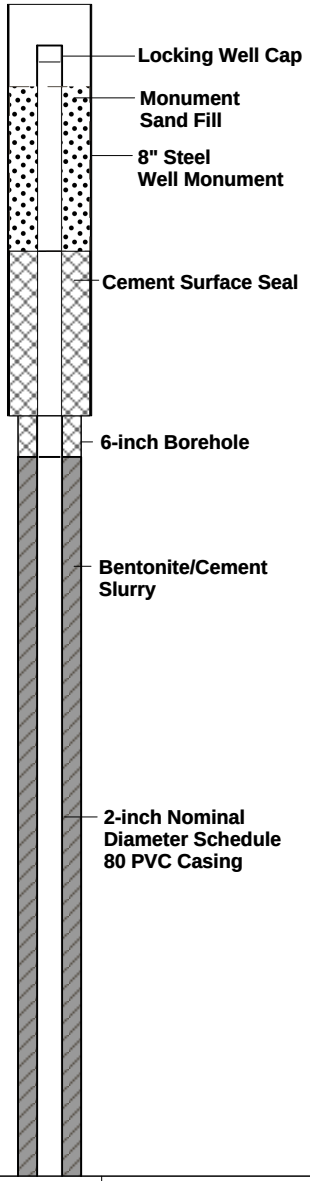
GSI Water Solutions, Inc.

LOG ID: GM1-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 851 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 40		**DATE STARTED:** 5/19/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/22/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 19.5	**COMPLETED:** 14.9
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES
0–1	**GM** 0 - 1.5 ft: Very soft, dark brown, dry, silty GRAVEL with sand (GM), organics, low plasticity, sand is very fine to course, subangular to subrounded, gravel is fine to coarse, subangular to rounded [FILL]	70	<15	15
1–2	**GM** 1.5 - 3.0 ft: Medium stiff, dark brown, moist, silty GRAVEL (GM), organics, medium plasticity, sand is very fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to subrounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	50	<10	40
3–4	**GM** 3.0 - 4.0 ft: Soft, dark brown to black, dry to moist, silty GRAVEL with sand (GM), odor of charcoal, organics, low plasticity, sand is fine to coarse, angular to subrounded, gravel is fine to medium, subangular to subrounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	25	35
4–5	**GW-GM** 4.0 - 5.0 ft; Very soft, dark grey, dry, well graded GRAVEL with silt and sand (GW-GM), low plasticity, sand is very fine to coarse, subangular to rounded, gravel is fine to medium, subangular to subrounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	30	<10
5–6	Gray, dry, increase in coarse gravel/cobbles at 6.5 ft			
7–8	**GW-GM** 5.0 - 12.0 ft: Very soft, brown to dark brown to grey, dry to wet, well graded GRAVEL with silt and sand (GW-GM), low plasticity, sand is very fine to coarse, subangular to rounded, gravel is fine to medium, subangular to subrounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	75	15	<10
10–11	Increase in moisture (moist to wet) at 11 ft			

AS-BUILT WELL CONSTRUCTION



LOG ID: GM1-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 851 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 40		**DATE STARTED:** 5/19/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/22/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 19.5	**COMPLETED:** 14.9
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES	AS-BUILT WELL CONSTRUCTION
12					
13					
14	Wet at 14.0 ft				
15	**GW** 12.0 - 18.0 ft: Very soft, dark brown, moist, well graded GRAVEL with sand (GW), low plasticity, sand is very fine to very coarse, subangular to rounded, gravel is fine to coarse, subangular to rounded, cobbles (< 6 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	80	15	<5	
16					
17	No return from 15 to 20 ft. Recovered with clean-out.				
18					
19	**GW-GM** 18.0 - 20.0 ft: Very soft, dark brown, moist, well graded GRAVEL with silt and sand (GW-GM), low plasticity, sand is very fine to coarse, subangular to rounded, gravel is fine to medium, subangular to subrounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	70	20	10	
20	Wet at 19.5 ft				
21	**NR** 20.0 - 22.5 ft: NO RETURN				
22					
23	**SW** 22.5 - 23.0 ft: Very soft, dark brown, wet, well graded SAND (SW), low plasticity, sand is very fine to very coarse, subangular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	0	100	<5	
	GW 23.0 - 24.0 ft: Very soft, dark brown, moist, well graded GRAVEL with sand (GW), low plasticity, sand is very fine to very coarse, subangular to rounded, gravel is very fine to very coarse, subangular to rounded, cobbles (< 6 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	50	<50	<5	
24	**GW** 24.0 - 25.0 ft: Very soft, dark brown, wet, well graded GRAVEL (GW), low plasticity, gravel is very fine to very coarse, subangular to rounded, cobbles <6 in, subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	100	0	<5	
25	**NR** 25.0 - 26.0 ft: NO RETURN				
26	**SW** 26.0 - 27.5 ft: Very soft, dark brown, wet, well graded SAND (SW), low plasticity, sand is very fine to coarse, subangular to	0	100	<5	**Sodium Bentonite Slurry**
27					

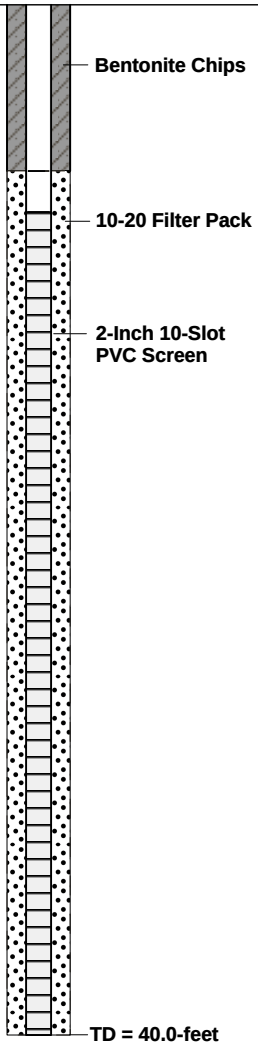
LOG ID: GM1-MW1

GSI Water Solutions, Inc.

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 851 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 40		**DATE STARTED:** 5/19/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/22/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 19.5	**COMPLETED:** 14.9
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES
28	rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]			
29	**GW** 27.5 - 30.0 ft: Very soft, dark brown, wet, well graded GRAVEL (GW), low plasticity, sand is very fine to very coarse, subangular to rounded, gravel is fine to coarse, subangular to rounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	100	0	<5
30	**SW** 30.0 - 31.5 ft: Very soft, dark brown, wet, well graded SAND (SW), low plasticity, sand is very fine to coarse, subangular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	0	100	<5
31				
32	Increase in silt/decrease in gravel at 33.0 ft			
33	**GW** 31.5 - 35.0 ft: Soft, dark brown, wet, well graded GRAVEL with sand (GW), low plasticity, sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to rounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	40	<5
34				
35	**SW-SM** 35.0 - 36.0 ft: Very soft, dark brown to dark gray, wet, well graded SAND with silt (SW-SM), sand is very fine to coarse, subangular to subrounded, gravel is fine to coarse, subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	10	80	10
36	**GW** 36.0 - 37.0 ft: Soft, brown to gray, wet, well graded GRAVEL (GW), gravel is fine to coarse, subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	90	<5	<5
37	Increase in cobbles at 38.0 ft			
38	**GW** 37.0 - 40.0 ft: Soft, dark brown, wet, well graded GRAVEL with sand (GW), low plasticity, sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to rounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	40	<5
39				
40	Total Depth = 40.0 ft			
41				
42				
43				

AS-BUILT WELL CONSTRUCTION

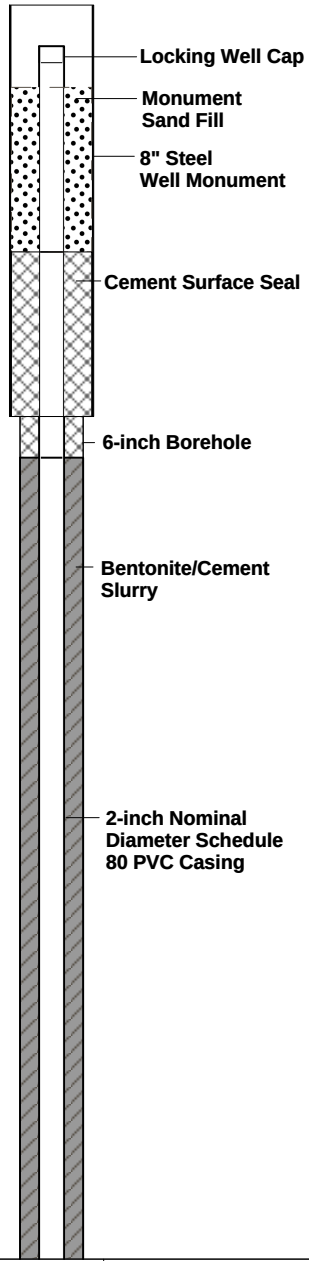


LOG ID: GM4-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 880 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 40		**DATE STARTED:** 5/19/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/19/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 10	**COMPLETED:** 12.1
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES
0–1	ML: 0.0 - 1.5 ft: Soft to medium stiff, dark brown, moist to dry, SILT (ML), organics, rootlets, low plasticity [FILL]	0	0	100
1–4	ML: 1.5 - 4.0 ft: Medium stiff to stiff, dark brown to red, moist, SILT (ML), high plasticity [QUATERNARY MIDDLE TERRACE DEPOSITS]	0	0	100
4–5	GM: 4.0 - 5.0 ft: Medium stiff, dark brown, moist, silty GRAVEL with sand (GM), medium plasticity, sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to rounded, cobbles (< 6 inches) [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	25	35
5–6	ML: 5.0 - 5.5 ft: Medium stiff to stiff, dark brown to red, moist, SILT (ML), high plasticity, gravel is fine to coarse, subangular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	<5	0	100
6–7.5	GW-GM: 5.5 - 7.5 ft: Medium stiff, dark brown, moist, well graded GRAVEL with silt and sand (GW-GM), low to medium plasticity, sand is very fine to coarse, subangular to rounded, gravel is fine to coarse, subangular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	70	20	10
7.5–10	GW: 7.5 - 10.0 ft: Very soft, dark brown to gray, dry to moist, well graded GRAVEL with sand (GW), sand is fine to coarse, gravel is fine to coarse, angular to subrounded, cobbles (<6 inches), low plasticity	80	15	<5
10–12	GM: 10.0 - 12.0 ft: Very soft, wet, dark brown, silty GRAVEL with sand (GM), sand is fine to coarse, gravel is fine to coarse, subangular to subrounded, cobbles (< 6 inches), subrounded to rounded, low plasticity [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	15	25

AS-BUILT WELL CONSTRUCTION



GSI Water Solutions, Inc.

LOG ID: GM4-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 880 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 40		**DATE STARTED:** 5/19/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/19/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 10	**COMPLETED:** 12.1
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES	AS-BUILT WELL CONSTRUCTION
13	GW 12.0 - 14.0 ft: Very soft, dark brown to gray, dry to moist, well graded GRAVEL with sand (GW), sand is fine to coarse, gravel is fine to coarse, angular to subrounded, cobbles (<6 inches), low plasticity	80	15	<5	
14					
15	GM 14.0 - 16.0 ft: Medium soft, moist to dry, dark brown to gray, silty GRAVEL with sand (GM), sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, angular to subrounded, some cobbles (< 8 inches), subrounded to rounded, low plasticity [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	20	20	
16					
17	GW 16.0 - 19.0 ft: Medium stiff, dark brown to gray, moist to wet, well graded GRAVEL (GW), low plasticity, sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to rounded, cobbles (< 8 inches), rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	90	10	<5	
18					
19	GW-GM 19.0 - 20.0 ft: Medium stiff, dry to moist, brown to gray, well graded GRAVEL with silt (GW-GM), low plasticity, very fine to coarse sand, fine to coarse gravel, subangular to rounded gravel, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	80	10	10	
20					
21	GW 20.0 - 23.0 ft: Soft, dark brown, very wet, well graded GRAVEL with sand (GW), low to medium plasticity, sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to subrounded, cobbles (< 6 inches) [QUATERNARY MIDDLE TERRACE DEPOSITS]	80	15	<5	
22					
23					
24	SW 23.0 - 26.0 ft: Very soft, dark brown, moist, well graded SAND with gravel (SW), low plasticity, sand is fine to coarse, gravel is fine to coarse, subrounded to subangular, cobbles (< 4 inches), rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	35	60	<5	
25					
26					
27	GW-GM 26.0 - 28.0 ft: Very stiff, brown to gray, dry to moist, well graded GRAVEL with silt (GW-GM), trace sand, sand is fine to coarse, gravel is subangular to rounded,cobbles (<8 inches), subrounded to rounded, low to medium plasticity [QUATERNARY MIDDLE TERRACE DEPOSITS]	90	<5	10	Bentonite Chips
28	GM 28.0 - 29.0 ft: Very soft, brown to gray, dry, silty GRAVEL				

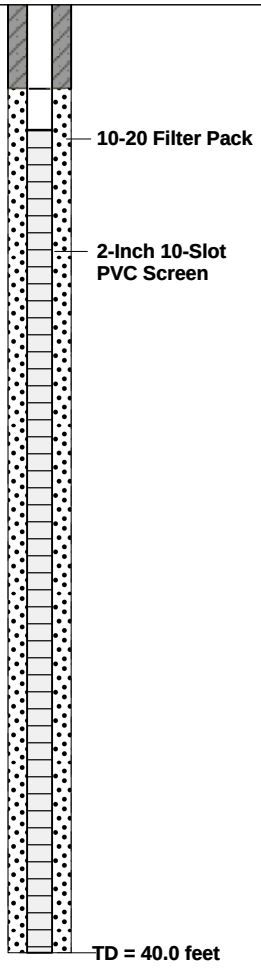
GSI Water Solutions, Inc.

LOG ID: GM4-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 880 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 40		**DATE STARTED:** 5/19/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/19/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 10	**COMPLETED:** 12.1
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES
29	GM with sand (GM), trace ash, sand is fine to coarse, gravel is fine to coarse, subangular to subrounded, cobbles (< 4 inches) [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	20	20
30	SM 29.0 - 30.0 ft: Soft, dark brown, moist, silty SAND with gravel (SM), ash, low to medium plasticity, sand fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to subrounded, cobbles (< 6 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	35	45	20
31	GW-GM 30.0 - 31.0 ft: Soft, dark brown to gray, moist, well graded GRAVEL with silt (GW-GM), low plasticity, sand is fine to coarse, subangular to rounded, gravel is fine to coarse, subangular to subrounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	80	10	10
32	SW-SM 31.0 - 32.5 ft: Soft to stiff, dark brown to gray, dry to moist, well graded SAND with silt and gravel (SW-SM), low to medium plasticity, sand is fine to coarse, gravel is fine to coarse, rounded to angular, cobbles (< 4 inches) [QUATERNARY MIDDLE TERRACE DEPOSITS]	30	60	10
33				
34	ML 32.5 - 35.0 ft: Stiff, gray, moist, SILT with gravel (ML), medium plasticity, sand is fine to coarse, rounded to angular, gravel is fine to coarse, rounded to angular [QUATERNARY MIDDLE TERRACE DEPOSITS]	20	10	70
35				
36	GW-GM 35.0 - 36.0 ft: Stiff, brown to gray, moist to wet, well graded GRAVEL with silt (GW-GM), trace sand, sand is fine to coarse, gravel is subangular to rounded, cobbles (≤ 8 inches), Increase in moisture with depth [QUATERNARY MIDDLE TERRACE DEPOSITS]	90	<5	10
37				
38	GM 36.0 - 40.0 ft: Soft, dark brown, wet, silty GRAVEL with sand (GM), low to medium plasticity, sand is fine to coarse, gravel is fine to coarse, subangular to rounded, cobbles (< 8 inches), rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	50	30	20
39				
40				
41				
42				
43				
44				

Total Depth = 40.0 ft



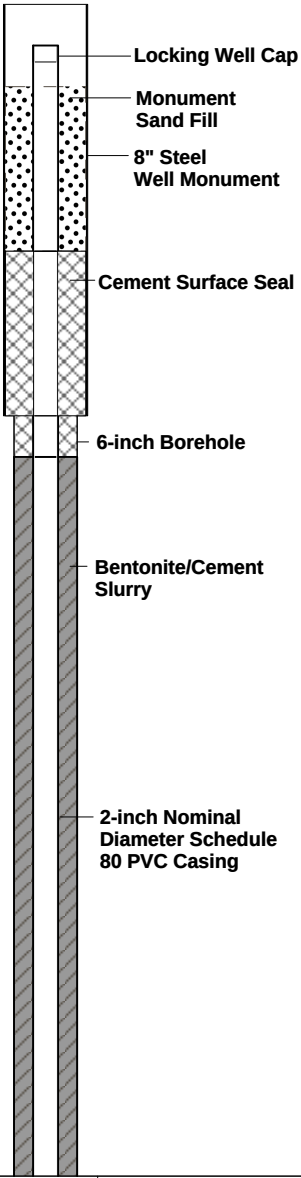
GSI Water Solutions, Inc.

LOG ID: GM5-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 1005 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 76		**DATE STARTED:** 5/15/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/15/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 60	**COMPLETED:** 57.5
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES
0–3.5	ML — 0.0 - 3.5 ft: Medium stiff, dark brown, moist, SILT (ML), medium plasticity, rootlets, trace sand is medium to coarse [FILL]	0	<5	100
3.5–4.5	ML — 3.5 - 4.5 ft: Stiff, dark brown, moist to dry, SILT (ML), low plasticity, rootlets, charcoal, trace sand is medium to coarse, trace gravel is medium to coarse [QUATERNARY MIDDLE TERRACE DEPOSITS]	<5	<5	90
4.5–6.0	ML — 4.5 - 6.0 ft: Stiff, dark brown, moist, gravelly SILT with sand (ML), medium to high plasticity, trace charcoal, few sand, fine to coarse, some gravel is fine to coarse, cobbles (< 6 inches) [QUATERNARY MIDDLE TERRACE DEPOSITS]	20	<10	70
6.0–8.0	ML — 6.0 - 8.0 ft: Stiff, dark brown, moist to dry, gravelly SILT with sand (ML), some sand is fine to coarse, gravel is fine to coarse, rounded to subangular, cobbles (< 6 inches) [QUATERNARY MIDDLE TERRACE DEPOSITS]	25	15	60
8.0–12.0	GM — 8.0 - 12.0 ft: Medium stiff, dark brown, moist, silty GRAVEL with sand (GM), high plasticity, sand is fine to coarse, angular to subrounded, gravel is fine to coarse, angular to subrounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	20	40

AS-BUILT WELL CONSTRUCTION



GSI Water Solutions, Inc.

LOG ID: GM5-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 1005 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 76		**DATE STARTED:** 5/15/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/15/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 60	**COMPLETED:** 57.5
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES	AS-BUILT WELL CONSTRUCTION
12					
13					
14					
15	GM 12.0 - 17.5 ft: Medium stiff to soft, dark brown, moist, silty GRAVEL with sand (GM), medium plasticity, sand is fine to coarse, angular to subangular, gravel is fine to coarse, angular to subangular, cobbles (< 6 inches) [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	40	20	
16					
17					
18	GM 17.5 - 19.5 ft: Medium stiff to soft, dark brown, moist to dry, silty GRAVEL with sand (GM), medium to high plasticity, sand is fine to coarse, subrounded to subangular, gravel is fine to coarse, angular to subrounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	20	20	
19					
20	GM 19.5 - 21.0 ft: Medium stiff, dark brown, moist, silty GRAVEL with sand (GM), high plasticity, sand is fine to coarse, angular to subrounded, gravel is fine to coarse, angular to subrounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	20	40	
21					
22					
23					
24					
25					
26					
27	GM 21.0 - 33.0 ft: Medium stiff to soft, dark brown, moist to dry, silty GRAVEL with sand (GM), medium to high plasticity, sand is fine to coarse, subrounded to subangular, gravel is fine to coarse, angular to subrounded, cobbles (< 8 inches),	60	20	20	

GSI Water Solutions, Inc.

LOG ID: GM5-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 1005 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 76		**DATE STARTED:** 5/15/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/15/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 60	**COMPLETED:** 57.5
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES	AS-BUILT WELL CONSTRUCTION
28	subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS] Large broken cobbles (< 8 inches) at 28.0-feet				
29					
30					
31					
32					
33					
34	GW 33.0 - 36.0 ft: Very soft, dark brown to gray, dry, well graded GRAVEL with sand (GW), sand is fine to coarse, subrounded to angular, gravel is fine to coarse, subrounded to angular, cobbles (< 8 inches), angular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	80	15	<15	
35					
36	GM 36.0 - 37.5 ft: Medium stiff, dark brown, moist, silty GRAVEL with sand (GM), high plasticity, sand is fine to coarse, angular to subrounded, gravel is fine to coarse, angular to subrounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	20	40	
37	NR 37.0 - 37.5 ft: NO RETURN				
38					
39					
40					
41	GW 37.5 - 45.0 ft: Very soft, dark brown to gray, dry, well graded GRAVEL with sand (GW), sand is fine to coarse, subrounded to angular, gravel is fine to coarse, subrounded to angular, cobbles (< 8 inches), angular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	80	15	<15	
42					
43					

GSI Water Solutions, Inc.

LOG ID: GM5-MW1

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 1005 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 76		**DATE STARTED:** 5/15/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/15/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 60	**COMPLETED:** 57.5
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES	AS-BUILT WELL CONSTRUCTION
44–47	**GM** 45.0 - 47.5 ft: Soft, dark brown, moist to dry, silty GRAVEL (GM), sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, angular to subrounded, cobbles (< 8 inches), subangular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	<10	30	
48–59	**GW** 47.5 - 62.0 ft: Very soft, dark brown to gray, dry, well graded GRAVEL with sand (GW), sand is fine to coarse, subrounded to angular, gravel is fine to coarse, subrounded to angular, cobbles (< 8 inches), angular to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	80	15	<15	Bentonite Chips

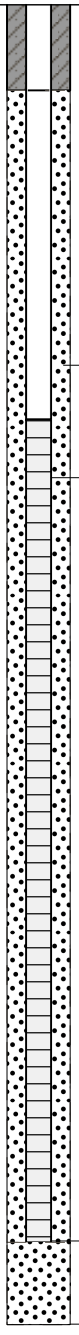
LOG ID: GM5-MW1

GSI Water Solutions, Inc.

PROJECT:	Santiam Canyon Infiltration Evaluation	**GROUND SURFACE ELEVATION AND DATUM:** 1005 feet amsl		
BORING LOCATION:	Mill City, OR	**TOTAL DEPTH (ft):** 76		**DATE STARTED:** 5/15/2023
DRILLING CONTRACTOR:	Holt	**LOGGED BY:** J. Hall		**DATE FINISHED:** 5/15/2023
SAMPLING METHOD:	Continuous Core	**DEPTH TO WATER (ft bgs)**	**FIRST:** 60	**COMPLETED:** 57.5
DRILLING METHOD:	Sonic			

DEPTH (feet)	SAMPLE DESCRIPTION Flow, color, weathering, grain size, vesicles primary and secondary minerals, alterations	% GRAVEL	% SAND	% FINES
60	Moist to wet at 60.0-feet			
62	62.0 - 65.0 ft: Medium stiff to soft, dark brown, wet, silty GRAVEL with sand (GM), medium plasticity, sand is fine to coarse, subangular to angular, gravel is fine to coarse, subangular to subrounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	<40	20
65	65.0 - 66.5 ft: NO RETURN			
66.5	66.5 - 68.0 ft: Medium stiff to soft, dark brown, wet, silty GRAVEL with sand (GM), medium plasticity, sand is fine to coarse, subangular to angular, gravel is fine to coarse, subangular to subrounded, cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	40	<40	20
68	68.0 - 70.0 ft: Soft, dark brown, wet, silty SAND with gravel (SM), low to medium plasticity, sand is fine to coarse, angular to subrounded, gravel is fine to coarse, subangular to subrounded, few cobbles (< 8 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	30	35	35
70	70.0 - 72.0 ft: Very Soft, dark brown, moist to wet, well graded SAND with silt and gravel (SW-SM), sand is fine to coarse, subangular to subrounded, gravel is fine to coarse, subangular to subrounded, few cobbles (< 6 inches), subrounded to rounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	30	60	<10
72	72.0 - 73.0 ft: Very Soft, gray, dry, well graded GRAVEL with silt and sand (GW), low plasticity, sand is very fine to coarse, subangular to angular, gravel is fine to coarse, subangular to angular [QUATERNARY MIDDLE TERRACE DEPOSITS]	60	25	<15
73	73.0 - 76.0 ft: Very Soft, dark brown, dry, silty GRAVEL (GM), low plasticity, sand is fine to coarse, angular to subangular, gravel is fine to coarse, angular to subrounded, cobbles (< 8 inches), subangular to subrounded [QUATERNARY MIDDLE TERRACE DEPOSITS]	70	<10	20
76	**Total Depth = 76.0-feet**			

AS-BUILT WELL CONSTRUCTION



- **10-20 Filter Pack**
- **2-Inch 10-Slot PVC Screen**
- **Bottom of Screen = 75.0-feet**
- **TD = 76.0-feet**

ATTACHMENT B

Soil Physical Parameters

GeoSystems Analysis, Inc.
Innovations in Hydrology

MEMORANDUM

August 10, 2023

TO: Matt Kohlbecker, GSI Water Solutions, Inc.

FROM: Jason Keller, GeoSystems Analysis, Inc.

RE: Gates – Mill City Borehole Sample Testing

INTRODUCTION

Geosystems Analysis, Inc. (GSA) completed physical and hydraulic testing of borehole samples collected from the Gates and Mill City, Oregon area in support of the treated wastewater infiltration feasibility assessment being completed by GSI Water Solutions (GSI) and Keller and Associates. Boreholes were drilled at three potential infiltration basin locations (Figure 1):

- Baughman Lucas (GM1)
- 4th Ave Right of Way (ROW) (GM4)
- Weyerhaeuser (GM5)

This technical memo provides test methods and results for physical and hydraulic testing performed on sonic core samples by GSA and its subcontractor.

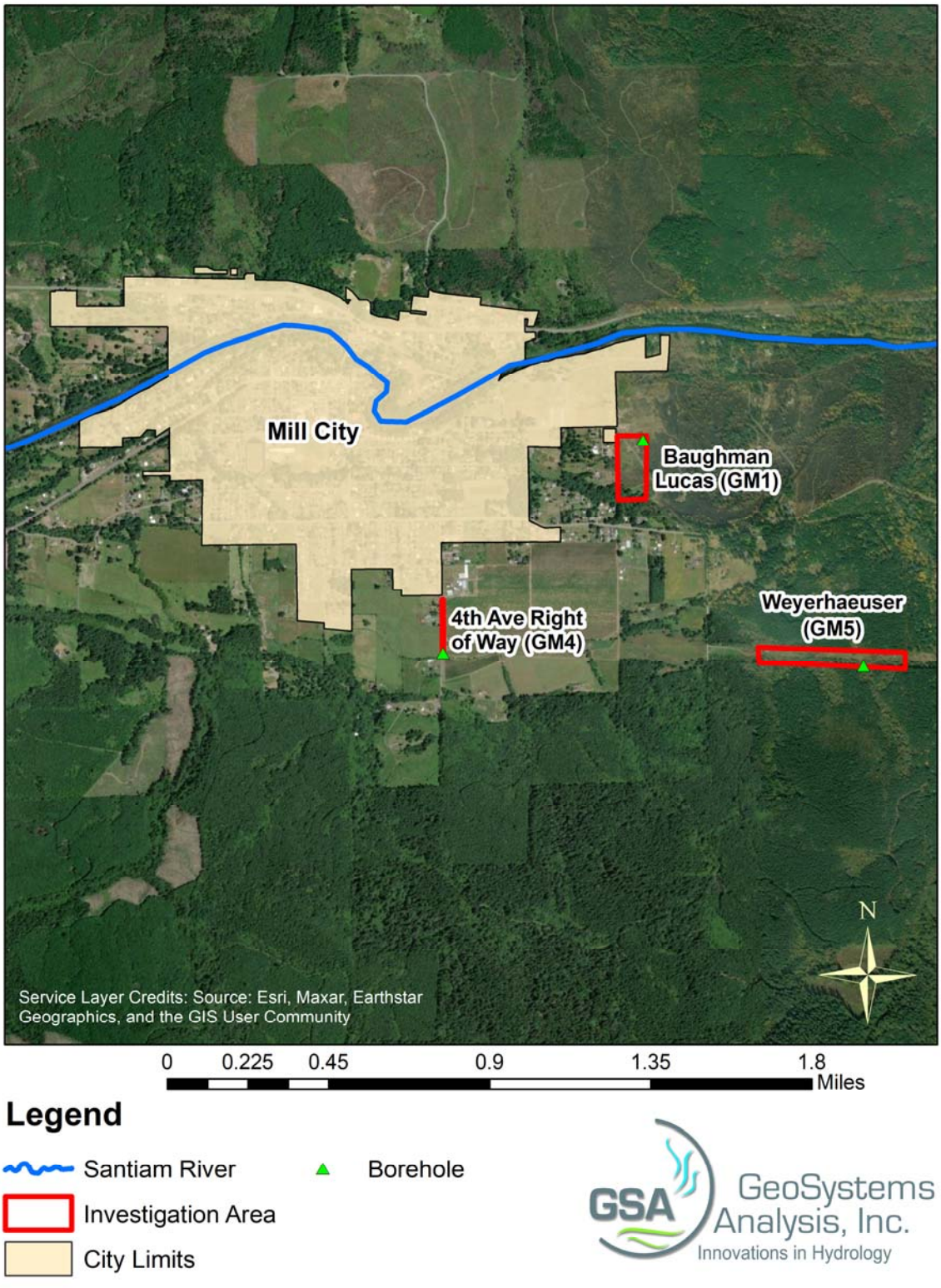


Figure 1. Borehole locations

METHODS

From May 15th through 19th, GSI supervised the drilling of three boreholes near Mill City, Oregon. Borehole locations are shown in Figure 1. Drilling was done by Holt Services Inc. using a track mounted sonic drill rig with a 5-inch inside diameter core barrel and 4.18-inch inside diameter sampler. The boreholes were drilled to the water table and completed as monitoring wells. Additional details of the drilling and monitoring well completion is provided in GSI (2023).

Sonic core were collected in approximately 2.5-ft lengths and placed in plastic sleeves. The length and weight of each 2.5-ft core section was recorded and then the core sample bags were opened, photographed, logged, and sampled. Geologic logging was conducted by GSI on each 2.5-ft core run to estimate major particle size fractions. Borehole logs are presented in GSI (2023).

Sub-samples were collected from horizons with distinct textural, color, and water content properties and placed in a sealed and labeled freezer bag for laboratory testing. Table 1 provides the test type, method, laboratory, and standard for all tests conducted on the samples. Sample testing methods are described below.

Table 1. Laboratory tests conducted

Test Type	Test Method	Testing Laboratory	Test Standard[1]	Samples Tested
Physical	Particle Size Distribution	GSA, Tucson, AZ	ASTM D6913-17 / ASTM D7928-17	GM1 = 2, GM4 = 2, GM5 = 2
	Specific Gravity	GSA, Tucson, AZ	ASTM D854-014	GM1 = 1, GM4 = 1, GM5 = 1
Hydraulic	Gravimetric Water Content	Oregon State University, Corvallis, OR	ASTM D2216-19	GM1 = 10, GM4 = 7, GM5 = 19
	Rigid-Wall Saturated Hydraulic Conductivity	GSA, Tucson, AZ	ASTM D5856-15	GM1 = 3, GM4 = 3, GM5 = 3

[1]American Society for Testing and Materials, Volume 4.08. 2009. West Conshohocken, Pennsylvania

Particle Size Distribution

Particle size distribution (PSD) testing was conducted by GSA on two samples from each borehole. Sand, silt, and clay fractions were determined using wet sieve and hydrometer methods (ASTM D6913-17, ASTM D7928-17).

Particle Density

Particle density measurements were conducted by GSA on one sample from each borehole. The sample was sieved to pass the #10 mesh (2 mm) sieve and 10 grams of sample passing the #10 mesh was used for particle density testing using the pycnometer method (ASTM D854-14).

Gravimetric Water Content

Gravimetric water content measurements were conducted by Oregon State University on a total of 36 samples using the oven dry method (ASTM D2216-19). Approximately 500 grams of each sample was weighed, placed in an oven at 110 degrees Celsius and dried until repeated water content measurements indicate a constant sample mass was achieved.

Saturated Hydraulic Conductivity

Saturated hydraulic conductivity (K_{sat}) tests were conducted by GSA using a 2-inch diameter by 3-inch-high rigid wall cell (ASTM D5856-15). The test cells were packed to a dry bulk density approximating the measured bulk density of the core sample from which the sample was taken. The packed test cells were saturated by upward infiltration with tap water and testing was performed with tap water.

RESULTS

Calculated core sample dry bulk density and laboratory results are summarized below. Complete laboratory results are provided in Appendix A and Appendix B.

Particle Size Distribution (PSD)

PSD testing results are shown in Figure 2. Table 2 provides percentages for gravel (>4.75 mm), sand (4.75 mm to 0.075 mm), silt (0.075 mm to 0.002 mm), and clay (<0.002 mm). All samples had a large gravel fraction of 34% or greater. The GM5 samples were finer textured than the GM4 and GM1 samples, with percent silt plus clay being 16% or greater compared for the GM5 samples, 11.8% or less for the GM1 samples and 9.4% and less for the GM4 samples.

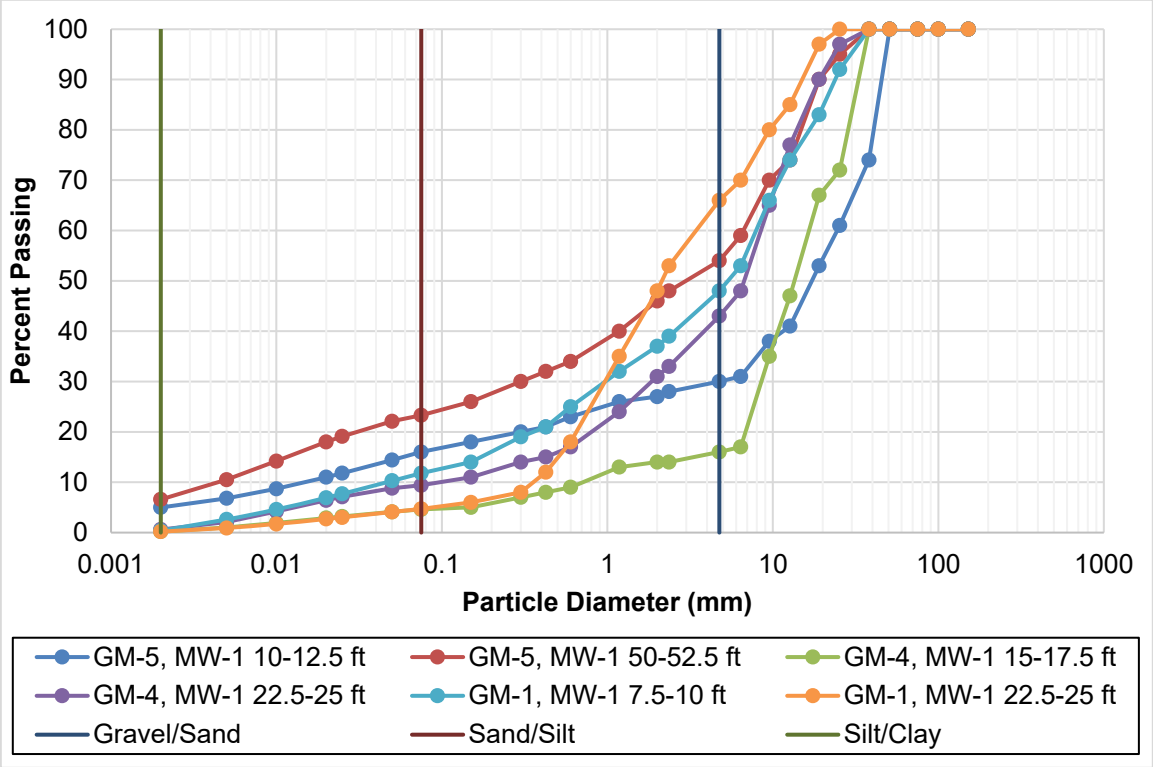


Figure 2. Particle size distribution

Table 2. Percent gravel, sand, silt, and clay

Particle Size	GM5, MW-1 10-12.5 ft	GM5, MW-1 50-52.5 ft	GM4, MW-1 15-17.5 ft	GM4, MW-1 22.5-25 ft	GM1, MW-1 7.5-10 ft	GM1, MW-1 22.5-25 ft
% Gravel (>4.75 mm)	70.0	46.0	84.0	57.0	52.0	34.0
% Sand (4.75 - 0.075 mm)	14.0	30.7	11.4	33.6	36.2	61.3
% Silt (0.075 - 0.002 mm)	11.0	16.7	4.4	8.8	11.4	4.5
% Clay (<0.002 mm)	5.0	6.6	0.2	0.6	0.4	0.2

Particle Density

Error! Reference source not found. provides particle density results. Particle density ranged from 2.67 g/cm^3 to 2.81 g/cm^3.

Table 3. Particle density

Sample	Particle Density (g/cm^3)
GM1 MW1 7.5-10	2.72
GM4 MW1 15-17.5	2.81
GM5 MW1 50-52.5	2.67

Water Content and Bulk Density

Core sample calculated bulk density and measured water content for GM1, GM4, and GM5 are presented in Figure 3, Figure 4, and Figure 5, respectively. The water content was variable and a function of soil texture and whether the sample was collected from below the water table. Finer textured soil layers tend to have greater water content than coarser textured soils. The observed depth to groundwater at GM1, GM4, and GM5 was approximately 21 ft, 14 ft, and 61 ft below ground surface. The large variability in water content at GM5 is likely due to differing layers of fine textured soil overlaying less fine textured soils.

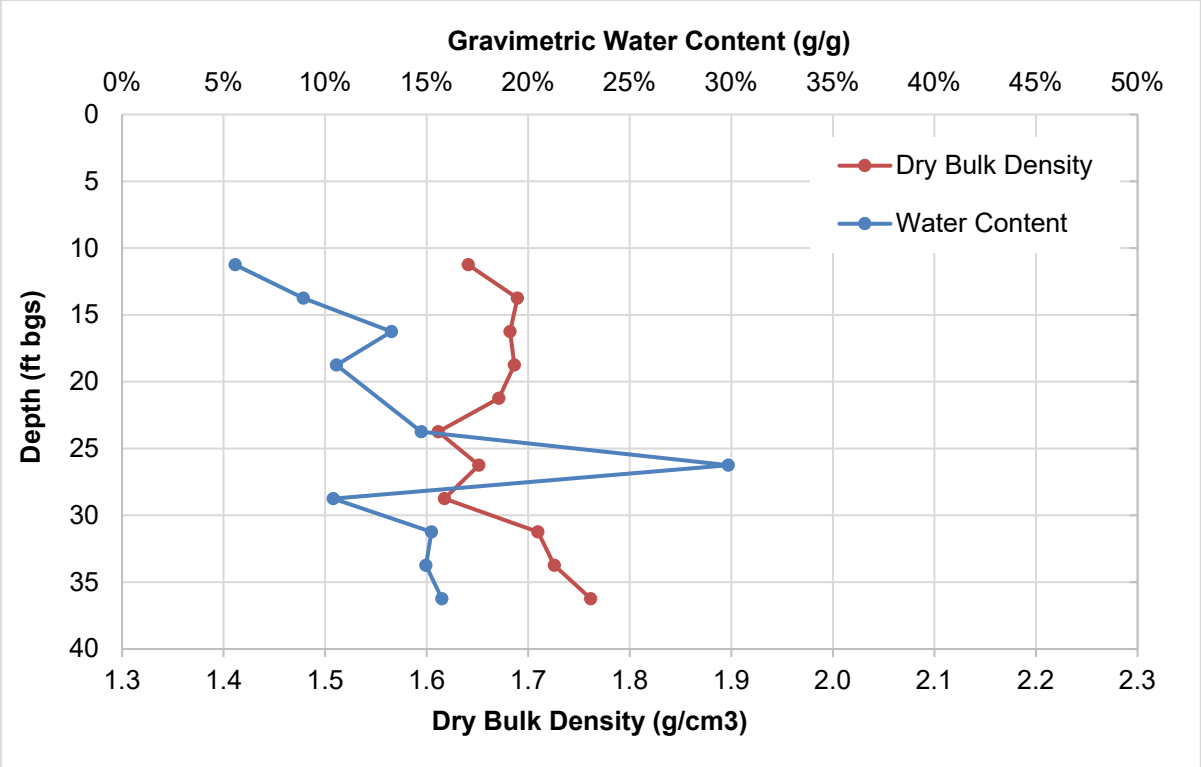


Figure 3. GM1 dry bulk density and water content

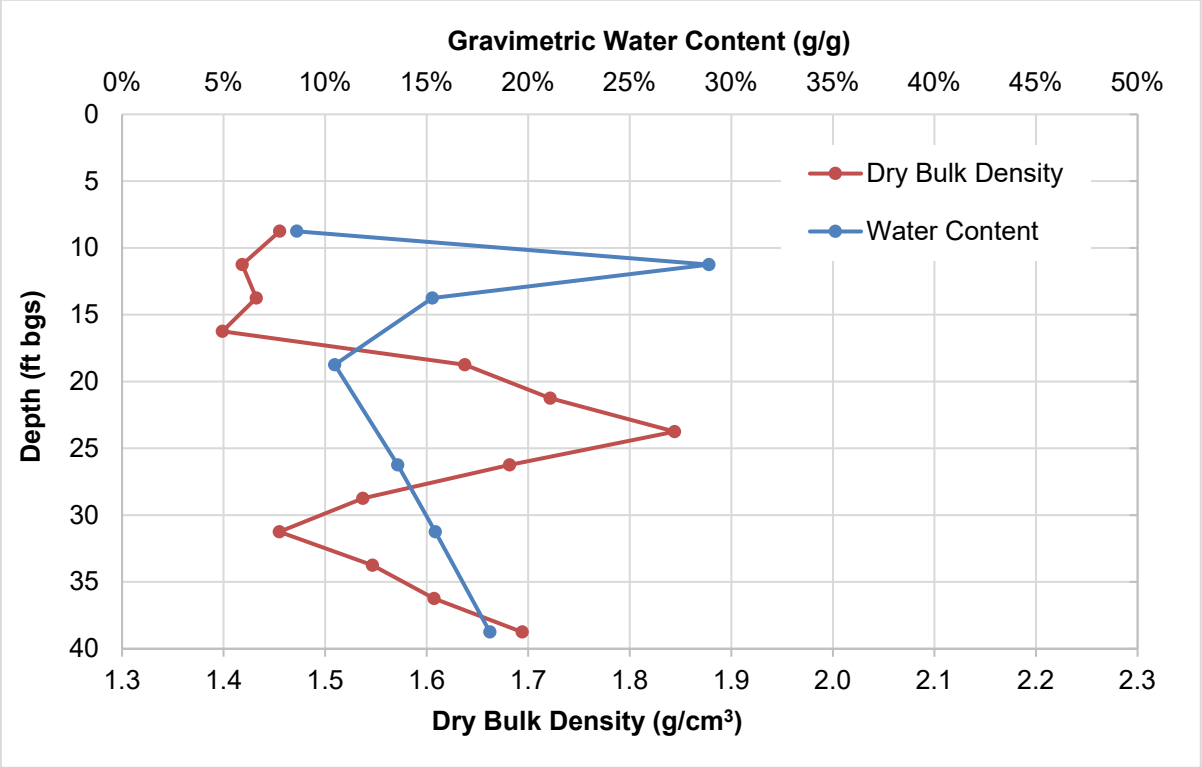


Figure 4. GM4 dry bulk density and water content

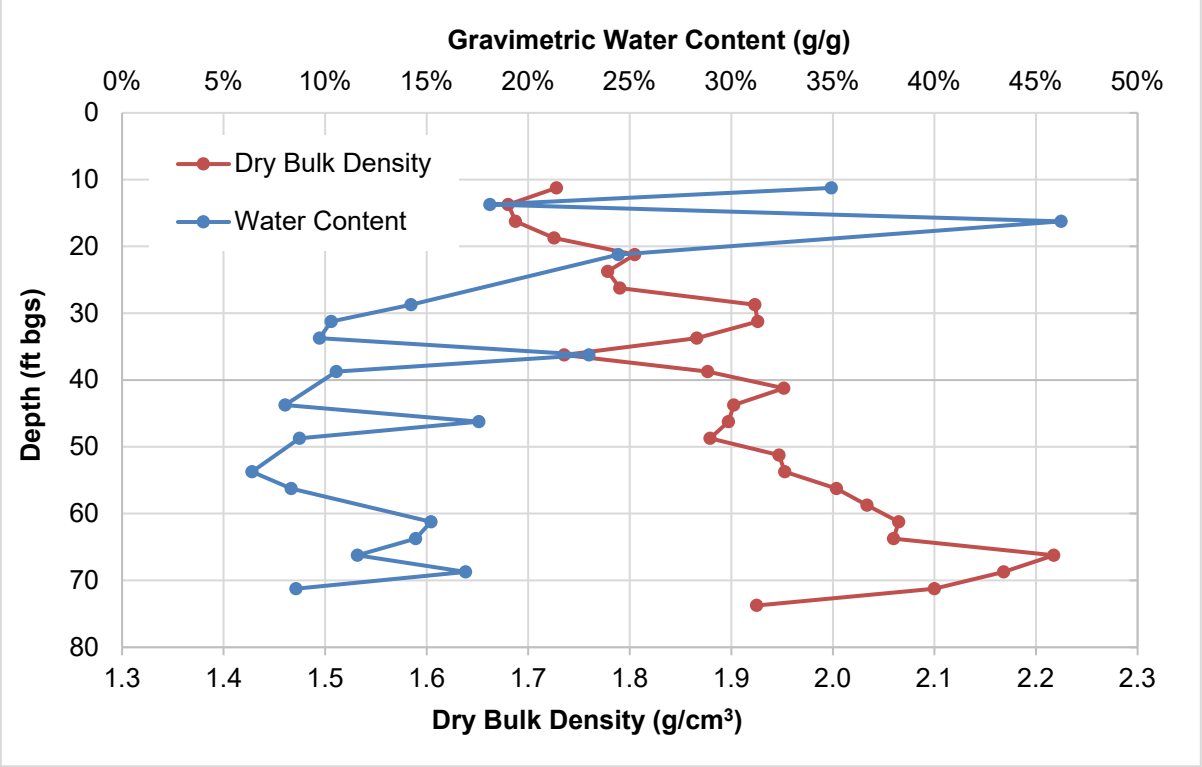


Figure 5. GM5 dry bulk density and water content

Saturated Hydraulic Conductivity

Measured K_{sat}, field measured percent fines (silt plus clay) and sample packing bulk density and porosity are presented in Table 4. Measured K_{sat} of the GM1 and GM4 samples were 9.9×10^{-4} cm/s (2.81 ft/day) or greater whereas measured K_{sat} of the GM5 samples were 5.3×10^{-7} cm/s (0.0015 ft/day) or less. K_{sat} results correspond with field observations of percent fines, with K_{sat} values being less for the finer textured GM5 samples (percent fines of 20% or more). The percent fines of the GM1 and GM4 samples were 10% or less and corresponded to greater measured K_{sat}. The low K_{sat} values for the GM5 samples indicate that the deeper unsaturated zone sediments at GM5 may significantly limit percolation of infiltrated water at this location.

Table 4. Saturated hydraulic conductivity, packing bulk density and porosity, and field estimated percent silt and clay

Sample ID	Field Measured Percent Silt + Clay	Dry Bulk Density (g/cm^3)	Total Porosity (cm^3/cm^3)	Saturated Hydraulic Conductivity	
				(cm/sec)	(ft/day)
GM-1, MW-1 7.5-10 ft	10	1.74	0.36	9.90E-04	2.81
GM-1, MW-1 15-17.5 ft	5	1.63	0.40	1.20E-02	34.02
GM-1, MW-1 22.5-25 ft	5	1.60	0.41	4.30E-03	12.19
GM-4, MW-1 15-17.5 ft	5	1.45	0.48	6.20E-03	17.57
GM-4, MW-1 17.5-20 ft	5	1.54	0.44	2.10E-03	5.95
GM-4, MW-1 22.5-25 ft	5	1.69	0.38	3.10E-03	8.79
GM-5, MW-1 10-12.5 ft	40	1.57	0.43	1.30E-07	0.0004
GM-5, MW-1 20-22.5 ft	20	1.67	0.39	5.30E-07	0.0015
GM-5, MW-1 50-52.5 ft	30	1.80	0.32	6.20E-08	0.0002

CONCLUSIONS

GM5 K_{sat} results of 5.3 x 10-7 cm/s (0.0015 ft/day) or less indicate the finer textured sediments observed in the unsaturated zone at GM5 may limit deep percolation at this location. Additionally, the presence of multiple layers of finer textured material throughout the unsaturated zone at GM5 is supported by the variable elevated water contents at this borehole. Conversely, the measured K_{sat} values at GM1 and GM4 do not indicate potential restrictions to net percolation from deeper unsaturated sediments present at these locations.

REFERENCES

GSI, see GSI Water Solutions, Inc.

GSI Water Solutions, Inc., 2023. Gates/Mill City Deep Soil Characterization and Slug Testing Results, Marion and Linn Counties, Oregon. Technical Memorandum to Chris Einmo, Marion County, dated August XX, 2023

Appendix A.
GSA Laboratory Test Results

GSA GeoSystems Analysis, Inc.
Innovations in Hydrology

3393 N Dodge Blvd
Tucson, AZ 85716
520-628-9330
Fax: 520-628-1122
www.gsanalysis.com

Date: August 8, 2023
Project Number: **92310**
Project Name: **GSI - Mill City Inflitration Site**
Job Description: Lab Testing
Client: GSI Water Solutions, Inc.
Project Contact: Matt Kohlbecker, RG
Billing Address: 55 SW Yamhill St., Suite 300
Portland, OR 97204

Test	*Method*	*Qty*
Specific Gravity of Soils	ASTM D854-14	3
Particle Size Analysis with Hydrometer	ASTM D6913-17 / ASTM C136-14 / ASTM D7928-17	6
Rigid-Wall Saturated Hydraulic Conductivity	ASTM D5856-15	9

Thank you for choosing GeoSystems Analysis for your material testing needs. We look forward to working with you again. If you have any questions or require additional information, please contact us at 1-520-628-9330

Sincerely,

Prepared By: Nate Blevens
Laboratory Project Manager

Reviewed By: Mike Yao
Laboratory Technical Director

GeoSystems Analysis, Inc.
Innovations in Hydrology

3393 N Dodge Blvd
Tucson, AZ 85716
520-628-9330
Fax: 520-628-1122
www.gsanalysis.com

Laboratory Test Results - Soil Particle Density

Date: August 8, 2023
Project Number: **92310**
Project Name: **GSI - Mill City Inflitration Site**
Client: GSI Water Solutions, Inc.

Sample ID	Particle Density (g/cm^3)
GM1 MW1 7.5-10	2.72
GM4 MW1 15-17.5	2.81
GM5 MW1 50-52.5	2.67

GSA GeoSystems Analysis, Inc.
Innovations in Hydrology

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Tucson, AZ 85716
520-628-9330
Fax: 520-628-1122
www.gsanalysis.com

Laboratory Test Results - Particle Size Distribution

Date: August 8, 2023
Project Number: **92310**
Project Name: **GSI - Mill City Inflitration Site**
Client: GSI Water Solutions, Inc.

PSD							
		Sample ID					
Sieve		GM-5, MW-1 10-12.5 ft	GM-5, MW-1 50-52.5 ft	GM-4, MW-1 15-17.5 ft	GM-4, MW-1 22.5-25 ft	GM-1, MW-1 7.5-10 ft	GM-1, MW-1 22.5-25 ft
(mm)	US standard	Percent Passing					
152	6"	100	100	100	100	100	100
100	4"	100	100	100	100	100	100
75	3"	100	100	100	100	100	100
50.8	2"	100	100	100	100	100	100
38.1	1.5"	74	100	100	100	100	100
25.4	1"	61	95	72	97	92	100
19.05	3/4"	53	90	67	90	83	97
12.7	1/2"	41	74	47	77	74	85
9.525	3/8"	38	70	35	65	66	80
6.4	1/4"	31	59	17	48	53	70
4.75	#4	30	54	16	43	48	66
2.36	#8	28	48	14	33	39	53
2	#10	27	46	14	31	37	48
1.18	#16	26	40	13	24	32	35
0.6	#30	23	34	9	17	25	18
0.425	#40	21	32	8	15	21	12
0.3	#50	20	30	7	14	19	8
0.15	#100	18	26	5	11	14	6
0.075	#200	16.0	23.3	4.6	9.4	11.8	4.7
0.05	Hydrometer	14.4	22.1	4.1	8.8	10.3	4.1
0.025		11.8	19.1	3.2	7.1	7.7	3.0
0.02		11.0	18.0	2.9	6.4	6.9	2.7
0.01		8.7	14.2	1.9	4.2	4.6	1.7
0.005		6.8	10.5	1.0	2.1	2.6	0.9
0.002		5.0	6.6	0.2	0.6	0.4	0.2

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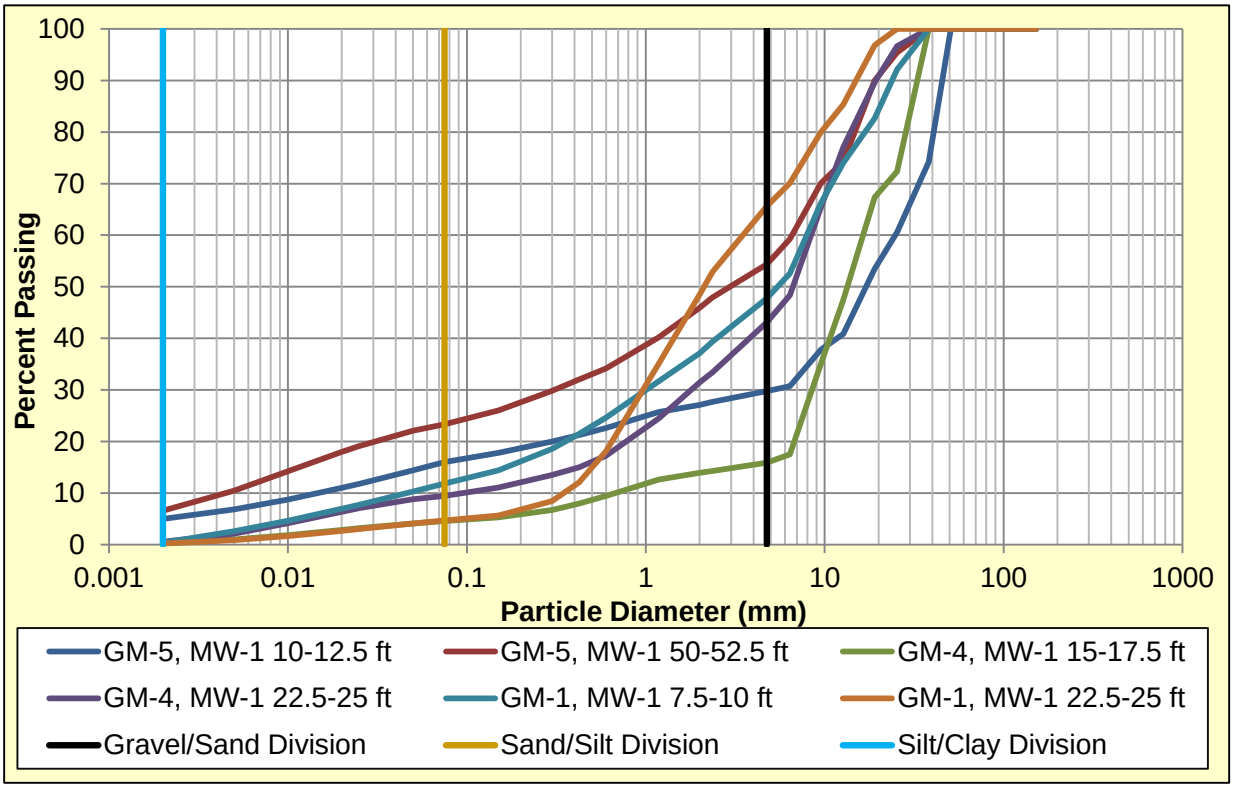
Laboratory Test Results - Particle Size Distribution

Date: August 8, 2023
Project Number: **92310**
Project Name: **GSI - Mill City Inflitration Site**
Client: GSI Water Solutions, Inc.



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Innovations in Hydrology

3393 N Dodge Blvd
Tucson, AZ 85716
520-628-9330
Fax: 520-628-1122
www.gsanalysis.com

Laboratory Test Results - Rigid-Wall Saturated Hydraulic Conductivity

Date: August 8, 2023
Project Number: **92310**
Project Name: **GSI - Mill City Inflitration Site**
Client: GSI Water Solutions, Inc.

Rigid-Wall Saturated Hydraulic Conductivity			
Sample ID	Measured		
	Dry Bulk Density (g/cm^3)	Total Porosity (cm^3/cm^3)	Saturated Hydraulic Conductivity (cm/sec)
GM-1, MW-1 7.5-10 ft	1.74	0.36	9.9E-04
GM-1, MW-1 15-17.5 ft*	1.63	0.40	1.2E-02
GM-1, MW-1 22.5-25 ft*	1.60	0.41	4.3E-03
GM-4, MW-1 15-17.5 ft	1.45	0.48	6.2E-03
GM-4, MW-1 17.5-20 ft*	1.54	0.44	2.1E-03
GM-4, MW-1 22.5-25 ft*	1.69	0.38	3.1E-03
GM-5, MW-1 10-12.5 ft*	1.57	0.43	1.3E-07
GM-5, MW-1 20-22.5 ft*	1.67	0.39	5.3E-07
GM-5, MW-1 50-52.5 ft	1.80	0.32	6.2E-08

*Using average particle density for porosity calculation (2.73 g/cm^3)

Appendix B.

OSU Laboratory Test Results

Oregon State University
Soil Health Laboratory
soil.lab@oregonstate.edu 541-737-2187
Crop and Soil Science Department
3079 Ag-Life Sciences Bldg Corvallis, OR 97331

Elemental Analysis Results

Name:	Jason Keller
Organization:	GeoSystems Analysis, Inc.
Contact for results:	jason@gsanalysis.com
Date submitted:	5/26/2023
Date delivered:	5/31/2023
Group number:	223308

Method:

Moisture Gravimetric moisture as sample is received. All other data reported on a dry matter basis

Sample ID		%
Customer ID	Lab ID	Moisture
GM5 10-12.5	1	34.9
GM5 12.5-15	2	18.1
GM5 15-17.5	3	46.2
GM5 20-22	4	24.4
GM5 27.5-30	5	14.2
GM5 30-32.5	6	10.3
GM5 32.5-35	7	9.7
GM5 35-37.5	8	23.0
GM5 37.5-40	9	10.6
GM5 42.5-45	10	8.0
GM5 45-47.5	11	17.6
GM5 47.5-50	12	8.7
GM5 52.5-55	13	6.4
GM5 55-57.5	14	8.3
GM5 60-62.5	15	15.2
GM5 62.5-65	16	14.5
GM5 65-67.5	17	11.6
GM5 67.5-70	18	16.9
GM5 70-72.5	19	8.6
GM1 10-12.5	20	5.6
GM1 12.5-15	21	8.9
GM1 15-17.5	22	13.3
GM1 17.5-20	23	10.6
GM1 25-27.5	24	29.9
GM1 30-32.5	25	15.2
GM1 32.5-35	26	15.0
GM1 35-35.5	27	15.7
GM1 36-37.5	28	15.7
GM1 37.5-40	29	11.9
GM4 7.5-10	30	8.6
GM4 10-12.5	31	28.9
GM4 12.5-15	32	15.3
GM4 17.5-20	33	10.5
GM4 22.5-25	34	14.7
GM4 25-27.5	35	13.6
GM4 27.5-30	36	10.4
GM4 30-32.5	37	15.4
GM4 37.5-40	38	18.1

Sample ID		g	g	g	%
Customer ID	Lab ID	Tin Weight	Weight Before 105 C	Weight After 105 C	Gravimetric moisture
GM5 10-12.5	1	12.6	584.4	436.4	34.9
GM5 12.5-15	2	12.5	720.0	611.5	18.1
GM5 15-17.5	3	12.4	463.1	320.6	46.2
GM5 20-22	4	12.5	444.4	359.6	24.4
GM5 27.5-30	5	12.5	506.1	444.6	14.2
GM5 30-32.5	6	12.4	298.3	271.6	10.3
GM5 32.5-35	7	12.5	370.1	338.4	9.7
GM5 35-37.5	8	12.5	470.5	384.9	23.0
GM5 37.5-40	9	12.4	428.3	388.6	10.6
GM5 42.5-45	10	12.3	432.0	400.8	8.0
GM5 45-47.5	11	12.7	513.2	438.4	17.6
GM5 47.5-50	12	13.3	409.0	377.2	8.7
GM5 52.5-55	13	12.9	446.9	420.8	6.4
GM5 55-57.5	14	12.4	380.4	352.1	8.3
GM5 60-62.5	15	12.4	447.9	390.4	15.2
GM5 62.5-65	16	12.5	685.3	600.3	14.5
GM5 65-67.5	17	12.7	629.8	565.7	11.6
GM5 67.5-70	18	12.7	584.3	501.6	16.9
GM5 70-72.5	19	12.7	509.6	470.4	8.6
GM1 10-12.5	20	12.4	465.2	441.3	5.6
GM1 12.5-15	21	12.5	311.5	287.0	8.9
GM1 15-17.5	22	12.4	543.4	481.2	13.3
GM1 17.5-20	23	12.4	390.4	354.3	10.6
GM1 25-27.5	24	12.6	540.2	418.9	29.9
GM1 30-32.5	25	12.5	439.8	383.3	15.2
GM1 32.5-35	26	12.4	557.9	486.9	15.0
GM1 35-35.5	27	12.4	363.0	315.3	15.7
GM1 36-37.5	28	12.5	574.1	498.1	15.7
GM1 37.5-40	29	12.4	358.1	321.4	11.9
GM4 7.5-10	30	12.4	442.9	408.8	8.6
GM4 10-12.5	31	12.5	451.4	353.0	28.9
GM4 12.5-15	32	12.4	521.0	453.6	15.3
GM4 17.5-20	33	12.3	338.3	307.4	10.5
GM4 22.5-25	34	12.4	436.0	381.6	14.7
GM4 25-27.5	35	12.4	642.3	567.0	13.6
GM4 27.5-30	36	12.4	429.6	390.3	10.4
GM4 30-32.5	37	12.5	511.6	444.9	15.4
GM4 37.5-40	38	12.4	477.4	406.1	18.1

ATTACHMENT C

Slug Test Results

Slug Test Results at GM1

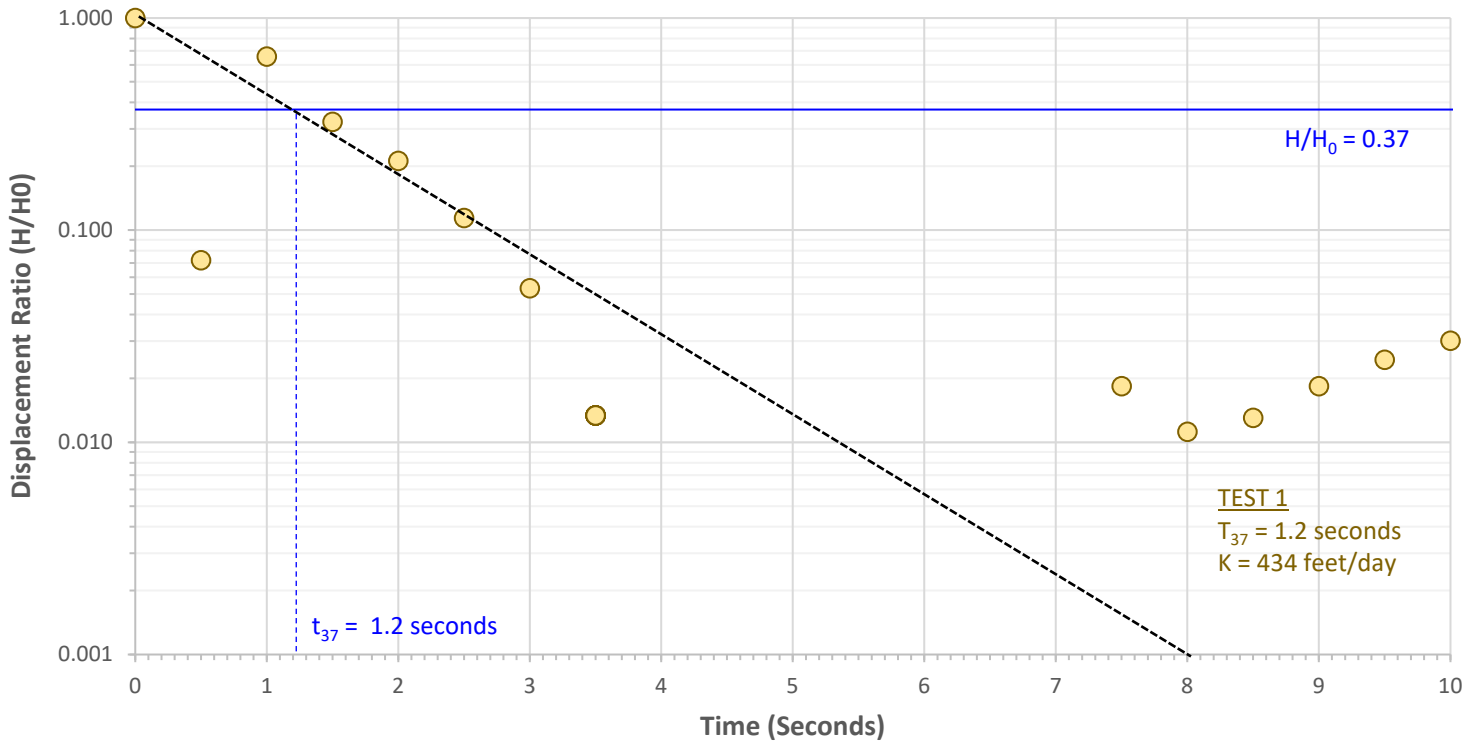
Santiam Canyon Treated Wastewater Infiltration Evaluation

	t_{37} (seconds)	K (feet/day)	Notes
Slug In 1	1.2	434	Hvorslev Method
Slug In 2	0.4	1,302	Hvorslev Method
Slug In 3	--	431	Underdamped response. Analyzed with Springer-Gelhar (1991)
Slug Out 1	1.4	370	Hvorslev Method
Slug Out 2	0.85	613.00	Hvorslev Method
Slug Out 3	--	--	Data too noisy for analysis
	Geomean	560.3	

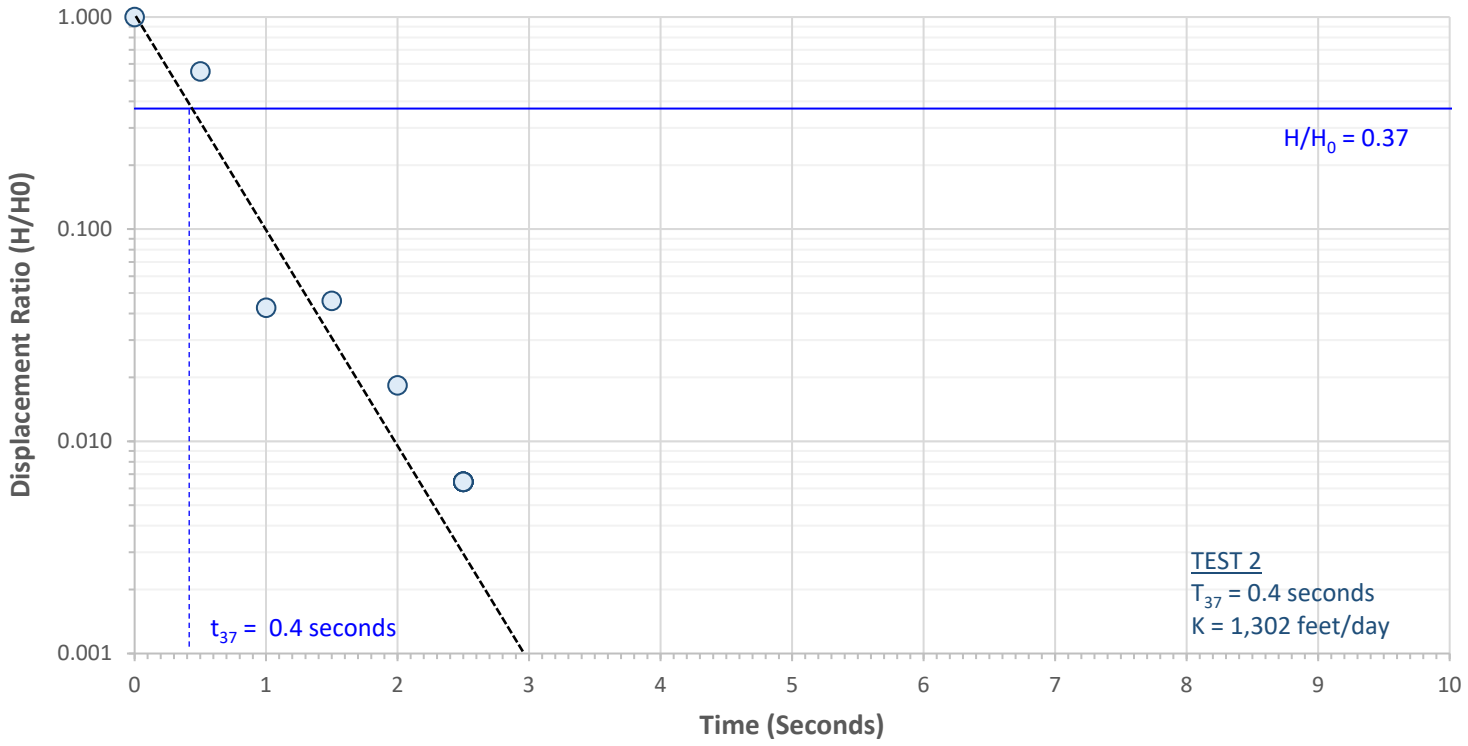
Note:

Site GM1 is characterized by high hydraulic conductivity. Recommend conservatively using the lowest measured value of 370 for MOUNDSOLV analyses for initial basin sizing. Need to recommend a pumping test to dial in final basin design.

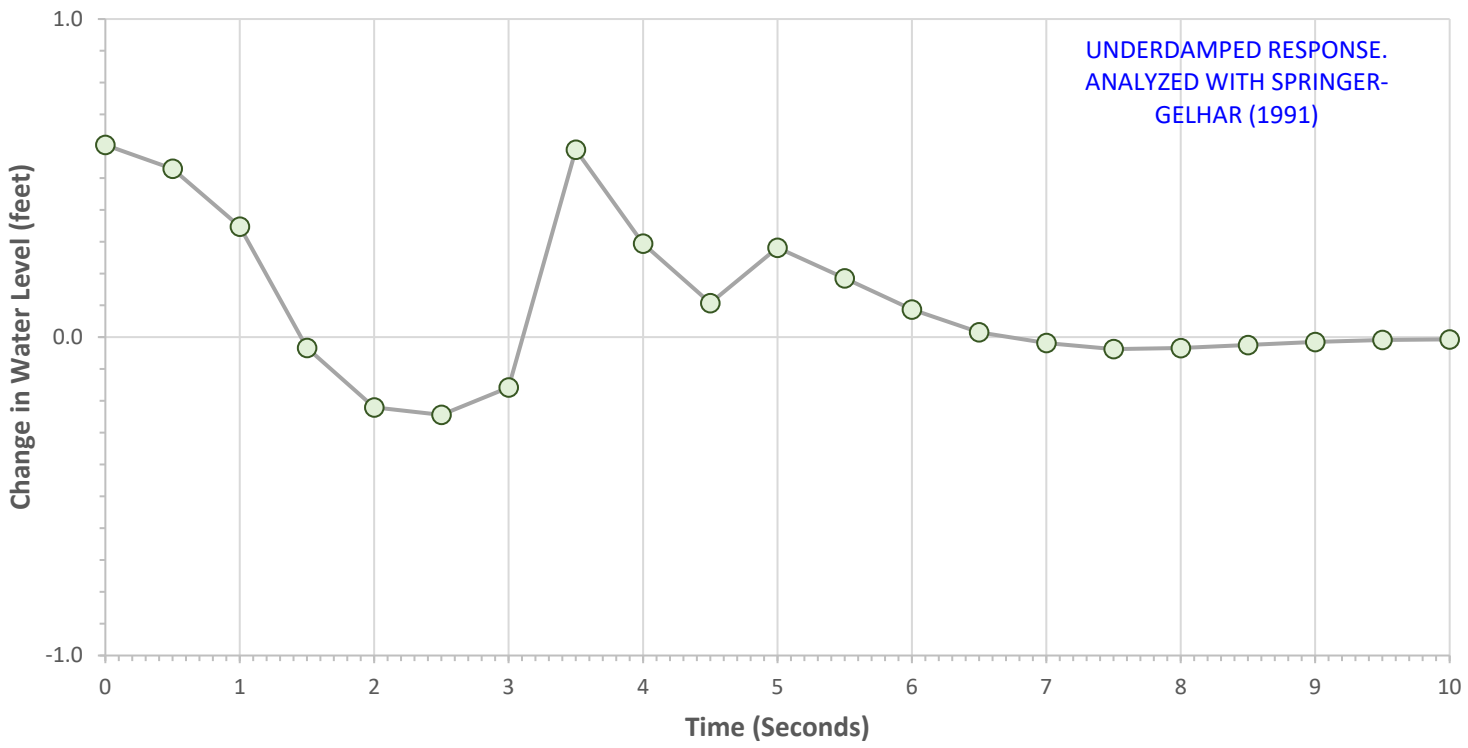
Slug-In Test No. 1



Slug-In Test No. 2

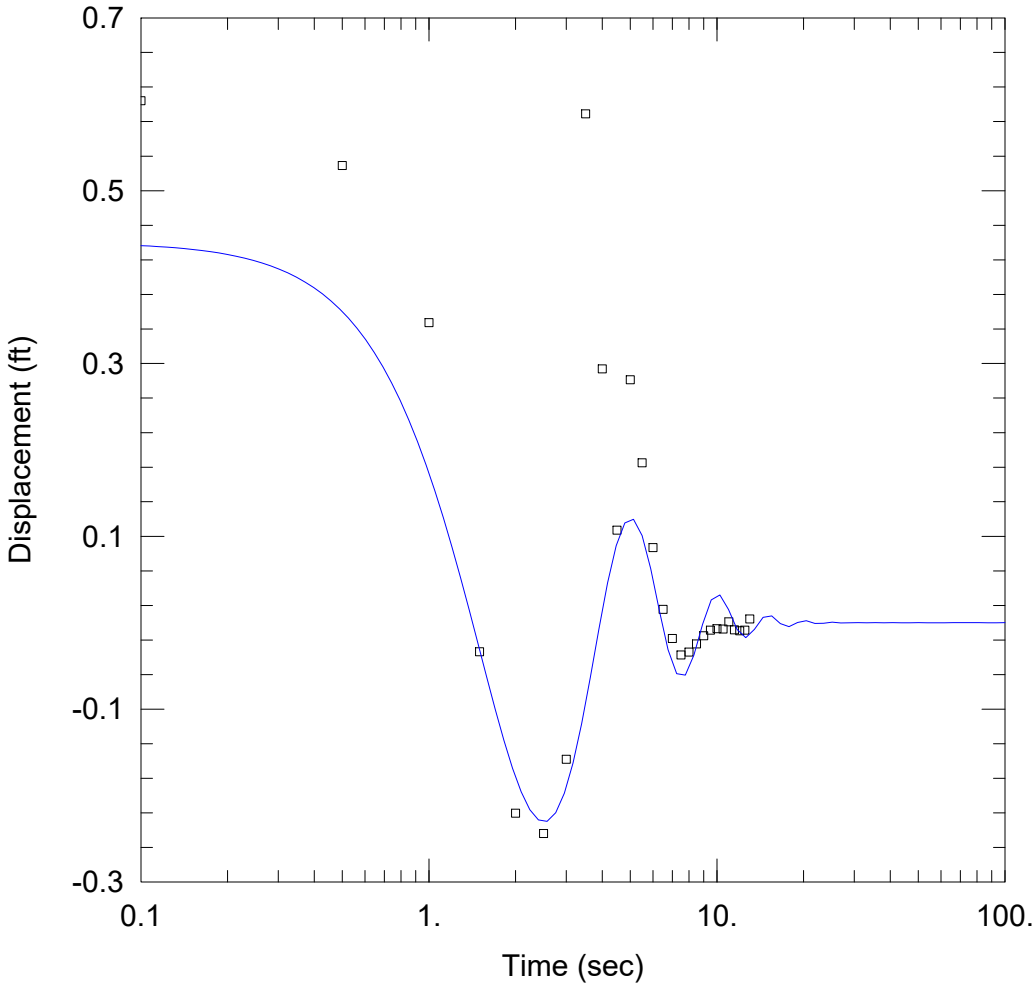


Slug-In Test No. 3



GSI Water Solutions, Inc.

Figure X
GM1-MW1 Slug-In Test Analyses
Santiam Canyon Treated Wastewater Infiltration Evaluation



WELL TEST ANALYSIS

Data Set: P:\...\SlugIn_GM1MW1.aqt
Date: 06/20/23 Time: 12:48:48

PROJECT INFORMATION

Company: Gates Mill City Infiltration
Client: Keller Associates
Project: 464.020
Location: Mill City, Oregon
Test Well: MW-1
Test Date: 6/8/2023

AQUIFER DATA

Saturated Thickness: 25. ft Anisotropy Ratio (Kz/Kr): 1.

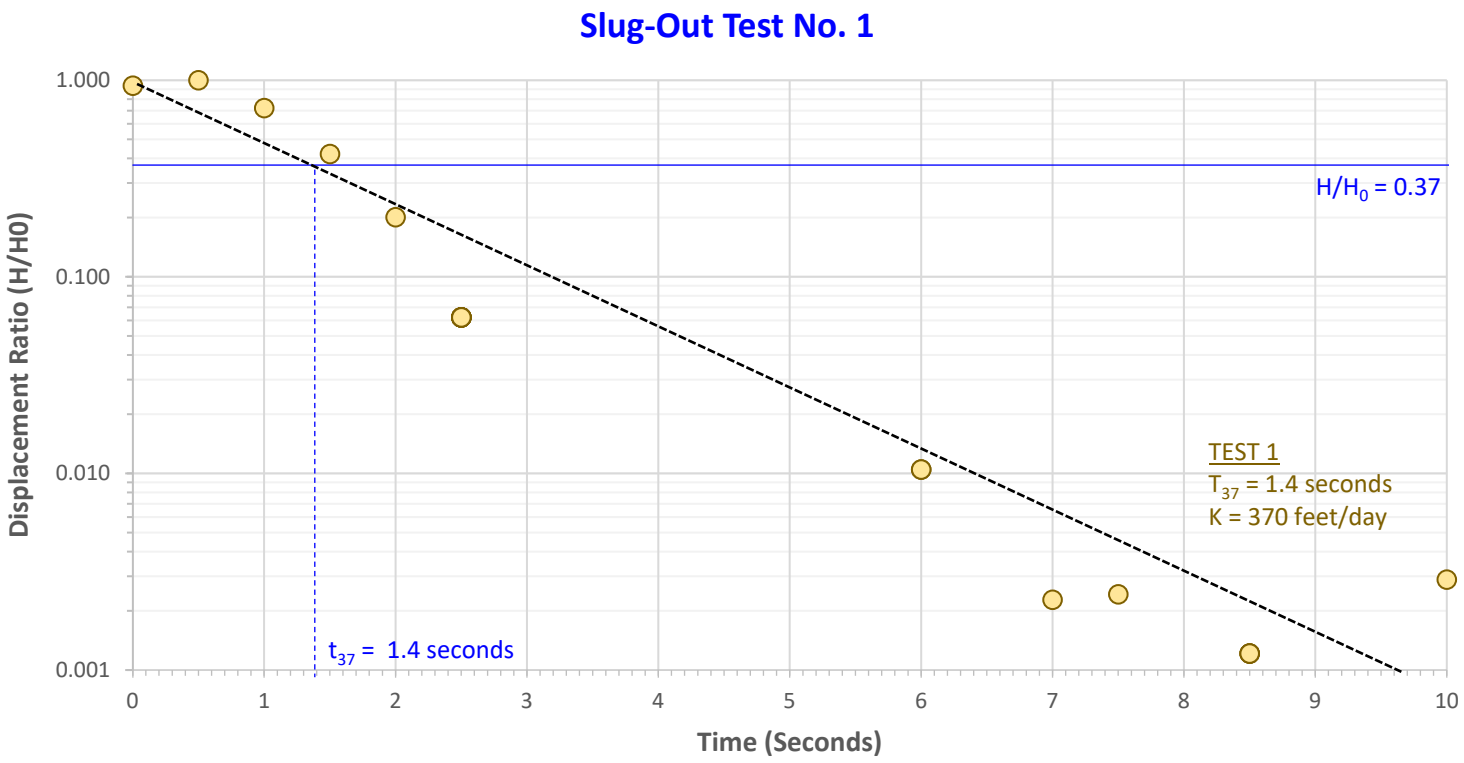
WELL DATA (MW-1)

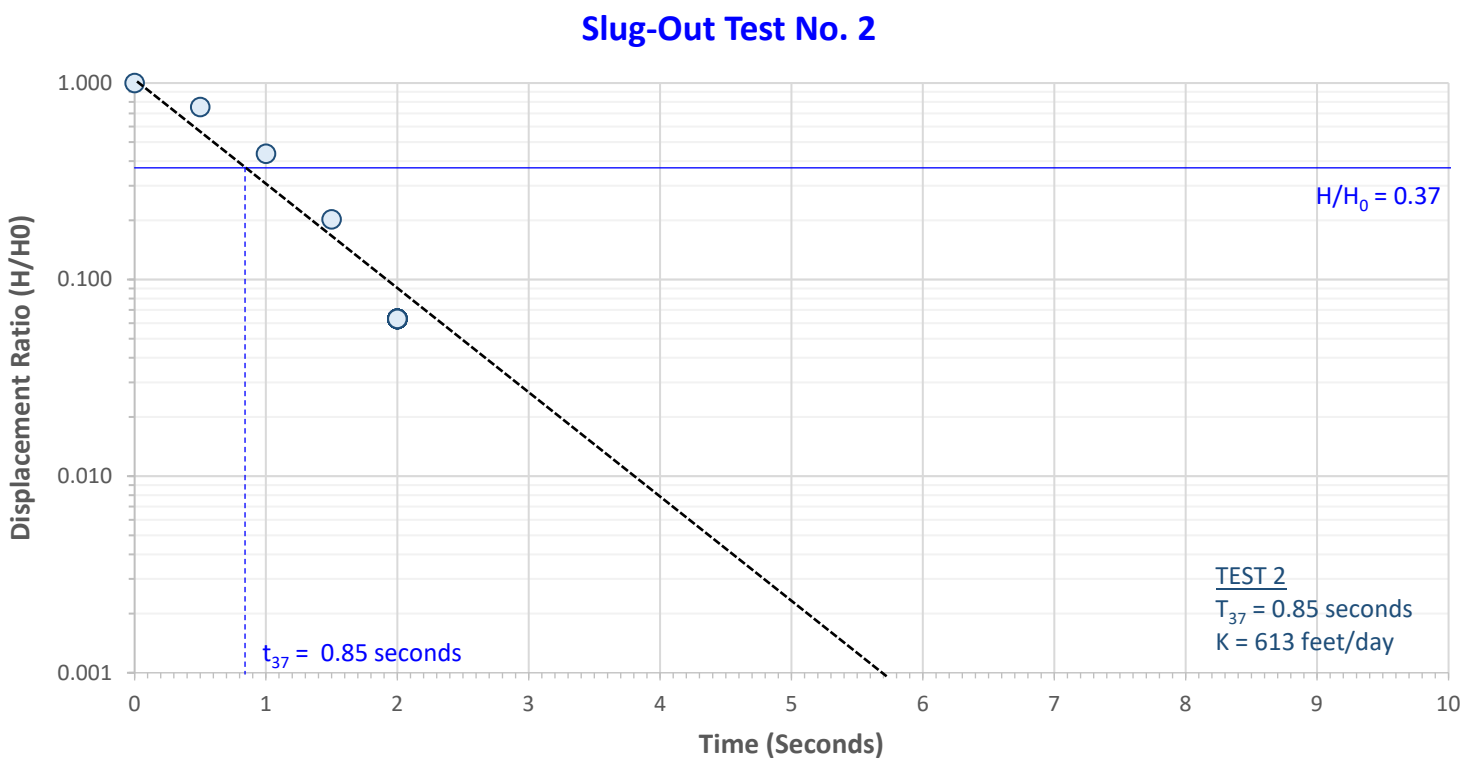
Initial Displacement: 0.44 ft
Total Well Penetration Depth: 40. ft
Casing Radius: 0.083 ft
Static Water Column Height: 25. ft
Screen Length: 10. ft
Well Radius: 0.083 ft
Gravel Pack Porosity: 0.

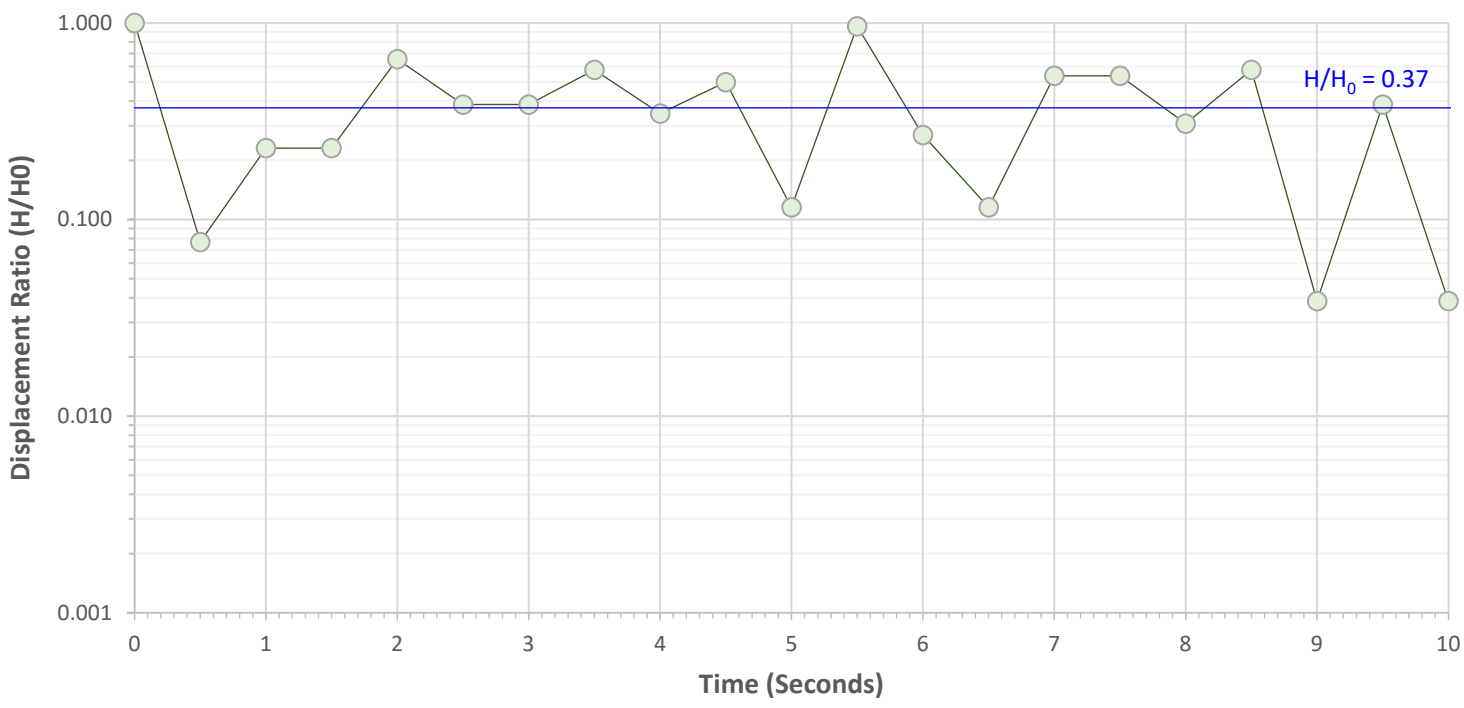
SOLUTION

Aquifer Model: Unconfined Solution Method: Springer-Gelhar

K = 0.004988 ft/sec Le = 19.69 ft







Water Solutions, Inc.

Figure X

GM1-MW1 Slug-Out Test Analyses

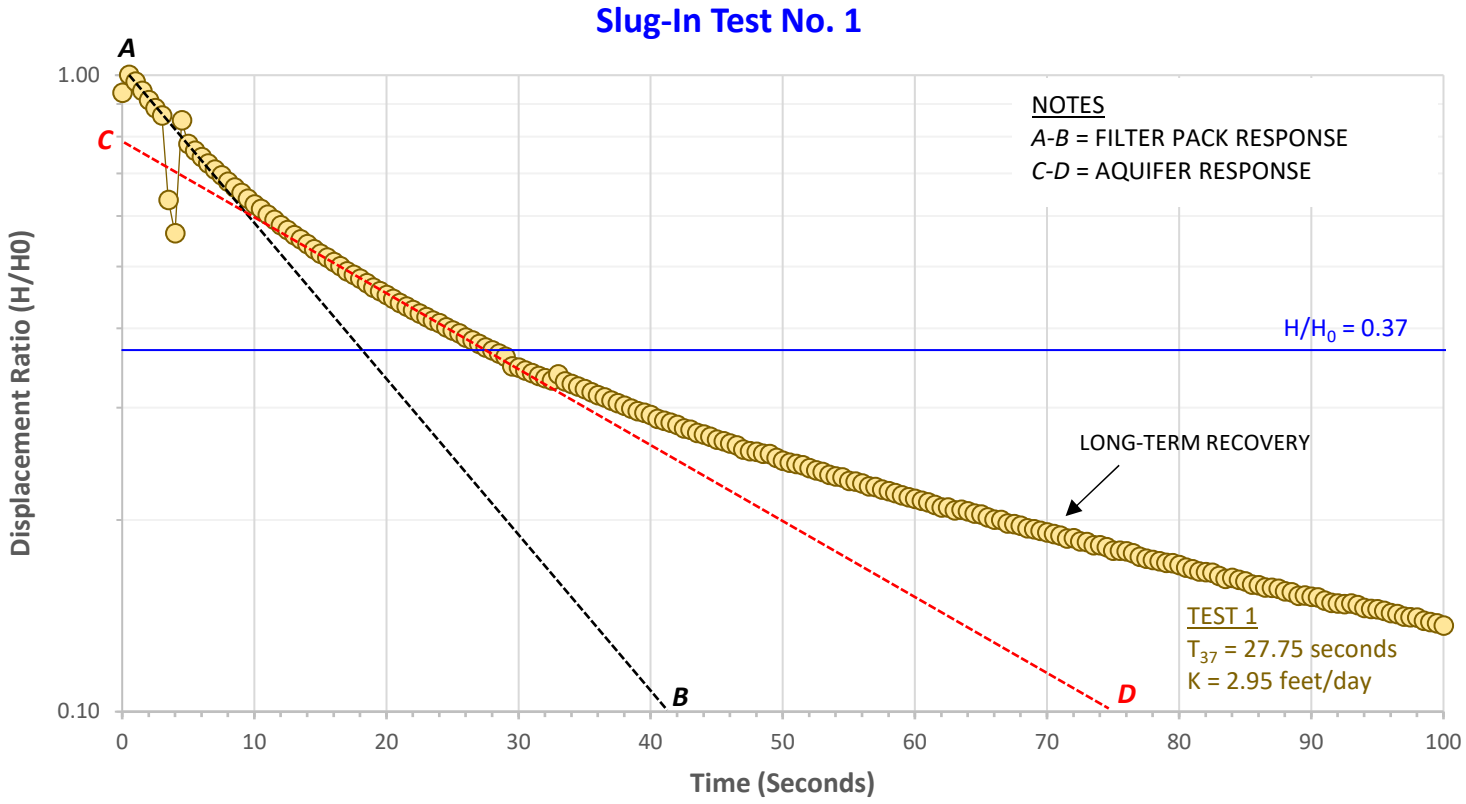
Santiam Canyon Treated Wastewater Infiltration Evaluation

Slug Test Results at GM4

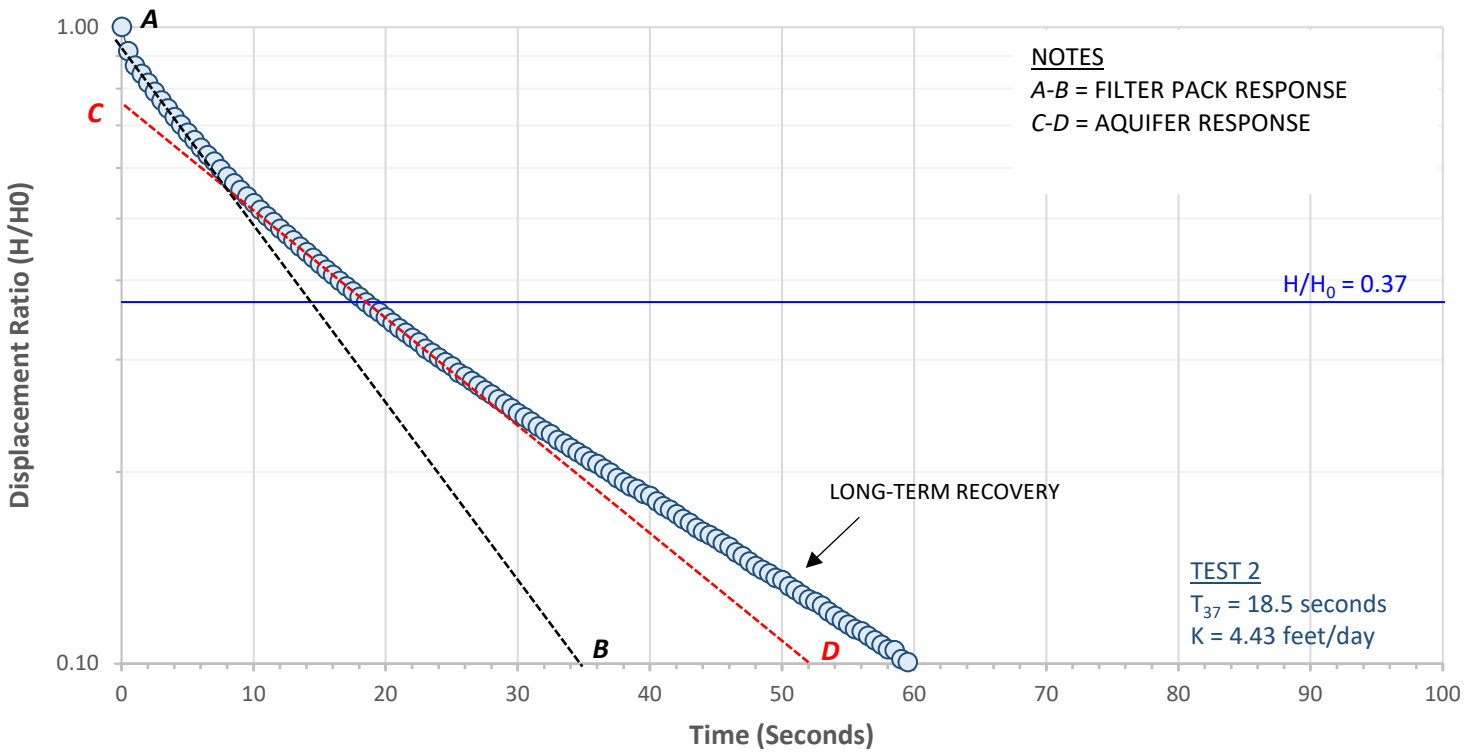
Santiam Canyon Treated Wastewater Infiltration Evaluation

	t_{37} (seconds)	K (feet/day)	Notes
MW-1, Slug In 1	27.75	2.95	Hvorslev Method
MW-1, Slug In 2	18.50	4.43	Hvorslev Method
MW-1, Slug In 3	28.25	2.90	Hvorslev Method
MW-1, Slug Out 1	22.50	3.64	Hvorslev Method
MW-1, Slug Out 2	19.75	4.15	Hvorslev Method
MW-1, Slug Out 3	23.75	3.45	Hvorslev Method. Value of t_{37} may reflect effects from late-term recovery, but effects are not likely to be significant because the hydraulic conductivity from Slug Out 3 is similar to the hydraulic conductivity from the other slug tests.
	Geomean	**3.54**	

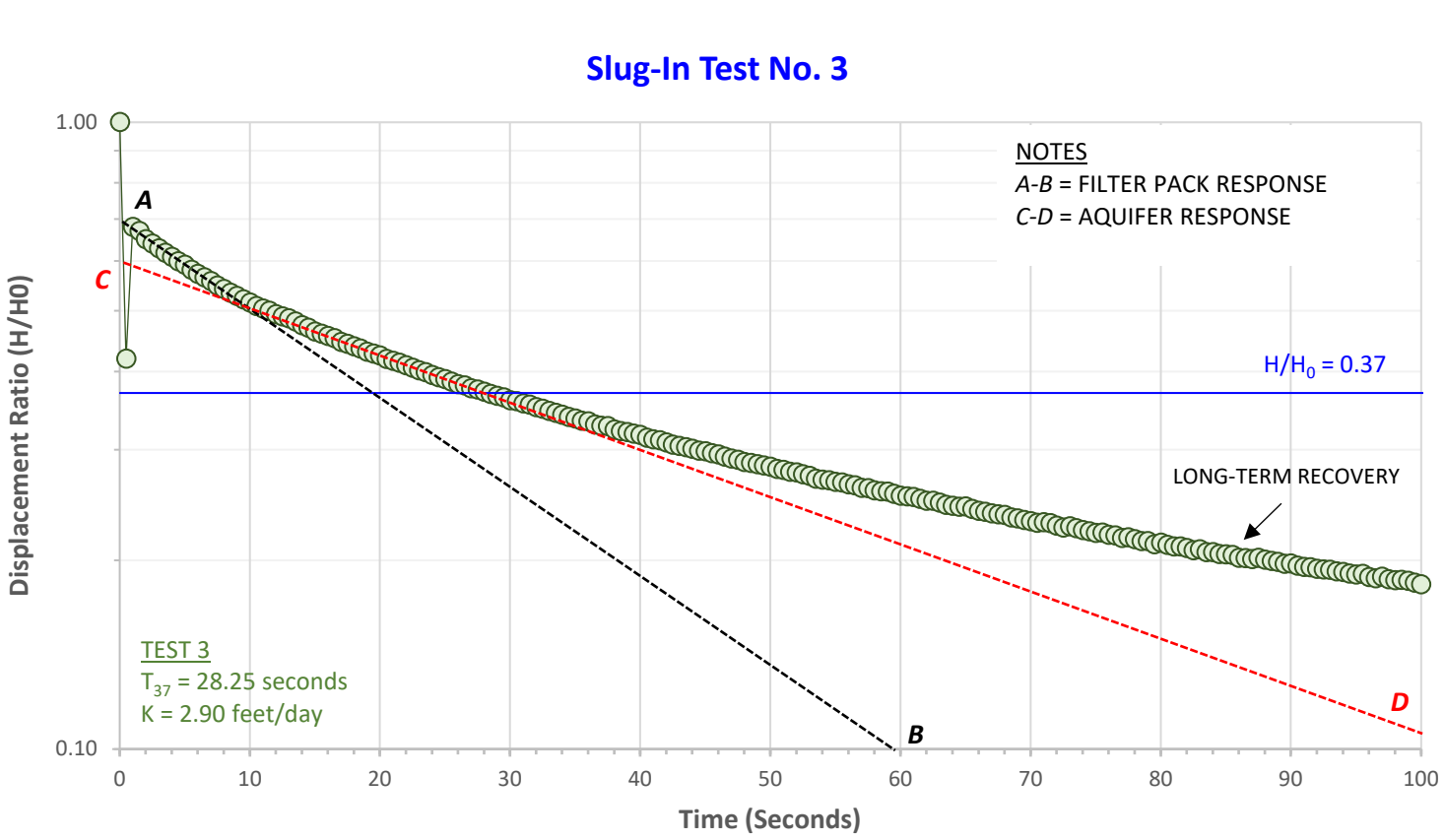
Slug-In Test No. 1



Slug-In Test No. 2



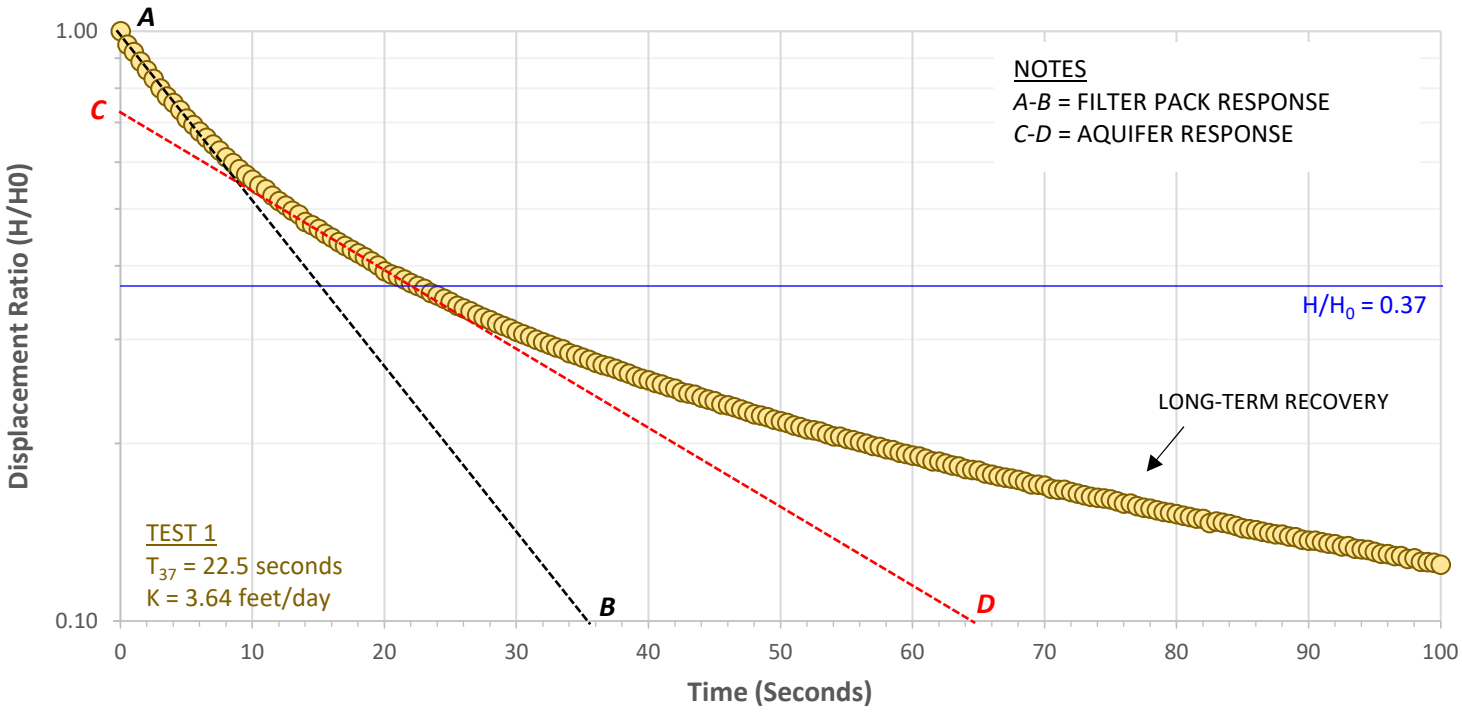
Slug-In Test No. 3



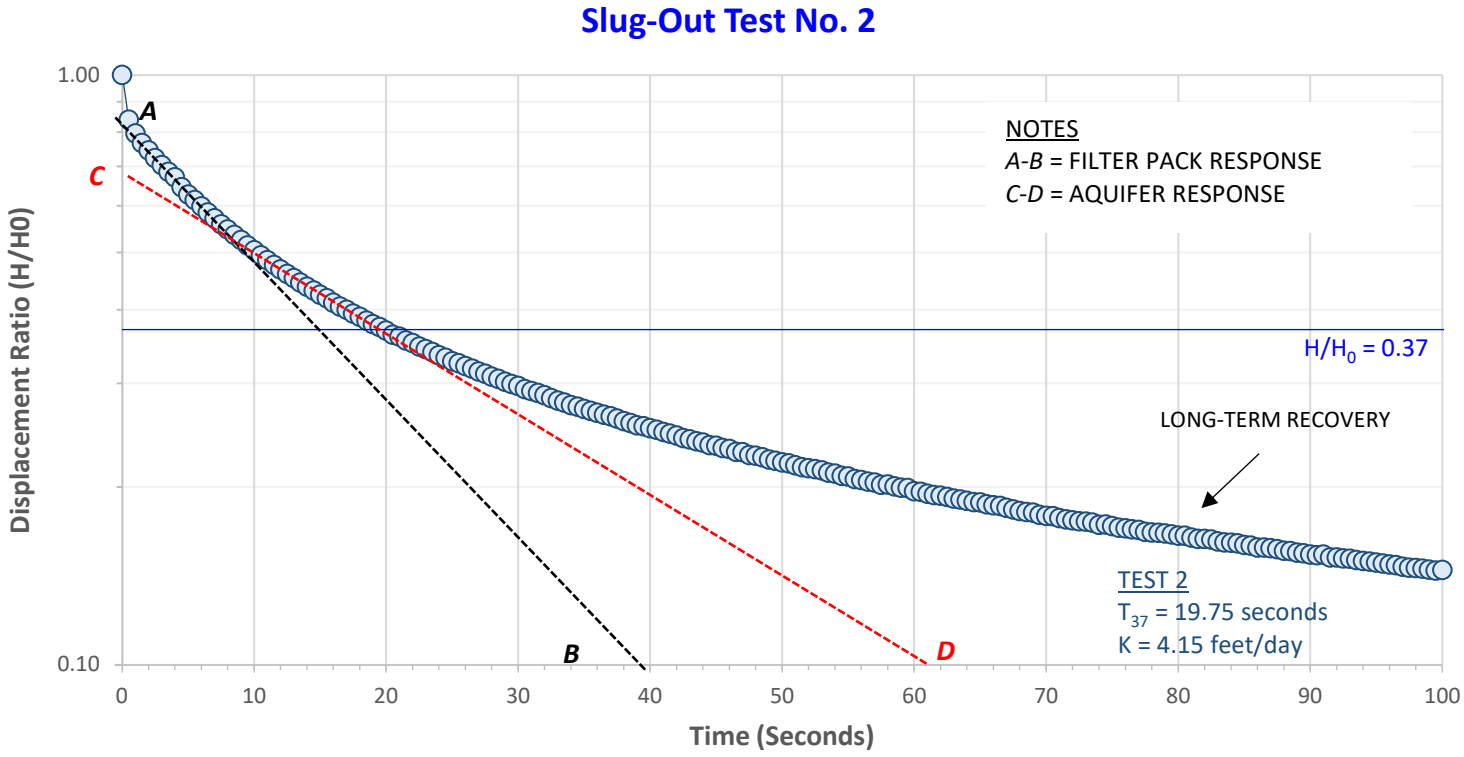
GSI Water Solutions, Inc.

Figure X
GM4-MW1 Slug-In Test Analyses
Santiam Canyon Treated Wastewater Infiltration Evaluation

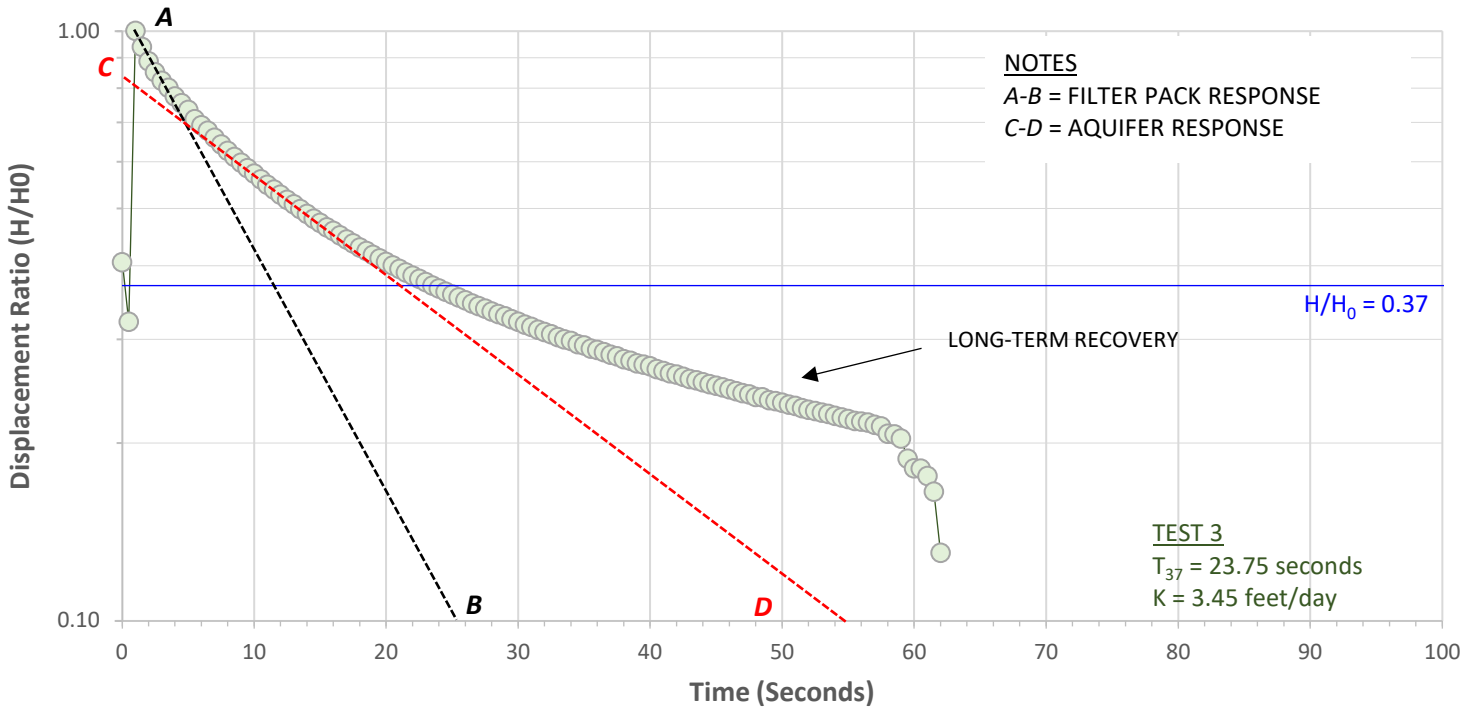
Slug-Out Test No. 1



Slug-Out Test No. 2



Slug-Out Test No. 3



GSI Water Solutions, Inc.

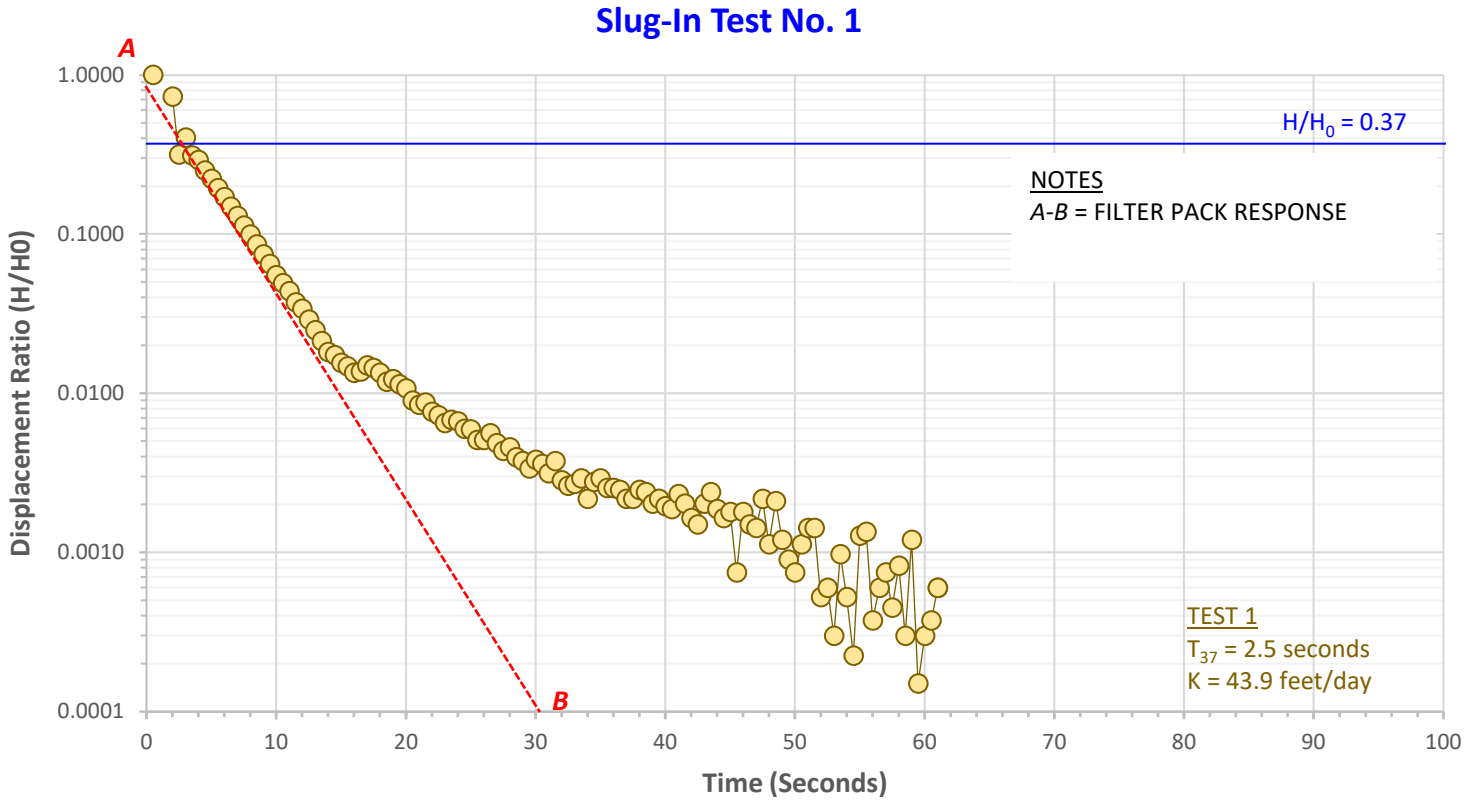
Figure X
GM4-MW1 Slug-Out Test Analyses
Santiam Canyon Treated Wastewater Infiltration Evaluation

Slug Test Results at GM5

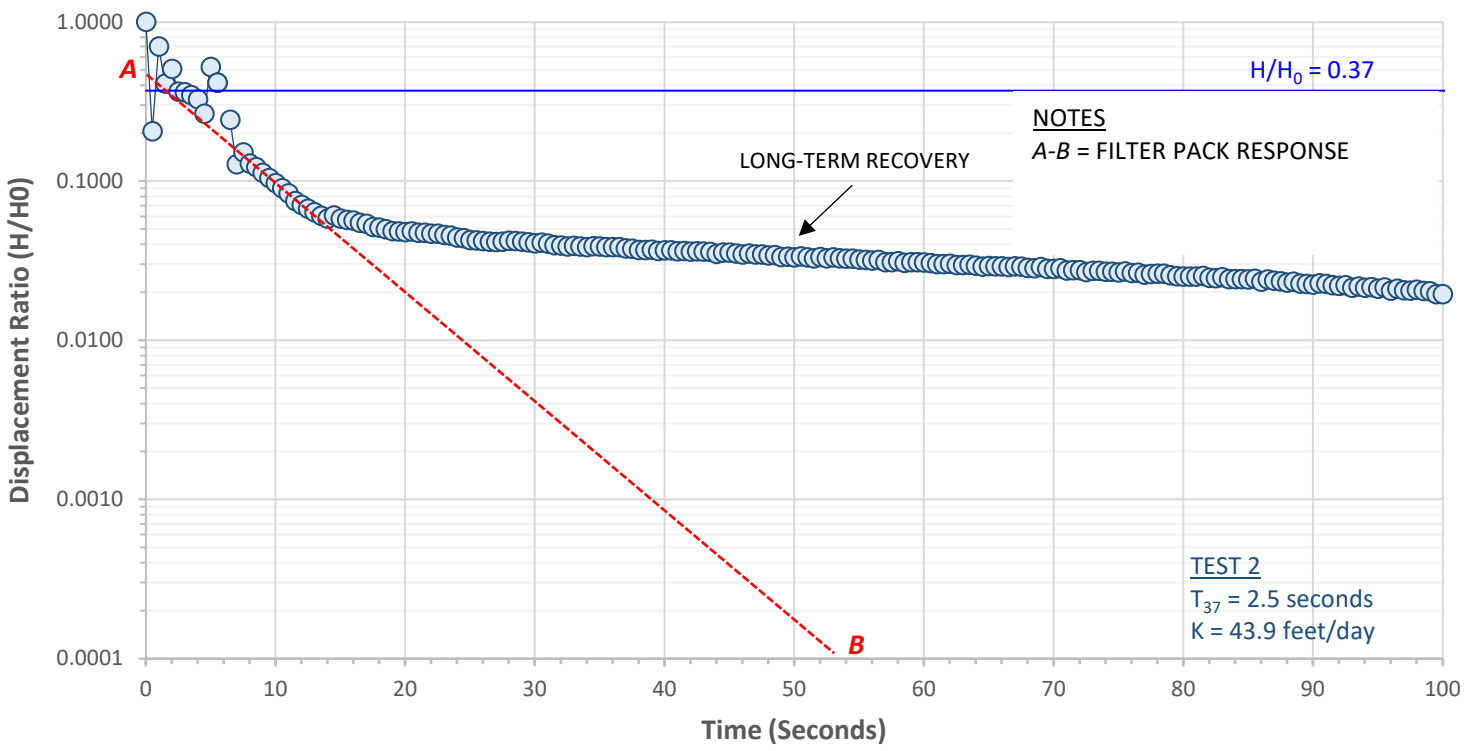
Santiam Canyon Treated Wastewater Infiltration Evaluation

	t_{37} (seconds)	K (feet/day)	Notes
MW-1, Slug In 1	2.5	43.9	Hvorslev Method
MW-1, Slug In 2	2.5	43.9	Hvorslev Method
MW-1, Slug In 3	3.5	31.4	Hvorslev Method
MW-1, Slug Out 1	3.5	31.4	Hvorslev Method
MW-1, Slug Out 2	3.5	31.4	Hvorslev Method
MW-1, Slug Out 3	5.0	22.0	Hvorslev Method
	Geomean	**33.07**	

Slug-In Test No. 1



Slug-In Test No. 2



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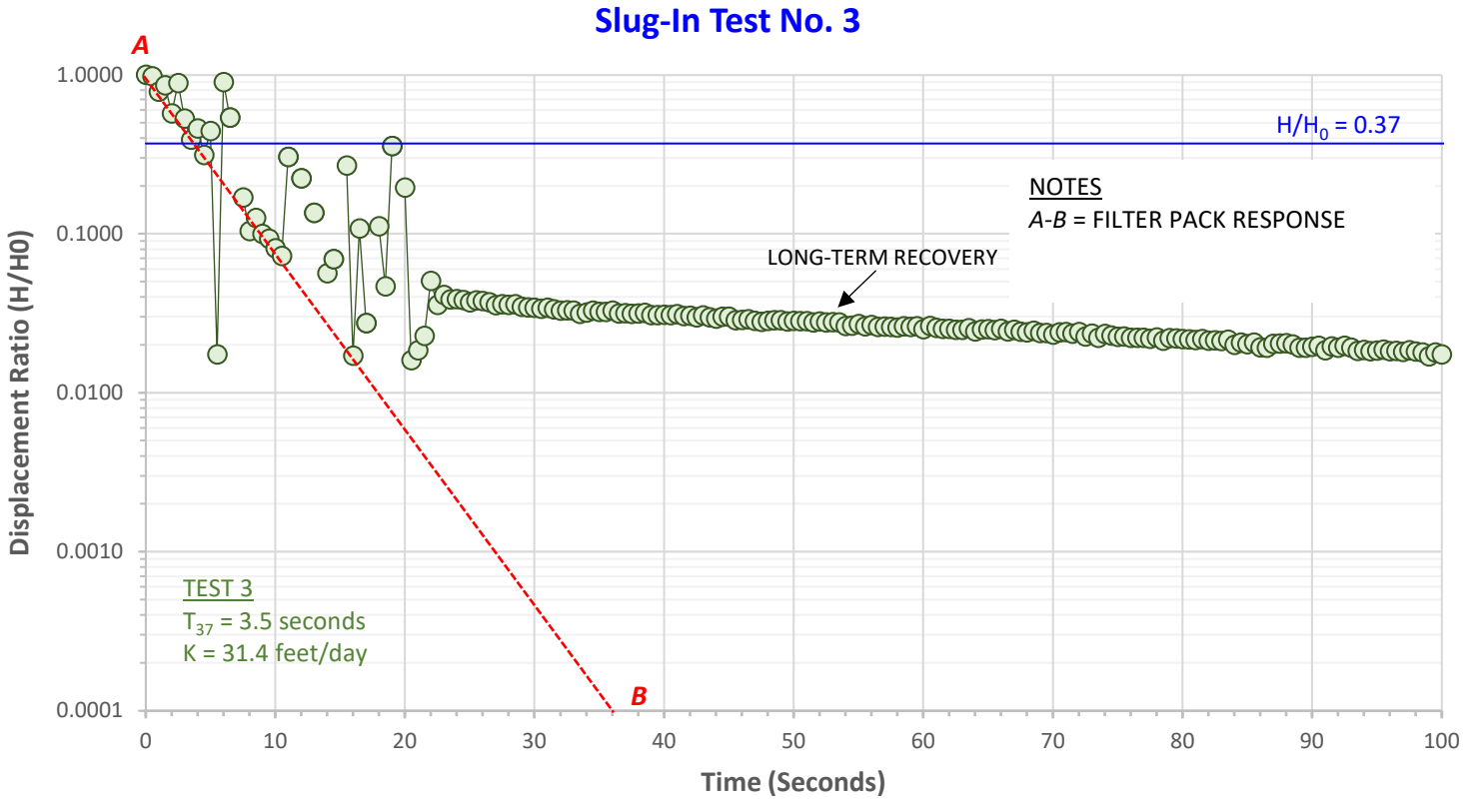
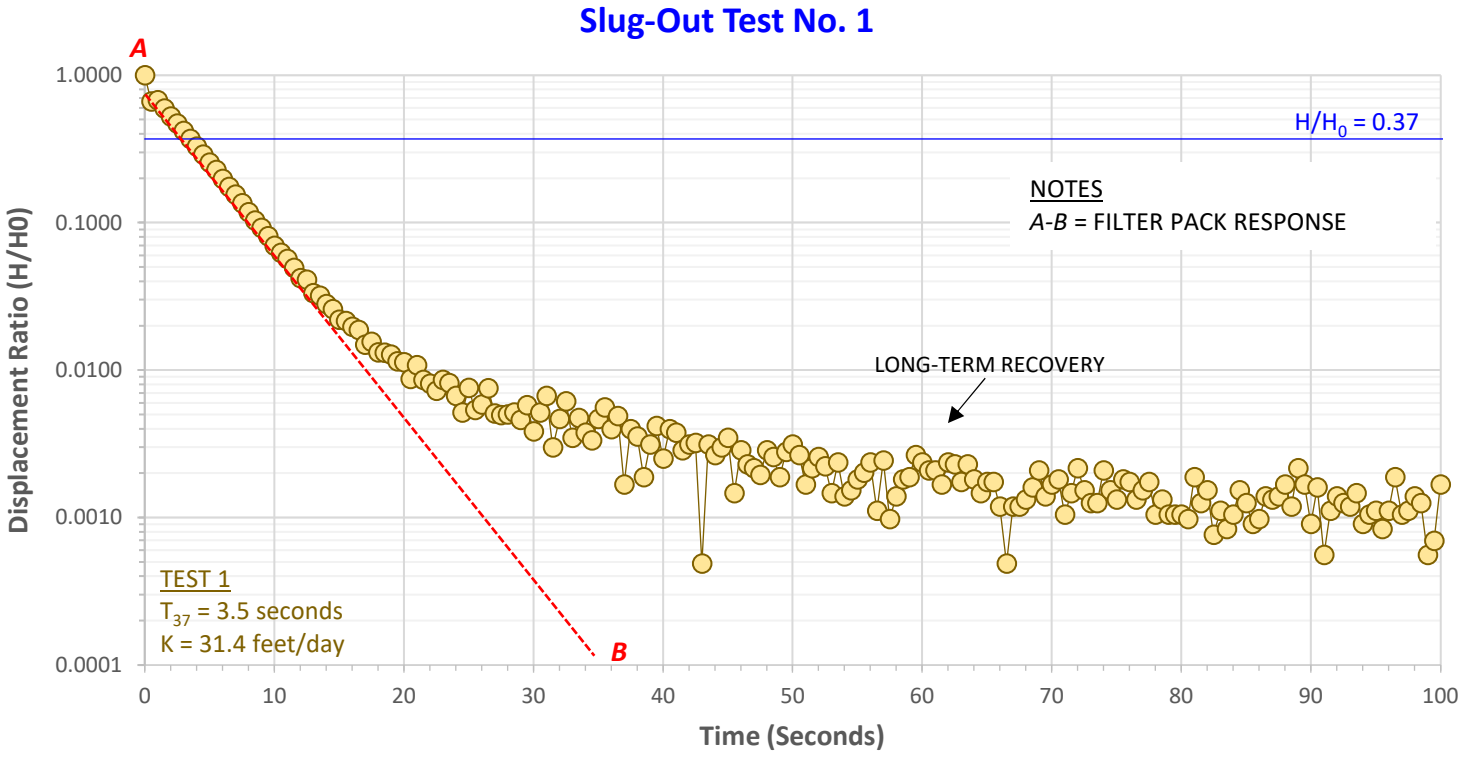


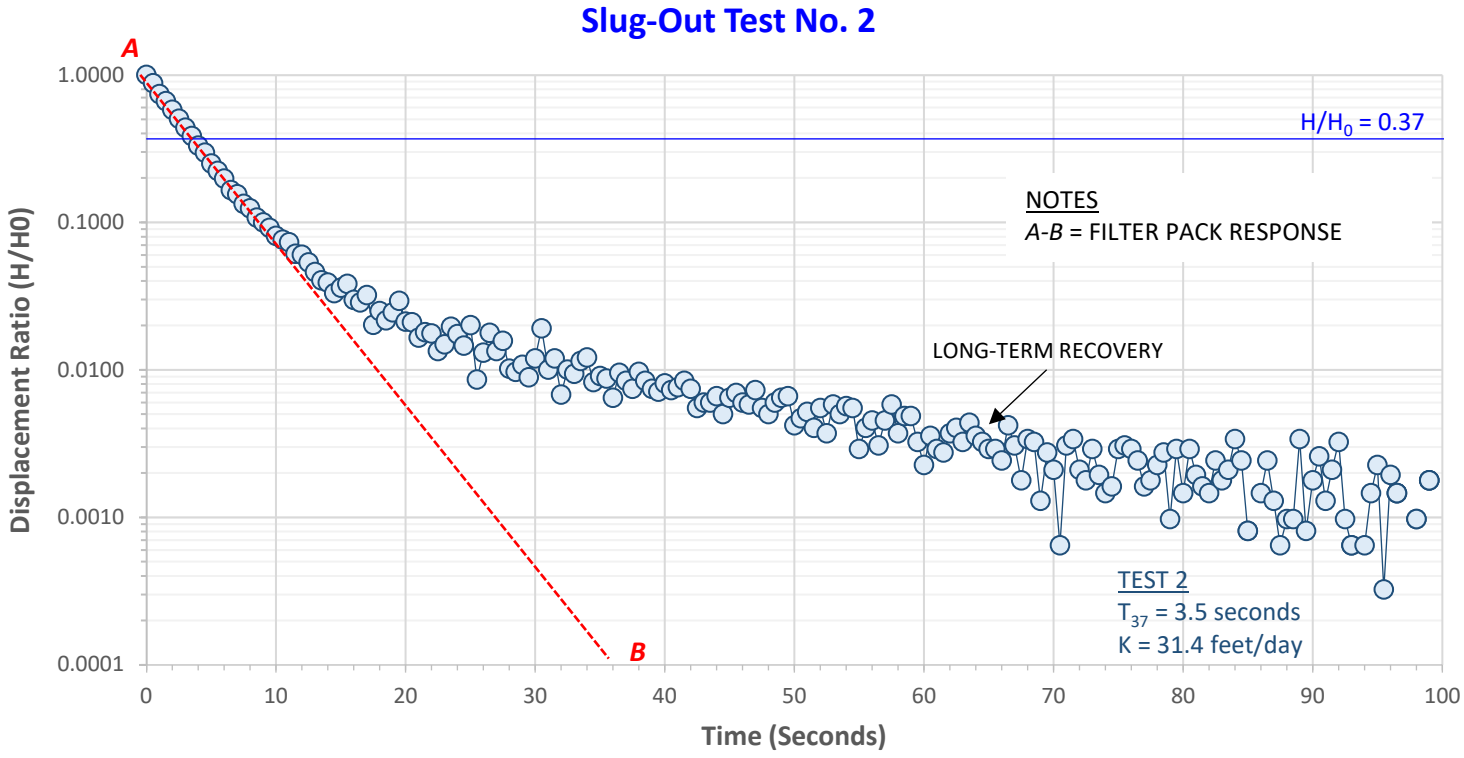
GSI Water Solutions, Inc.

Figure X
GM5-MW1 Slug-In Test Analyses
Santiam Canyon Treated Wastewater Infiltration Evaluation

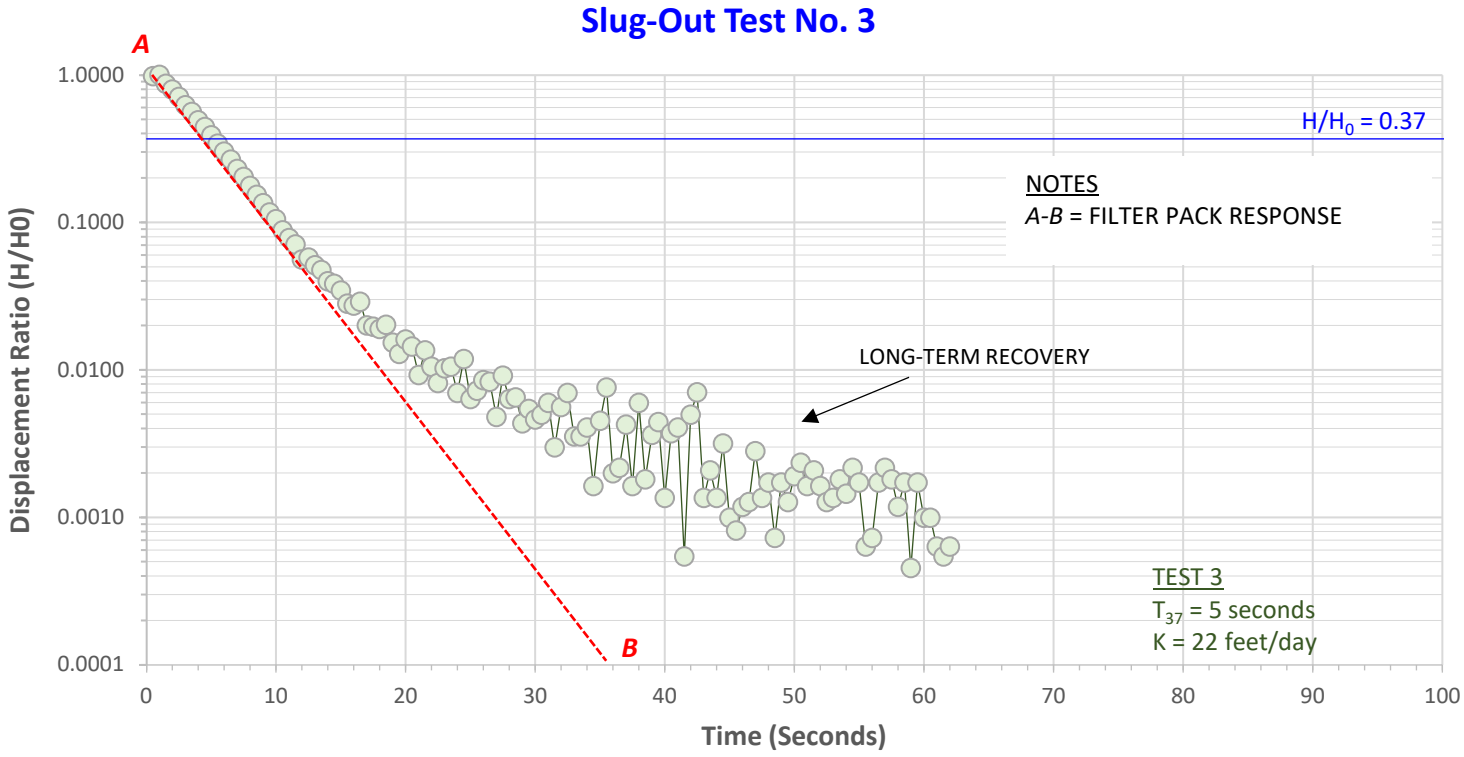
Slug-Out Test No. 1



Slug-Out Test No. 2



Slug-Out Test No. 3



GSI Water Solutions, Inc.

Figure X
GM5-MW1 Slug-Out Test Analyses
Santiam Canyon Treated Wastewater Infiltration Evaluation

ATTACHMENT D

Groundwater SDWA Analysis and Wastewater Influent Testing Laboratory Results

Burlington, WA *Corporate Laboratory (a)*
1620 S Walnut St - Burlington, WA 98233 - **800.755.9295** • 360.757.1400
Bellingham, WA *Microbiology (b)*
805 Orchard Dr Ste 4 - Bellingham, WA 98225 - 360.715.1212
Portland, OR *Microbiology/Chemistry (c)*
9725 SW Commerce Cr Ste A2 - Wilsonville, OR 97070 - 503.682.7802
Corvallis, OR *Microbiology/Chemistry (d)*
1100 NE Circle Blvd, Ste 130 - Corvallis, OR 97330 - 541.753.4946
Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: GSI Water Solutions, Inc.
55 SW Yamhill Street Ste 300
Portland, OR 97204

System Name:
System ID Number:
Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM1MW1
County:

Reference Number: 23-15512
Project: Santiam Canyon 0464.020.001 - (

Sample Number: GM1MW10523
Lab Number: 23_31092
Collect Date: 5/28/23 11:20
Date Received: 5/30/23
Report Date: 7/12/23
Sampled By: Mellisa Girbach
Sampler Phone:
Approved by: anp,bj,mcs,pap,pdk,t
Authorized by:

Thanh B Phan
Lab Manager, Portland

EPA#	ANALYTES	RESULTS	UNITS	LRL	MCL	Analyst	Lab Code*	METHOD	Analyzed	COMMENT
	CORROSIVITY									
1925	HYDROGEN ION (pH)	**6.15 H5**	pH Units			klp	4072 a	SM4500-H+ B	06/08/23 15:58	Temp (C) : 22.1
1067	ALKALINITY	**42.5**	mg CaCO3/	2		klp	4072 a	SM2320 B	06/08/23	
1910	CORROSIVITY	**-2.92**	SI			bj	4072 a	SM203	06/23/23	
	CARBONATE	**ND**	mgCaCO3/L	2		klp	4072 a	SM2320 B	06/08/23	
	BICARBONATE	**42.5**	mg CaCO3/	2		klp	4072 a	SM2320 B	06/08/23	
	HYDROXIDE	**ND**	mg CaCO3/	2		klp	4072 a	SM2320 B	06/08/23	
1067	ALKALINITY	**42.5**	mg CaCO3/	2.0		klp	4072 a	SM2320 B	06/08/23	
1024	CYANIDE	**ND**	mg/L	0.005	**0.2**	tjb	4072 a	D7511-12	06/07/23	
	TOTAL DISSOLVED SOLIDS	**78**	mg/L	10	**500**	mso	4072 a	SM2540 C	06/13/23	
1020	CHROMIUM	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1075	BERYLLIUM	**ND**	mg/L	0.0003		tjb	4072 a	200.8	06/02/23	
1041	NITRITE-N	**ND H3**	mg/L	0.01	**1.0**	anl	OR100063 c	SM4500-NO3 F	05/30/23 16:41	
1005	ARSENIC	**ND**	mg/L	0.0005		tjb	4072 a	200.8	06/02/23	
1045	SELENIUM	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1050	SILVER	**ND**	mg/L	0.0002		tjb	4072 a	200.8	06/02/23	
1015	CADMIUM	**ND**	mg/L	0.00025		tjb	4072 a	200.8	06/02/23	
1074	ANTIMONY	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1040	NITRATE-N	**1.10 H3**	mg/L	0.005	**10**	anl	OR100063 c	SM4500-NO3 F	05/30/23 16:41	
1010	BARIUM	**0.0035**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1030	LEAD	**0.00027 J**	mg/L	0.0005		tjb	4072 a	200.8	06/20/23	
1035	MERCURY	**ND**	mg/L	0.0002		tjb	4072 a	245.1	06/13/23	
	HARDNESS	**39.4**	mg CaCO3/	10		bj	4072 a	200.7	06/05/23	

NOTES:
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting limit (LRL).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.

If you have any questions concerning this report contact us at the above phone number.

FORM: cIOC OR.rpt

ANALYTICAL

Burlington, WA *Corporate Laboratory (a)*
1620 S Walnut St - Burlington, WA 98233 - **800.755.9295** • 360.757.1400

Bellingham, WA *Microbiology (b)*
805 Orchard Dr Ste 4 - Bellingham, WA 98225 - 360.715.1212

Portland, OR *Microbiology/Chemistry (c)*
9725 SW Commerce Cr Ste A2 - Wilsonville, OR 97070 - 503.682.7802

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1100 NE Circle Blvd, Ste 130 - Corvallis, OR 97330 - 541.753.4946

Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: GSI Water Solutions, Inc.
55 SW Yamhill Street Ste 300
Portland, OR 97204

System Name:
System ID Number:
Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM1MW1
County:

Reference Number: 23-15512
Project: Santiam Canyon 0464.020.001 - (

Sample Number: GM1MW10523
Lab Number: 23_31092
Collect Date: 5/28/23 11:20
Date Received: 5/30/23
Report Date: 7/12/23
Sampled By: Mellisa Girbach
Sampler Phone:
Approved by: anp,bj,mcs,pap,pdk,t
Authorized by:

Thanh B Phan
Lab Manager, Portland

EPA#	ANALYTES	RESULTS	UNITS	LRL	MCL	Analyst	Lab Code*	METHOD	Analyzed	COMMENT
	SILICA	**30.0**	mg/L	0.05		bj	4072 a	200.7	06/05/23	
	TOTAL SUSPENDED SOLIDS	**11.5 NN**	mg/L	2		pap	OR100063 c	I-3765-85	06/01/23	
1032	MANGANESE	**0.0776**	mg/L	0.001		bj	4072 a	200.7	06/05/23	
1028	IRON	**0.62**	mg/L	0.050		bj	4072 a	200.7	06/05/23	
1002	ALUMINUM	**0.52**	mg/L	0.010		bj	4072 a	200.7	06/05/23	
1036	NICKEL	**0.00086 J**	mg/L	0.0005		tjb	4072 a	200.8	06/02/23	
1022	COPPER	**0.0020**	mg/L	0.002		tjb	4072 a	200.8	06/02/23	
1095	ZINC	**0.0033**	mg/L	0.0025		tjb	4072 a	200.8	06/02/23	
	FLUORIDE	**ND**	mg/L	0.10	**4**	jwn	4072 a	300.0	06/01/23	
1016	CALCIUM	**10.5**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1052	SODIUM	**3.8**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1031	MAGNESIUM	**3.2**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1042	POTASSIUM	**2.6**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1017	CHLORIDE	**1.4**	mg/L	0.2		jwn	4072 a	300.0	06/01/23	
	MOLYBDENUM	**0.00062**	mg/L	0.001		tjb	4072 a	200.8	06/20/23	
1085	THALLIUM	**ND**	mg/L	0.0001		tjb	4072 a	200.8	06/02/23	
1055	SULFATE	**1.6**	mg/L	0.2		jwn	4072 a	300.0	06/01/23	
	Radiological									
4006	URANIUM	**ND**	mg/L	0.001	**0.030**	tjb	4072 a	200.8	06/02/23	
4000	GROSS ALPHA	**ND**	pCi/L	3	**15**	reh1	156	900.0	06/30/23	Analyzed by PacePA
4100	GROSS BETA	**ND**	pCi/L	4	**50**	reh1	156	900.0	06/30/23	Analyzed by PacePA
	Radium 226	**ND**	pCi/L	1		jlj		903.1	06/28/23	Analyzed by PacePA
	Radium 228	**ND**	pCi/L	1	**5**	val		904.0	06/23/23	Analyzed by PacePA

NOTES:
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting limit (LRL).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.

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FORM: cIOC OR.rpt

ANALYTICAL

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Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

ORGANICS IN DRINKING WATER

Client Name: GSI Water Solutions, Inc.
55 SW Yamhill Street Ste 300
Portland, OR 97204

Reference Number: 23-15512
Project: Santiam Canyon 0464.020.001 -

System Name:
System ID Number:
DWP Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Composition:
Sample Location: GM1MW1
County:

Field ID: GM1MW10523
Lab Number: 23_31092
Date Collected: 5/28/23 11:20
Sampled By: Mellisa Girbach
Sampler Phone:
Report Date: 7/12/23
Approved By: nml,pdm

Authorized By:

Thanh B Phan
Lab Manager, Portland

EPA#	COMPOUNDS	RESULTS	UNITS	LRL	MCL	METHOD	Analyst	Lab	Analyzed	COMMENT
	Synthetic Organic Chemicals									
2105	2,4 - D	**ND**	mg/L	0.0001	0.070	515.4	BFR	4072	06/09/23	
2110	2,4,5 - TP (SILVEX)	**ND**	mg/L	0.0001	0.050	515.4	BFR	4072	06/09/23	
2035	DI(2-ETHYLHEXYL)-ADIPATE	**ND**	mg/L	0.00005	0.400	525.2	MA	4072	06/30/23	
2051	ALACHLOR	**ND**	mg/L	0.00005	0.002	525.2	MA	4072	06/30/23	
2050	ATRAZINE	**ND**	mg/L	0.00005	0.003	525.2	MA	4072	06/30/23	
2306	BENZO(A)PYRENE	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2010	LINDANE (BHC - GAMMA)	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2046	CARBOFURAN	**ND**	mg/L	0.001	0.040	531.2	MA	4072	06/21/23	
2959	CHLORDANE	**ND**	mg/L	0.0001	0.002	508.1	MA	4072	06/22/23	
2031	DALAPON	**ND**	mg/L	0.0005	0.200	515.4	BFR	4072	06/09/23	
2931	1,2-DIBROMO-3-CHLOROPROPANE	**ND**	mg/L	0.00002	0.0002	504.1	MA	4072	06/07/23	
2041	DINOSEB	**ND**	mg/L	0.0001	0.007	515.4	BFR	4072	06/09/23	
2032	DIQUAT	**ND**	mg/L	0.0004	0.020	549.2	KRC	4072	06/07/23	
2033	ENDOTHALL	**ND**	mg/L	0.005	0.100	548.1	MA	4072	06/14/23	
2005	ENDRIN	**ND**	mg/L	0.00005	0.002	525.2	MA	4072	06/30/23	
2946	1,2 - DIBROMOETHANE (EDB)	**ND**	mg/L	0.00002	0.00005	504.1	MA	4072	06/07/23	
2034	GLYPHOSATE	**ND**	mg/L	0.005	0.700	547	MA	4072	06/20/23	
2067	HEPTACHLOR EPOXIDE "B"	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2065	HEPTACHLOR	**ND**	mg/L	0.00005	0.0004	525.2	MA	4072	06/30/23	
2274	HEXACHLOROBENZENE	**ND**	mg/L	0.00005	0.001	525.2	MA	4072	06/30/23	
2042	HEXACHLOROCYCLO-PENTADIENE	**ND**	mg/L	0.00005	0.050	525.2	MA	4072	06/30/23	
2015	METHOXYCHLOR	**ND**	mg/L	0.00005	0.040	525.2	MA	4072	06/30/23	
2326	PENTACHLOROPHENOL	**ND**	mg/L	0.00004	0.001	515.4	BFR	4072	06/09/23	
2039	DI(2-ETHYLHEXYL)-PHTHALATE	**ND**	mg/L	0.0001	0.006	525.2	MA	4072	06/30/23	
2040	PICLORAM	**ND**	mg/L	0.0001	0.500	515.4	BFR	4072	06/09/23	
2037	SIMAZINE	**ND**	mg/L	0.00005	0.004	525.2	MA	4072	06/30/23	
2020	TOXAPHENE	**ND**	mg/L	0.001	0.003	508.1	MA	4072	06/22/23	
2036	OXAMYL (VYDATE)	**ND**	mg/L	0.001	0.200	531.2	MA	4072	06/21/23	
2383	PCBS (Total Aroclors)	**ND**	mg/L	0.0002	0.0005	508.1	MA	4072	06/22/23	

NOTES:
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; a blank MCL value indicates a level is not currently established.
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting Limit (LRL).

If you have any questions concerning this report contact Thanh B Phan at the above phone number.
FORM: SOC_OR

EDGE ANALYTICAL

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NELAP ACCREDITED TNI LABORATORY
ORELAP 4072
Idaho WA00097

VOLATILE ORGANIC COMPOUNDS (VOC) REPORT

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

Reference Number: 23-22395
Project: Santiam Canyon Infiltration Eval

System Name:
System ID Number:
DWP Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM1-MW1
County:
Sampled By: Jesse Hall
Sampler Phone:

Field ID: GM1
Lab Number: 23_44385
Date Collected: 7/25/23 11:00
Date Extracted: 524_230728
Date Analyzed: 07/28/23
Report Date: 8/4/23
Analyst: NML
Approved By: pdm

Authorized By:

Thanh B Phan
Lab Manager, Portland

EPA#	COMPOUNDS	RESULTS	UNITS	LRL	MCL	Method	Lab Code*	COMMENT
	EPA/State Regulated							
2977	1,1 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.007	524.2	4072 a	
2981	1,1,1 - TRICHLOROETHANE	**ND**	mg/L	0.0005	0.200	524.2	4072 a	
2985	1,1,2 - TRICHLOROETHANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2980	1,2 - DICHLOROETHANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2983	1,2 - DICHLOROPROPANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2378	1,2,4 - TRICHLOROBENZENE	**ND**	mg/L	0.0005	0.070	524.2	4072 a	
2990	BENZENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2982	CARBON TETRACHLORIDE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2989	CHLOROBENZENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2380	CIS - 1,2 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.070	524.2	4072 a	
2992	ETHYLBENZENE	**ND**	mg/L	0.0005	0.700	524.2	4072 a	
2964	METHYLENE CHLORIDE (Dichlorometha	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2968	O - DICHLOROBENZENE	**ND**	mg/L	0.0005	0.600	524.2	4072 a	
2969	P - DICHLOROBENZENE	**ND**	mg/L	0.0005	0.075	524.2	4072 a	
2996	STYRENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2979	T - 1,2 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2987	TETRACHLOROETHYLENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2991	TOLUENE	**ND**	mg/L	0.0005	1.0	524.2	4072 a	
2955	TOTAL XYLENES	**ND**	mg/L	0.0005	10.0	524.2	4072 a	
2984	TRICHLOROETHYLENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2976	VINYL CHLORIDE	**ND**	mg/L	0.0005	0.002	524.2	4072 a	

NOTES:
If a compound is detected > or = to the Lower Reporting Level, LRL, specified increased monitoring frequencies may occur per PHD.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA. Blank MCL value indicates a level is not currently established.
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting Limit (LRL).
* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.
An * in front of the parameter name indicates it is not NELAP accredited but it is accredited through WSDOH or USEPA Region 10.
These test results meet all the requirements of NELAP, unless otherwise stated in writing, and relate only to these samples. Estimates of uncertainty are not included in this report. If this information is required please contact us at the phone number listed in the report header.
If you have any questions concerning this report contact our office at the above phone number.
FORM: cVOC OR.rpt

EDGE ANALYTICAL

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Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

System Name:
System ID Number:
Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM4MW1
County:

Reference Number: 23-15516
Project: Santiam Canyon 0464.020.001 - (

Sample Number: GM4MW10523
Lab Number: 23_31097
Collect Date: 5/29/23 14:55
Date Received: 5/30/23
Report Date: 7/12/23
Sampled By: Mellisa Girbach
Sampler Phone:
Approved by: anp,bj,mcs,pap,pdk,t
Authorized by:

Thanh B Phan
Lab Manager, Portland

EPA#	ANALYTES	RESULTS	UNITS	LRL	MCL	Analyst	Lab Code*	METHOD	Analyzed	COMMENT
	CORROSIVITY									
1925	HYDROGEN ION (pH)	**7.15 H5**	pH Units			klp	4072 a	SM4500-H+ B	06/08/23 16:01	Temp (C) : 22.0
1067	ALKALINITY	**114**	mg CaCO3/	5		klp	4072 a	SM2320 B	06/08/23	
1910	CORROSIVITY	**-1.25**	SI			bj	4072 a	SM203	06/23/23	
	CARBONATE	**ND**	mgCaCO3/L	5		klp	4072 a	SM2320 B	06/08/23	
	BICARBONATE	**114**	mg CaCO3/	5		klp	4072 a	SM2320 B	06/08/23	
	HYDROXIDE	**ND**	mg CaCO3/	5		klp	4072 a	SM2320 B	06/08/23	
1067	ALKALINITY	**114**	mg CaCO3/	5.0		klp	4072 a	SM2320 B	06/08/23	
1024	CYANIDE	**ND**	mg/L	0.005	**0.2**	tjb	4072 a	D7511-12	06/07/23	
	TOTAL DISSOLVED SOLIDS	**147**	mg/L	10	**500**	mso	046 a	SM2540 C	06/13/23	
1020	CHROMIUM	**0.0019**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1075	BERYLLIUM	**ND**	mg/L	0.0003		tjb	4072 a	200.8	06/02/23	
1041	NITRITE-N	**ND**	mg/L	0.01	**1.0**	anl	OR100063 c	SM4500-NO3 F	05/30/23 16:48	
1005	ARSENIC	**0.0017**	mg/L	0.0005		tjb	4072 a	200.8	06/02/23	
1045	SELENIUM	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1050	SILVER	**ND**	mg/L	0.0002		tjb	4072 a	200.8	06/02/23	
1015	CADMIUM	**0.00019 J**	mg/L	0.00025		tjb	4072 a	200.8	06/02/23	
1074	ANTIMONY	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1040	NITRATE-N	**0.02**	mg/L	0.005	**10**	anl	OR100063 c	SM4500-NO3 F	05/30/23 16:48	
1010	BARIUM	**0.0211**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1030	LEAD	**0.00087**	mg/L	0.0005		tjb	4072 a	200.8	06/20/23	
1035	MERCURY	**ND**	mg/L	0.0002		tjb	4072 a	245.1	06/13/23	
	HARDNESS	**99.6**	mg CaCO3/	10		bj	4072 a	200.7	06/05/23	

NOTES:
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting limit (LRL).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.

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INORGANIC COMPOUNDS (IOC) REPORT

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

System Name:
System ID Number:
Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM4MW1
County:

Reference Number: 23-15516
Project: Santiam Canyon 0464.020.001 - (

Sample Number: GM4MW10523
Lab Number: 23_31097
Collect Date: 5/29/23 14:55
Date Received: 5/30/23
Report Date: 7/12/23
Sampled By: Mellisa Girbach
Sampler Phone:
Approved by: anp,bj,mcs,pap,pdk,t
Authorized by:

Thanh B Phan
Lab Manager, Portland

EPA#	ANALYTES	RESULTS	UNITS	LRL	MCL	Analyst	Lab Code*	METHOD	Analyzed	COMMENT
	SILICA	**58.2**	mg/L	0.05		bj	4072 a	200.7	06/05/23	
	TOTAL SUSPENDED SOLIDS	**84 NN**	mg/L	2		pap		I-3765-85	06/01/23	
1032	MANGANESE	**0.449**	mg/L	0.001		bj	4072 a	200.7	06/05/23	
1028	IRON	**3.63**	mg/L	0.050		bj	4072 a	200.7	06/05/23	
1002	ALUMINUM	**3.80**	mg/L	0.010		bj	4072 a	200.7	06/05/23	
1036	NICKEL	**0.0043**	mg/L	0.0005		tjb	4072 a	200.8	06/02/23	
1022	COPPER	**0.0367**	mg/L	0.002		tjb	4072 a	200.8	06/02/23	
1095	ZINC	**0.0087**	mg/L	0.0025		tjb	4072 a	200.8	06/02/23	
	FLUORIDE	**ND**	mg/L	0.10	**4**	jwn	4072 a	300.0	06/07/23	
1016	CALCIUM	**18.6**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1052	SODIUM	**9.4**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1031	MAGNESIUM	**12.9**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1042	POTASSIUM	**1.8**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1017	CHLORIDE	**2.1**	mg/L	0.2		jwn	4072 a	300.0	06/07/23	
	MOLYBDENUM	**0.00078 J**	mg/L	0.001		tjb	4072 a	200.8	06/20/23	
1085	THALLIUM	**ND**	mg/L	0.0001		tjb	4072 a	200.8	06/02/23	
1055	SULFATE	**0.9**	mg/L	0.4		jwn	4072 a	300.0	06/07/23	
	Radiological									
4006	URANIUM	**ND**	mg/L	0.001	**0.030**	tjb	4072 a	200.8	06/02/23	
4000	GROSS ALPHA	**ND**	pCi/L	3	**15**	reh1	156	900.0	06/30/23	Analyzed by PacePA
4100	GROSS BETA	**ND**	pCi/L	4	**50**	reh1	156	900.0	06/30/23	Analyzed by PacePA
	Radium 226	**ND**	pCi/L	1		jlj		903.1	06/28/23	Analyzed by PacePA
	Radium 228	**ND**	pCi/L	1	**5**	val		904.0	06/23/23	Analyzed by PacePA

NOTES:
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting limit (LRL).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
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ORGANICS IN DRINKING WATER

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

Reference Number: 23-15516
Project: Santiam Canyon 0464.020.001 -

System Name:
System ID Number:
DWP Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Composition:
Sample Location: GM4MW1
County:

Field ID: GM4MW10523
Lab Number: 23_31097
Date Collected: 5/29/23 14:55
Sampled By: Mellisa Girbach
Sampler Phone:
Report Date: 7/12/23
Approved By: nml,pdm

Authorized By:

Thanh B Phan
Lab Manager, Portland

EPA#	COMPOUNDS	RESULTS	UNITS	LRL	MCL	METHOD	Analyst	Lab	Analyzed	COMMENT
	Synthetic Organic Chemicals									
2105	2,4 - D	**ND**	mg/L	0.0001	0.070	515.4	BFR	4072	06/09/23	
2110	2,4,5 - TP (SILVEX)	**ND**	mg/L	0.0001	0.050	515.4	BFR	4072	06/09/23	
2035	DI(2-ETHYLHEXYL)-ADIPATE	**ND**	mg/L	0.00005	0.400	525.2	MA	4072	06/30/23	
2051	ALACHLOR	**ND**	mg/L	0.00005	0.002	525.2	MA	4072	06/30/23	
2050	ATRAZINE	**ND**	mg/L	0.00005	0.003	525.2	MA	4072	06/30/23	
2306	BENZO(A)PYRENE	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2010	LINDANE (BHC - GAMMA)	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2046	CARBOFURAN	**ND**	mg/L	0.001	0.040	531.2	MA	4072	06/21/23	
2959	CHLORDANE	**ND**	mg/L	0.0001	0.002	508.1	MA	4072	06/22/23	
2031	DALAPON	**ND**	mg/L	0.0005	0.200	515.4	BFR	4072	06/09/23	
2931	1,2-DIBROMO-3-CHLOROPROPANE	**ND**	mg/L	0.00002	0.0002	504.1	MA	4072	06/07/23	
2041	DINOSEB	**ND**	mg/L	0.0001	0.007	515.4	BFR	4072	06/09/23	
2032	DIQUAT	**ND**	mg/L	0.0004	0.020	549.2	KRC	4072	06/07/23	
2033	ENDOTHALL	**ND**	mg/L	0.005	0.100	548.1	MA	4072	06/05/23	
2005	ENDRIN	**ND**	mg/L	0.00005	0.002	525.2	MA	4072	06/30/23	
2946	1,2 - DIBROMOETHANE (EDB)	**ND**	mg/L	0.00002	0.00005	504.1	MA	4072	06/07/23	
2034	GLYPHOSATE	**ND**	mg/L	0.005	0.700	547	MA	4072	07/03/23	
2067	HEPTACHLOR EPOXIDE "B"	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2065	HEPTACHLOR	**ND**	mg/L	0.00005	0.0004	525.2	MA	4072	06/30/23	
2274	HEXACHLOROBENZENE	**ND**	mg/L	0.00005	0.001	525.2	MA	4072	06/30/23	
2042	HEXACHLOROCYCLO-PENTADIENE	**ND**	mg/L	0.00005	0.050	525.2	MA	4072	06/30/23	
2015	METHOXYCHLOR	**ND**	mg/L	0.00005	0.040	525.2	MA	4072	06/30/23	
2326	PENTACHLOROPHENOL	**ND**	mg/L	0.00004	0.001	515.4	BFR	4072	06/09/23	
2039	DI(2-ETHYLHEXYL)-PHTHALATE	**ND**	mg/L	0.0001	0.006	525.2	MA	4072	06/30/23	
2040	PICLORAM	**ND**	mg/L	0.0001	0.500	515.4	BFR	4072	06/09/23	
2037	SIMAZINE	**ND**	mg/L	0.00005	0.004	525.2	MA	4072	06/30/23	
2020	TOXAPHENE	**ND**	mg/L	0.001	0.003	508.1	MA	4072	06/22/23	
2036	OXAMYL (VYDATE)	**ND**	mg/L	0.001	0.200	531.2	MA	4072	06/21/23	
2383	PCBS (Total Aroclors)	**ND**	mg/L	0.0002	0.0005	508.1	MA	4072	06/22/23	

NOTES:
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; a blank MCL value indicates a level is not currently established.
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting Limit (LRL).

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FORM: SOC_OR

ANALYTICAL

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Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

ORELAP 4072
Idaho WA00097

VOLATILE ORGANIC COMPOUNDS (VOC) REPORT

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

Reference Number: 23-15516
Project: Santiam Canyon 0464.020.001 -

System Name:
System ID Number:
DWP Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM4MW1
County:
Sampled By: Mellisa Girbach
Sampler Phone:

Field ID: GM4MW10523
Lab Number: 23_31097
Date Collected: 5/29/23 14:55
Date Extracted: 524_230605
Date Analyzed: 06/05/23
Report Date: 7/12/23
Analyst: NML
Approved By: pdm

Authorized By:

Thanh B Phan
Lab Manager, Portland

EPA#	COMPOUNDS	RESULTS	UNITS	LRL	MCL	Method	Lab Code*	COMMENT
	EPA/State Regulated							
2977	1,1 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.007	524.2	4072 a	
2981	1,1,1 - TRICHLOROETHANE	**ND**	mg/L	0.0005	0.200	524.2	4072 a	
2985	1,1,2 - TRICHLOROETHANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2980	1,2 - DICHLOROETHANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2983	1,2 - DICHLOROPROPANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2378	1,2,4 - TRICHLOROBENZENE	**ND**	mg/L	0.0005	0.070	524.2	4072 a	
2990	BENZENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2982	CARBON TETRACHLORIDE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2989	CHLOROBENZENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2380	CIS - 1,2 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.070	524.2	4072 a	
2992	ETHYLBENZENE	**ND**	mg/L	0.0005	0.700	524.2	4072 a	
2964	METHYLENE CHLORIDE (Dichlorometha	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2968	O - DICHLOROBENZENE	**ND**	mg/L	0.0005	0.600	524.2	4072 a	
2969	P - DICHLOROBENZENE	**ND**	mg/L	0.0005	0.075	524.2	4072 a	
2996	STYRENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2979	T - 1,2 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2987	TETRACHLOROETHYLENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2991	TOLUENE	**ND**	mg/L	0.0005	1.0	524.2	4072 a	
2955	TOTAL XYLENES	**ND**	mg/L	0.0005	10.0	524.2	4072 a	
2984	TRICHLOROETHYLENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2976	VINYL CHLORIDE	**ND**	mg/L	0.0005	0.002	524.2	4072 a	

NOTES:
If a compound is detected > or = to the Lower Reporting Level, LRL, specified increased monitoring frequencies may occur per PHD.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA. Blank MCL value indicates a level is not currently established.
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting Limit (LRL).
* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.

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Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

System Name:
System ID Number:
Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM5MW1
County:

Reference Number: 23-15521
Project: Santiam Canyon 0464.020.001 - (

Sample Number: GM5MW10523
Lab Number: 23_31106
Collect Date: 5/30/23 13:20
Date Received: 5/30/23
Report Date: 7/12/23
Sampled By: Mellisa Girbach
Sampler Phone:
Approved by: anp,bj,mcs,pap,pdk,t
Authorized by:

Thanh B Phan
Lab Manager, Portland

EPA#	ANALYTES	RESULTS	UNITS	LRL	MCL	Analyst	Lab Code*	METHOD	Analyzed	COMMENT
	CORROSIVITY									
1925	HYDROGEN ION (pH)	**7.06 H5**	pH Units			klp	4072 a	SM4500-H+ B	06/08/23 16:04	Temp (C) : 22.7
1067	ALKALINITY	**41.4**	mg CaCO3/	2		klp	4072 a	SM2320 B	06/08/23	
1910	CORROSIVITY	**-2.08**	SI			bj	4072 a	SM203	06/23/23	
	CARBONATE	**ND**	mgCaCO3/L	2		klp	4072 a	SM2320 B	06/08/23	
	BICARBONATE	**41.4**	mg CaCO3/	2		klp	4072 a	SM2320 B	06/08/23	
	HYDROXIDE	**ND**	mg CaCO3/	2		klp	4072 a	SM2320 B	06/08/23	
1067	ALKALINITY	**41.4**	mg CaCO3/	2.0		klp	4072 a	SM2320 B	06/08/23	
1024	CYANIDE	**ND**	mg/L	0.005	**0.2**	tjb	4072 a	D7511-12	06/07/23	
	TOTAL DISSOLVED SOLIDS	**84**	mg/L	10	**500**	mso	4072 a	SM2540 C	06/13/23	
1020	CHROMIUM	**0.0032**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1075	BERYLLIUM	**ND**	mg/L	0.0003		tjb	4072 a	200.8	06/02/23	
1041	NITRITE-N	**ND**	mg/L	0.01	**1.0**	anl	OR100063 c	SM4500-NO3 F	05/30/23 16:49	
1005	ARSENIC	**0.00095**	mg/L	0.0005		tjb	4072 a	200.8	06/02/23	
1045	SELENIUM	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1050	SILVER	**ND**	mg/L	0.0002		tjb	4072 a	200.8	06/02/23	
1015	CADMIUM	**ND**	mg/L	0.00025		tjb	4072 a	200.8	06/02/23	
1074	ANTIMONY	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1040	NITRATE-N	**0.46**	mg/L	0.005	**10**	anl	OR100063 c	SM4500-NO3 F	05/30/23 16:49	
1010	BARIUM	**0.0120**	mg/L	0.001		tjb	4072 a	200.8	06/02/23	
1030	LEAD	**0.00060**	mg/L	0.0005		tjb	4072 a	200.8	06/20/23	
1035	MERCURY	**ND**	mg/L	0.0002		tjb	4072 a	245.1	06/13/23	
	HARDNESS	**36.3**	mg CaCO3/	10		bj	4072 a	200.7	06/05/23	

NOTES:
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FORM: cIOC OR.rpt

EDGE ANALYTICAL

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INORGANIC COMPOUNDS (IOC) REPORT

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

System Name:
System ID Number:
Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM5MW1
County:

Reference Number: 23-15521
Project: Santiam Canyon 0464.020.001 - (

Sample Number: GM5MW10523
Lab Number: 23_31106
Collect Date: 5/30/23 13:20
Date Received: 5/30/23
Report Date: 7/12/23
Sampled By: Mellisa Girbach
Sampler Phone:
Approved by: anp,bj,mcs,pap,pdk,t
Authorized by:

Thanh B Phan
Lab Manager, Portland

EPA#	ANALYTES	RESULTS	UNITS	LRL	MCL	Analyst	Lab Code*	METHOD	Analyzed	COMMENT
	SILICA	**43.3**	mg/L	0.05		bj	4072 a	200.7	06/05/23	
	TOTAL SUSPENDED SOLIDS	**71 NN**	mg/L	4		pap		I-3765-85	06/01/23	
1032	MANGANESE	**0.106**	mg/L	0.001		bj	4072 a	200.7	06/05/23	
1028	IRON	**2.61**	mg/L	0.050		bj	4072 a	200.7	06/05/23	
1002	ALUMINUM	**2.26**	mg/L	0.010		bj	4072 a	200.7	06/05/23	
1036	NICKEL	**0.0028**	mg/L	0.0005		tjb	4072 a	200.8	06/02/23	
1022	COPPER	**0.0142**	mg/L	0.002		tjb	4072 a	200.8	06/02/23	
1095	ZINC	**0.0059**	mg/L	0.0025		tjb	4072 a	200.8	06/02/23	
	FLUORIDE	**ND**	mg/L	0.10	**4**	jwn	4072 a	300.0	06/02/23	
1016	CALCIUM	**9.1**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1052	SODIUM	**4.8**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1031	MAGNESIUM	**3.3**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1042	POTASSIUM	**1.0**	mg/L	0.5		bj	4072 a	200.7	06/05/23	
1017	CHLORIDE	**1.4**	mg/L	0.2		jwn	4072 a	300.0	06/02/23	
	MOLYBDENUM	**ND**	mg/L	0.001		tjb	4072 a	200.8	06/20/23	
1085	THALLIUM	**ND**	mg/L	0.0001		tjb	4072 a	200.8	06/02/23	
1055	SULFATE	**0.3**	mg/L	0.2		jwn	4072 a	300.0	06/02/23	
	Radiological									
4006	URANIUM	**ND**	mg/L	0.001	**0.030**	tjb	4072 a	200.8	06/02/23	
4000	GROSS ALPHA	**ND**	pCi/L	3	**15**	reh1	156	900.0	06/30/23	Analyzed by PacePA
4100	GROSS BETA	**ND**	pCi/L	4	**50**	reh1	156	900.0	06/30/23	Analyzed by PacePA
	Radium 226	**ND**	pCi/L	1		jlj		903.1	06/28/23	Analyzed by PacePA
	Radium 228	**ND**	pCi/L	1	**5**	val		904.0	06/23/23	Analyzed by PacePA

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20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

ORGANICS IN DRINKING WATER

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

Reference Number: 23-15521
Project: Santiam Canyon 0464.020.001 -

System Name:
System ID Number:
DWP Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Composition:
Sample Location: GM5MW1
County:

Field ID: GM5MW10523
Lab Number: 23_31106
Date Collected: 5/30/23 13:20
Sampled By: Mellisa Girbach
Sampler Phone:
Report Date: 7/12/23
Approved By: nml,pdm

Authorized By:

Thanh B Phan
Lab Manager, Portland

EPA#	COMPOUNDS	RESULTS	UNITS	LRL	MCL	METHOD	Analyst	Lab	Analyzed	COMMENT
	Synthetic Organic Chemicals									
2105	2,4 - D	**ND**	mg/L	0.0001	0.070	515.4	BFR	4072	06/13/23	
2110	2,4,5 - TP (SILVEX)	**ND**	mg/L	0.0001	0.050	515.4	BFR	4072	06/13/23	
2035	DI(2-ETHYLHEXYL)-ADIPATE	**ND**	mg/L	0.00005	0.400	525.2	MA	4072	06/30/23	
2051	ALACHLOR	**ND**	mg/L	0.00005	0.002	525.2	MA	4072	06/30/23	
2050	ATRAZINE	**ND**	mg/L	0.00005	0.003	525.2	MA	4072	06/30/23	
2306	BENZO(A)PYRENE	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2010	LINDANE (BHC - GAMMA)	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2046	CARBOFURAN	**ND**	mg/L	0.001	0.040	531.2	MA	4072	06/21/23	
2959	CHLORDANE	**ND**	mg/L	0.0001	0.002	508.1	MA	4072	06/22/23	
2031	DALAPON	**ND**	mg/L	0.0005	0.200	515.4	BFR	4072	06/13/23	
2931	1,2-DIBROMO-3-CHLOROPROPANE	**ND**	mg/L	0.00002	0.0002	504.1	MA	4072	06/07/23	
2041	DINOSEB	**ND**	mg/L	0.0001	0.007	515.4	BFR	4072	06/13/23	
2032	DIQUAT	**ND**	mg/L	0.0004	0.020	549.2	KRC	4072	06/07/23	
2033	ENDOTHALL	**ND**	mg/L	0.005	0.100	548.1	MA	4072	06/05/23	
2005	ENDRIN	**ND**	mg/L	0.00005	0.002	525.2	MA	4072	06/30/23	
2946	1,2 - DIBROMOETHANE (EDB)	**ND**	mg/L	0.00002	0.00005	504.1	MA	4072	06/07/23	
2034	GLYPHOSATE	**ND**	mg/L	0.005	0.700	547	MA	4072	07/03/23	
2067	HEPTACHLOR EPOXIDE "B"	**ND**	mg/L	0.00005	0.0002	525.2	MA	4072	06/30/23	
2065	HEPTACHLOR	**ND**	mg/L	0.00005	0.0004	525.2	MA	4072	06/30/23	
2274	HEXACHLOROBENZENE	**ND**	mg/L	0.00005	0.001	525.2	MA	4072	06/30/23	
2042	HEXACHLOROCYCLO-PENTADIENE	**ND**	mg/L	0.00005	0.050	525.2	MA	4072	06/30/23	
2015	METHOXYCHLOR	**ND**	mg/L	0.00005	0.040	525.2	MA	4072	06/30/23	
2326	PENTACHLOROPHENOL	**ND**	mg/L	0.00004	0.001	515.4	BFR	4072	06/13/23	
2039	DI(2-ETHYLHEXYL)-PHTHALATE	**ND**	mg/L	0.0001	0.006	525.2	MA	4072	06/30/23	
2040	PICLORAM	**ND**	mg/L	0.0001	0.500	515.4	BFR	4072	06/13/23	
2037	SIMAZINE	**ND**	mg/L	0.00005	0.004	525.2	MA	4072	06/30/23	
2020	TOXAPHENE	**ND**	mg/L	0.001	0.003	508.1	MA	4072	06/22/23	
2036	OXAMYL (VYDATE)	**ND**	mg/L	0.001	0.200	531.2	MA	4072	06/21/23	
2383	PCBS (Total Aroclors)	**ND**	mg/L	0.0002	0.0005	508.1	MA	4072	06/22/23	

NOTES:
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20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

ORELAP 4072
Idaho WA00097

VOLATILE ORGANIC COMPOUNDS (VOC) REPORT

Client Name: GSI Water Solutions, Inc.
650 NE Holladay Street Ste 900
Portland, OR 97232

Reference Number: 23-15521
Project: Santiam Canyon 0464.020.001 -

System Name:
System ID Number:
DWP Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: GM5MW1
County:
Sampled By: Mellisa Girbach
Sampler Phone:

Field ID: GM5MW10523
Lab Number: 23_31106
Date Collected: 5/30/23 13:20
Date Extracted: 524_230605
Date Analyzed: 06/05/23
Report Date: 7/12/23
Analyst: NML
Approved By: pdm

Authorized By:

Thanh B Phan
Lab Manager, Portland

EPA#	COMPOUNDS	RESULTS	UNITS	LRL	MCL	Method	Lab Code*	COMMENT
	EPA/State Regulated							
2977	1,1 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.007	524.2	4072 a	
2981	1,1,1 - TRICHLOROETHANE	**ND**	mg/L	0.0005	0.200	524.2	4072 a	
2985	1,1,2 - TRICHLOROETHANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2980	1,2 - DICHLOROETHANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2983	1,2 - DICHLOROPROPANE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2378	1,2,4 - TRICHLOROBENZENE	**ND**	mg/L	0.0005	0.070	524.2	4072 a	
2990	BENZENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2982	CARBON TETRACHLORIDE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2989	CHLOROBENZENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2380	CIS - 1,2 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.070	524.2	4072 a	
2992	ETHYLBENZENE	**ND**	mg/L	0.0005	0.700	524.2	4072 a	
2964	METHYLENE CHLORIDE (Dichlorometha	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2968	O - DICHLOROBENZENE	**ND**	mg/L	0.0005	0.600	524.2	4072 a	
2969	P - DICHLOROBENZENE	**ND**	mg/L	0.0005	0.075	524.2	4072 a	
2996	STYRENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2979	T - 1,2 - DICHLOROETHYLENE	**ND**	mg/L	0.0005	0.100	524.2	4072 a	
2987	TETRACHLOROETHYLENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2991	TOLUENE	**ND**	mg/L	0.0005	1.0	524.2	4072 a	
2955	TOTAL XYLENES	**ND**	mg/L	0.0005	10.0	524.2	4072 a	
2984	TRICHLOROETHYLENE	**ND**	mg/L	0.0005	0.005	524.2	4072 a	
2976	VINYL CHLORIDE	**ND**	mg/L	0.0005	0.002	524.2	4072 a	

NOTES:
If a compound is detected > or = to the Lower Reporting Level, LRL, specified increased monitoring frequencies may occur per PHD.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA. Blank MCL value indicates a level is not currently established.
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting Limit (LRL).
* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.

If you have any questions concerning this report contact our office at the above phone number.

WATERLAB CORP.

2603 - 12th Street, SE
Salem, OR 97302
Voice: (503) 363-0473
FAX: (503) 363-8900

TEST REPORT

TO: City of Mill City c/o City Recorder
P. O. Box 256
Mill City, OR 97360

05/09/2023

CITMILC

PO#:

Collection Information

Date: 05/02/2023
Time: 0900
By: Russ
Lab #: 20230502-095
Location: 360 Remine Rd Mill City INF

Lab Receipt Information

05/02/2023
1045
SW

Case Narrative

The analyses were performed according to the guidelines in the WATERLAB Corp Quality Assurance Program. This report contains analytical results for the sample(s) as received by the laboratory.

Analyte	Method	Acc*	Results	Qual	MRL	Units	EPA Limit	Analysis Date Time	Tech
Alkalinity, Total - 1927	SM2320 B		279.		10.	mg/l CaCO3		05/04/2023	AS
Bicarbonate Alkalinity	SM2320B		340.4		10	HC03		05/04/2023	AS
Hardness as CaCO3	SM2340C		86.		10.	mg/l CaCO3	250	05/04/2023	AS

ND- No Detection at @ MRL
SM-"Standard Methods for the Examination of Water & Wastewater",19th ed
EPA- "Methods for Chemical Analysis for Water and Wastes",USEPA
MRL-"Method Reporting Limit"
* Accreditation
A- Waterlab Corporation, ORELAP 100039
The results relate only to the parameters tested or to the sample as received by the laboratory.

Approved by: _____

Customer

WATERLAB CORP.

2603 - 12th Street, SE
Salem, OR 97302
Voice: (503) 363-0473
FAX: (503) 363-8900

TEST REPORT

TO: City of Mill City c/o City Recorder
P. O. Box 256
Mill City, OR 97360

05/22/2023

CITMILC

PO#:

Collection Information

Date: 05/02/2023
Time: 0900
By: Russ
Lab #: 20230502-096
Location: 360 Remine Rd Mill City Inf

Lab Receipt Information

05/02/2023
1045
SW

Case Narrative

The analyses were performed according to the guidelines in the WATERLAB Corp Quality Assurance Program. This report contains analytical results for the sample(s) as received by the laboratory.

Analyte	Method	Acc*	Results	Qual	MRL	Units	Analysis Date Time	Tech
Inorganic Chemicals								
Antimony	SM3113B		ND		0.005	mg/l	05/12/2023	bem
Arsenic	SM3113B		ND		0.002	mg/l	05/08/2023	bem
Barium	SM3113B	B	0.0109		0.0005	mg/l	05/12/2023 1515	cbb
Beryllium	SM3113B		ND		0.001	mg/l	06/05/2023	bem
Cadmium	SM3113B		ND		0.001	mg/l	05/11/2023	bem
Chromium	SM3113B		ND		0.02	mg/l	05/09/2023	bem
Fluoride	EPA300.0		7.41		0.2	mg/l	05/02/2023	bem
Lead	SM3113 B		ND		0.001	mg/l	05/15/2023	bem
Mercury	SM3112B		ND		0.001	mg/l	05/17/2023	bem

ND- No Detection at @ MRL
SM-"Standard Methods for the Examination of Water & Wastewater",19th ed
EPA- "Methods for Chemical Analysis for Water and Wastes",USEPA
MRL-"Method Reporting Limit"
* Accreditation
A- Waterlab Corporation, ORELAP 100039
The results relate only to the parameters tested or to the sample as received by the laboratory.

B=Neilson Research Corporation, ORELAP ID#OR100016

Approved by: _____

WATERLAB CORP.

2603 - 12th Street, SE
Salem, OR 97302
Voice: (503) 363-0473
FAX: (503) 363-8900

TEST REPORT

LAB # : 20230502-096 (Cont) CITMILC

Analyte	Method	Acc*	Results	Qual	MRL	Units	Analysis Date Time		Tech
Nickel	SM3113B		ND		0.05	mg/l	05/09/2023		bem
Nitrogen, Nitrate	EPA300.0		ND		0.2	mg/l N	05/02/2023	1640	as
Nitrogen, Nitrite	EPA300.0		ND		0.2	mg/l N	05/02/2023	1640	as
Selenium	SM3113B		ND		0.005	mg/l	05/12/2023		bem
Sodium	SM3111B		50.2		1.0	mg/l	05/09/2023		as
Thallium	SM3113B		ND		0.001	mg/l	05/11/2023		bem
Aluminum	SM3113B		0.275		0.050	mg/l	05/30/2023		bem
Copper	SM3113 B		ND		0.002	mg/l	05/31/2023		bem
Iron	SM3111B		0.286		0.1	mg/l	05/31/2023		as
Manganese	SM3111B		ND		0.05	mg/l	05/31/2023		as
Silver	SM3113B		ND		0.01	mg/l	05/22/2023		bem
Zinc	SM3111 B		0.0547		0.01	mg/l	05/31/2023		bem

ND- No Detection at @ MRL
SM-"Standard Methods for the Examination of Water & Wastewater",19th ed
EPA- "Methods for Chemical Analysis for Water and Wastes",USEPA
MRL-"Method Reporting Limit"
* Accreditation
A- Waterlab Corporation, ORELAP 100039
The results relate only to the parameters tested or to the sample as received by the laboratory.

B=Neilson Research Corporation, ORELAP ID#OR100016

Approved by: _____

ANALYTICAL SUMMARY REPORT

June 09, 2023

Waterlab Corp
2603 12th St SE
Salem, OR 97302-2154

Work Order: C23050297

Project Name: Mill City WWTP

Energy Laboratories, Inc. Casper WY received the following 1 sample for Waterlab Corp on 5/8/2023 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C23050297-001	20230502-094 Mill City WWTP	05/02/23 8:30	05/08/23	Waste Water	Metals by ICP/ICPMS, Drinking Water Metals Preparation by EPA 200.2 Gross Alpha, Gross Beta, Total Radium 226 + Radium 228, Total Radium 226, Total Radium 228, Total

The analyses presented in this report were performed by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601, unless otherwise noted. Any exceptions or problems with the analyses are noted in the report package. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these test results, please contact your Project Manager .

Report Approved By:

Ashley L. Wilson
Project Manager

Digitally signed by
Ashley L. Wilson
Date: 2023.06.09 14:46:22 -06:00

CLIENT: Waterlab Corp
Project: Mill City WWTP
Work Order: C23050297

Report Date: 06/09/23

CASE NARRATIVE

ENERGY LABORATORIES, INC. - CASPER,WY certifies that certain method selections contained in this report meet requirements as set forth by the above accrediting authorities. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative. Please verify ELI's certification coverage by visiting www.energylab.com.

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Waterlab Corp
Project: Mill City WWTP
Lab ID: C23050297-001
Client Sample ID: 20230502-094 Mill City WWTP

Report Date: 06/09/23
Collection Date: 05/02/23 08:30
DateReceived: 05/08/23
Matrix: Waste Water

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Uranium	ND	mg/L		0.0003	0.03	E200.8	05/17/23 04:23 / eli-b
Uranium, Activity	ND	pCi/L		0.2		E200.8	05/17/23 04:23 / eli-b
RADIONUCLIDES, TOTAL							
Gross Alpha	-5	pCi/L	U			E900.0	05/27/23 02:30 / haw
Gross Alpha precision (±)	1.7	pCi/L				E900.0	05/27/23 02:30 / haw
Gross Alpha MDC	3.1	pCi/L				E900.0	05/27/23 02:30 / haw
Gross Beta	14.8	pCi/L				E900.0	05/27/23 02:30 / haw
Gross Beta precision (±)	3.1	pCi/L				E900.0	05/27/23 02:30 / haw
Gross Beta MDC	3.9	pCi/L				E900.0	05/27/23 02:30 / haw
Radium 226	-0.05	pCi/L	U			E903.0	05/23/23 11:12 / kdk
Radium 226 precision (±)	0.2	pCi/L				E903.0	05/23/23 11:12 / kdk
Radium 226 MDC	0.3	pCi/L				E903.0	05/23/23 11:12 / kdk
Radium 228	2.5	pCi/L				RA-05	05/18/23 13:08 / trs
Radium 228 precision (±)	1.1	pCi/L				RA-05	05/18/23 13:08 / trs
Radium 228 MDC	1.6	pCi/L				RA-05	05/18/23 13:08 / trs
Radium 226 + Radium 228	2.6	pCi/L				A7500-RA	05/24/23 12:54 / dmf
Radium 226 + Radium 228 precision (±)	1.1	pCi/L				A7500-RA	05/24/23 12:54 / dmf
Radium 226 + Radium 228 MDC	1.6	pCi/L				A7500-RA	05/24/23 12:54 / dmf

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
U - Not detected at Minimum Detectable Concentration (MDC)
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Waterlab Corp **Work Order:** C23050297 **Report Date:** 05/17/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8									Analytical Run: ICPMS207-B_230515A	
Lab ID: QCS		Initial Calibration Verification Standard							05/17/23 02:09	
Uranium		0.0476	mg/L	0.00030	95	90	110			
Lab ID: CCV		Continuing Calibration Verification Standard							05/17/23 03:40	
Uranium		0.0476	mg/L	0.00030	95	90	110			
Method: E200.8									Batch: 178689	
Lab ID: MB-178689	2	Method Blank				Run: ICPMS207-B_230515A			05/17/23 02:58	
Uranium		0.00003	mg/L	0.00002						
Uranium, Activity		0.02	pCi/L	0.01						
Lab ID: LCS4-178689		Laboratory Control Sample				Run: ICPMS207-B_230515A			05/17/23 03:04	
Uranium		0.0932	mg/L	0.00030	93	85	115			
Lab ID: B23050597-001AMS4		Sample Matrix Spike				Run: ICPMS207-B_230515A			05/17/23 03:58	
Uranium		0.0960	mg/L	0.00030	95	70	130			
Lab ID: B23050597-001AMSD		Sample Matrix Spike Duplicate				Run: ICPMS207-B_230515A			05/17/23 04:04	
Uranium		0.102	mg/L	0.00030	101	70	130	6.0	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Waterlab Corp **Work Order:** C23050297 **Report Date:** 06/01/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E900.0										Batch: GrAB-3184
Lab ID: Th230-GrAB-3184	3	Laboratory Control Sample			Run: G542M-2_230523A					05/27/23 02:30
Gross Alpha		98	pCi/L		98	70	130			
Gross Alpha precision (±)		20	pCi/L							
Gross Alpha MDC		3.8	pCi/L							
Lab ID: Sr90-GrAB-3184	3	Laboratory Control Sample			Run: G542M-2_230523A					05/27/23 02:30
Gross Beta		550	pCi/L		115	70	130			
Gross Beta precision (±)		56	pCi/L							
Gross Beta MDC		3.6	pCi/L							
Lab ID: MB-GrAB-3184	6	Method Blank			Run: G542M-2_230523A					05/27/23 02:30
Gross Alpha		-5	pCi/L							U
Gross Alpha precision (±)		2	pCi/L							
Gross Alpha MDC		3	pCi/L							
Gross Beta		-4	pCi/L							U
Gross Beta precision (±)		2	pCi/L							
Gross Beta MDC		4	pCi/L							
Lab ID: C23050241-001AMS	3	Sample Matrix Spike			Run: G542M-2_230523A					05/27/23 02:30
Gross Alpha		350	pCi/L		87	70	130			
Gross Alpha precision (±)		72	pCi/L							
Gross Alpha MDC		16	pCi/L							
Lab ID: C23050241-001AMSD	3	Sample Matrix Spike Duplicate			Run: G542M-2_230523A					05/27/23 02:30
Gross Alpha		400	pCi/L		99	70	130	12	30	
Gross Alpha precision (±)		81	pCi/L							
Gross Alpha MDC		18	pCi/L							
- The RER result is 0.42.										
Lab ID: C23050585-010AMS1	3	Sample Matrix Spike			Run: G542M-2_230523A					05/31/23 08:46
Gross Beta		3800	pCi/L		118	70	130			
Gross Beta precision (±)		380	pCi/L							
Gross Beta MDC		19	pCi/L							
Lab ID: C23050585-010AMSD	3	Sample Matrix Spike Duplicate			Run: G542M-2_230523A					05/31/23 08:46
Gross Beta		3700	pCi/L		115	70	130	3.1	30	
Gross Beta precision (±)		370	pCi/L							
Gross Beta MDC		20	pCi/L							
- The RER result is 0.22.										

Qualifiers:

RL - Analyte Reporting Limit

U - Not detected at Minimum Detectable Concentration (MDC)

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Waterlab Corp **Work Order:** C23050297 **Report Date:** 06/01/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E903.0									Batch: RA226-10894	
Lab ID: LCS-RA226-10894	3	Laboratory Control Sample			Run: TENNELEC-3_230512B				05/23/23 11:12	
Radium 226		11	pCi/L		114	70	130			
Radium 226 precision (±)		2.3	pCi/L							
Radium 226 MDC		0.22	pCi/L							
Lab ID: MB-RA226-10894	3	Method Blank			Run: TENNELEC-3_230512B				05/23/23 11:12	
Radium 226		0.1	pCi/L							U
Radium 226 precision (±)		0.2	pCi/L							
Radium 226 MDC		0.2	pCi/L							
Lab ID: C23050423-001FDUP	3	Sample Duplicate			Run: TENNELEC-3_230512B				05/23/23 11:12	
Radium 226		1.9	pCi/L					5.6	30	
Radium 226 precision (±)		0.48	pCi/L							
Radium 226 MDC		0.23	pCi/L							

- The RER result is 0.15.

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

U - Not detected at Minimum Detectable Concentration (MDC)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Waterlab Corp **Work Order:** C23050297 **Report Date:** 06/01/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: RA-05										Batch: RA228-7094
Lab ID: LCS-228-RA226-10894	3	Laboratory Control Sample				Run: TENNELEC-3_230512A				05/18/23 13:08
Radium 228		5.7	pCi/L		81	70	130			
Radium 228 precision (±)		1.4	pCi/L							
Radium 228 MDC		1.2	pCi/L							
Lab ID: MB-RA226-10894	3	Method Blank				Run: TENNELEC-3_230512A				05/18/23 13:08
Radium 228		2	pCi/L							
Radium 228 precision (±)		0.8	pCi/L							
Radium 228 MDC		1	pCi/L							
Lab ID: C23050423-001FDUP	3	Sample Duplicate				Run: TENNELEC-3_230512A				05/18/23 13:08
Radium 228		2.2	pCi/L					11	30	
Radium 228 precision (±)		0.91	pCi/L							
Radium 228 MDC		1.3	pCi/L							

- The RER result is 0.19.

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

Work Order Receipt Checklist

Waterlab Corp

C23050297

Login completed by: Hannah R. Johnson
Date Received: 5/8/2023

Reviewed by: cjohnson
Received by: cch

Reviewed Date: 5/10/2023
Carrier name: UPS

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☐	No ☑	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☐	No ☑	Not Applicable ☐
Container/Temp Blank temperature:	12.8°C No Ice		
Containers requiring zero headspace have no headspace or bubble that is <6mm (1/4").	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

The reference date for Radon analysis is the sample collection date. The reference date for all other Radiochemical analyses is the analysis date. Radiochemical precision results represent a 2-sigma Total Measurement Uncertainty.

Contact and Corrective Action Comments:

The sample collection time indicated on the COC is 09:00, the collection time listed on the sample bottles is 08:30, Beth requested we use the collection time on the sample bottles-Chantel S. Johnson

Chain of Custody & Analytical Request Record

ENERGY LABORATORIES — Trust our People. Trust our Data.

www.energylab.com

Account Information (Billing Information)

Company/Name	Waterlab Corp
Contact	Beth Myers
Phone	503-363-0473
Mailing Address	2603 12th St SE
City, State, Zip	Salem, OR 97302
Email	beth@waterlabcorp.com
Receive Invoice	☐ Hard Copy ☒ Email
Receive Report	☐ Hard Copy ☒ Email
Purchase Order	
Quote	
Bottle Order	

Report Information (if different than Account Information)

Company/Name	
Contact	Beth Myers
Phone	
Mailing Address	
City, State, Zip	
Email	beth@waterlabcorp.com
Receive Report	☐ Hard Copy ☒ Email
Special Report/Formats	☐ LEVEL IV ☒ NELAC ☐ EDD/EDT (contact laboratory) ☐ Other

Comments

Please do not return cooler !!!!!!!!

Project Information

Project Name, PWSID, Permit, etc.	Mill City WWTP
Sampler Name	
Sampler Phone	(503) 363-0473
Sample Origin State	Oregon
EPA/State Compliance	☐ Yes ☒ No

MINING CLIENTS, please indicate sample type.
*If ore has been processed or refined, call before sending.
☐ Byproduct 11 (e)2 material ☐ Unprocessed ore (NOT ground or refined)*

Matrix Codes: A - Air; W - Water; S - Soils/Solids; V - Vegetation; B - Biossay; O - Other; DW - Drinking Water

All turnaround times are standard unless marked as RUSH.
Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers	Matrix (See Codes Above)	Gross Alpha	Radium 226/228	Uranium	Gross Beta	See Attached	RUSH TAT	EL LAB ID (Laboratory Use Only)
1	20230502-094 Mill City WWTP	5/2/23	9:00 am	4	W	✓	✓	✓	✓			
2												
3												
4												
5												
6												
7												
8												
9												
10												

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	April Stratton	5/2/23 11:00	April Stratton			
	Relinquished by (print)	Date/Time	Signature	Received by Laboratory (print)	Date/Time	Signature
				Chance Hancock	5-8-23 9am	

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals Y N C B	Intact Y N	Receipt Temp °C	Temp Blank Y N	On Ice Y N	Payment Type CC Cash Check	Amount $	Receipt Number (cash/check only)

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

WATERLAB CORP.

2603 - 12th Street, SE
Salem, OR 97302
Voice: (503) 363-0473
FAX: (503) 363-8900

TEST REPORT

TO: City of Mill City c/o City Recorder
P. O. Box 256
Mill City, OR 97360

05/22/2023

CITMILC

PO#:

Collection Information

Date: 05/02/2023
Time: 0900
By: Russ
Lab #: 20230502-097
Location: 360 Remine Rd. Mills City/ Influent

Lab Receipt Information

05/02/2023
1045
SW

Case Narrative

The analyses were performed according to the guidelines in the WATERLAB Corp Quality Assurance Program. This report contains analytical results for the sample(s) as received by the laboratory.

Analyte	Method	Acc*	Results	Qual	MRL	Units	Analysis Date	Time	Tech
Synthetic Organic Contaminants									
Synthetic Organics, Regulated									
1,2-Dibromo-3-chloropropane	EPA 504.1	B	ND		0.0000	mg/liter	05/04/2023	2017	TJW
Ethylene Dibromide	EPA 504.1	B	ND		0.0000	mg/liter	05/04/2023	2017	TJW
Chlordane	EPA 508	B	ND		0.0002	mg/liter	05/10/2023	0806	TJW
Endrin	EPA 508	B	ND		0.00001	mg/liter	05/10/2023	0806	TJW
BHC-Gamma Lindane	EPA 508	B	ND		0.00001	mg/liter	05/10/2023	0806	TJW

ND- No Detection at @ MRL
SM-"Standard Methods for the Examination of Water & Wastewater",19th ed
EPA- "Methods for Chemical Analysis for Water and Wastes",USEPA
MRL-"Method Reporting Limit"
* Accreditation
A- Waterlab Corporation, ORELAP 100039
The results relate only to the parameters tested or to the sample as received by the laboratory.

B=Neilson Research Corporation, ORELAP ID#OR100016

Approved by: _____

WATERLAB CORP.

2603 - 12th Street, SE
Salem, OR 97302
Voice: (503) 363-0473
FAX: (503) 363-8900

TEST REPORT

LAB # : 20230502-097 (Cont) CITMILC

Analyte	Method	Acc*	Results	Qual	MRL	Units	Analysis Date Time		Tech
Heptachlor	EPA 508	B	ND		0.00001	mg/liter	05/10/2023	0806	TJW
Heptachlor Epoxide	EPA 508	B	ND		0.00001	mg/liter	05/10/2023	0806	TJW
Methoxychlor	EPA 508	B	ND		0.0000	mg/liter	05/10/2023	0806	TJW
Polychlorinated Biphenyls	EPA 508	B	ND		0.0002	mg/liter	05/10/2023	0806	TJW
Toxaphene	EPA 508	B	ND		0.0003	mg/liter	05/10/2023	0806	TJW
2,4,5-TP Silvex	EPA 515.3	B	ND		0.005	mg/liter	05/16/2023	0026	TJW
Dalapon	EPA 515.3	B	ND		0.005	mg/liter	05/16/2023	0026	TJW
Dinoseb	EPA 515.3	B	ND		0.001	mg/liter	05/16/2023	0026	TJW
Pentachlorophenol	EPA 515.3	B	ND		0.0005	mg/liter	05/16/2023	0026	TJW
Picloram	EPA 515.3	B	ND		0.005	mg/liter	05/16/2023	0026	TJW
Alachlor	EPA 525.2	B	ND		0.0002	mg/liter	05/18/2023	1628	TJW
Atrazine	EPA 525.2	B	ND		0.0003	mg/liter	05/18/2023	1628	TJW
Benzo(a)pyrene	EPA 525.2	B	ND		0.0001	mg/liter	05/18/2023	1628	TJW
Bis(2-ethylhexyl)phthalate	EPA 525.2	B	0.00901		0.002	mg/liter	05/18/2023	1628	TJW
Bis(2-ethylhexyl)adipate	EPA 525.2	B	ND		0.004	mg/liter	05/18/2023	1628	TJW
Hexachlorobenzene	EPA 525.2	B	ND		0.0003	mg/liter	05/18/2023	1628	TJW
Hexachlorocyclopentadiene	EPA 525.2	B	ND		0.005	mg/liter	05/18/2023	1628	TJW
Simazine	EPA 525.2	B	ND		0.0004	mg/liter	05/18/2023	1628	TJW
Carbofuran	EPA 531.2	B	ND		0.004	mg/liter	05/03/2023	1809	TJW
Vydate	EPA 531.2	B	ND		0.004	mg/liter	05/03/2023	1809	TJW
Endothall	EPA 548.1	B	ND		0.01	mg/liter	05/17/2023	1726	TJW
Diquat	EPA 549.2	B	ND		0.01	mg/liter	05/11/2023	1548	TJW
2,4-D	EPA 515.3	B	ND		0.002	mg/liter	05/16/2023	0026	TJW

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TEST REPORT

LAB # : 20230502-097 (Cont) CITMILC

Analyte	Method	Acc*	Results	Qual	MRL	Units	Analysis Date Time		Tech
Glyphosate	EPA 547	B	ND		0.05	mg/liter	05/08/2023	1220	TJW

ND- No Detection at @ MRL
SM-"Standard Methods for the Examination of Water & Wastewater",19th ed
EPA- "Methods for Chemical Analysis for Water and Wastes",USEPA
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Approved by: _____

WATERLAB CORP.

2603 - 12th Street, SE
Salem, OR 97302
Voice: (503) 363-0473
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TEST REPORT

TO: City of Mill City c/o City Recorder
P. O. Box 256
Mill City, OR 97360

05/22/2023

CITMILC

PO#:

Collection Information

Date: 05/02/2023
Time: 0900
By: Russ

Lab #: 20230502-098
Location: 360 Remine Rd. Mills City/ Influent

Lab Receipt Information

05/02/2023
1045
SW

Case Narrative

The analyses were performed according to the guidelines in the WATERLAB Corp Quality Assurance Program. This report contains analytical results for the sample(s) as received by the laboratory.

Analyte	Method	Acc*	Results	Qual	MRL	Units	Analysis Date Time		Tech
Volatile Organics, Regulated									
1,1,1-Trichloroethane	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
1,1,2-Trichloroethane	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
1,1-Dichloroethylene	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
1,2,4-Trichlorobenzene	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
1,2-Dichloroethane	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
1,2-Dichloropropane	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW
Benzene	E524.2	B	ND		0.0005	mg/liter	05/05/2023	0024	TJW

ND- No Detection at @ MRL
SM-"Standard Methods for the Examination of Water & Wastewater",19th ed
EPA- "Methods for Chemical Analysis for Water and Wastes",USEPA
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B=Neilson Research Corporation, ORELAP ID#OR100016

Approved by: Bobbi E. Myers

WATERLAB CORP.

2603 - 12th Street, SE
Salem, OR 97302
Voice: (503) 363-0473
FAX: (503) 363-8900

TEST REPORT

LAB # : 20230502-098 (Cont) CITMILC Page: 2

Analyte	Method	Acc*	Results	Qual	MRL	Units	Analysis Date Time	Tech
Carbon Tetrachloride	E524.2	B	ND		0.0005	mg/liter	05/05/2023 0024	TJW
cis-1,2-Dichloroethylene	E524.2	B	ND		0.0005	mg/liter	05/05/2023 0024	TJW
Dichloromethane	E524.2	B	ND		0.0005	mg/liter	05/05/2023 0024	TJW
Ethylbenzene	E524.2	B	ND		0.0005	mg/liter	05/05/2023 0024	TJW
Monochlorobenzene	E524.2	B	ND		0.0005	mg/liter	05/05/2023 0024	TJW
o-Dichlorobenzene	E524.2	B	ND		0.0005	mg/liter	05/05/2023 0024	TJW
p-Dichlorobenzene	E524.2	B	ND		0.0005	mg/liter	05/05/2023 0024	TJW
Styrene	E524.2	B	ND		0.0005	mg/liter	05/05/2023 0024	TJW
Tetrachloroethylene (PCE)	E524.2	B	ND		0.0005	mg/liter	05/05/2023 0024	TJW
Toluene	E524.2	B	0.0496		0.0005	mg/liter	05/05/2023 0024	TJW
trans-1,2-Dichloroethylene	E524.2	B	ND		0.0005	mg/liter	05/05/2023 0024	TJW
Trichloroethylene (TCE)	E524.2	B	ND		0.0005	mg/liter	05/05/2023 0024	TJW
Vinyl Chloride	E524.2	B	ND		0.0005	mg/liter	05/05/2023 0024	TJW
Xylenes, Total	E524.2	B	ND		0.0005	mg/liter	05/05/2023 0024	TJW

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EPA- "Methods for Chemical Analysis for Water and Wastes",USEPA
MRL-"Method Reporting Limit"
* Accreditation
A- Waterlab Corporation, ORELAP 100039
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B=Neilson Research Corporation, ORELAP ID#OR100016

Approved by: Bette E. Myers

Table 8

Wastewater Influent and Groundwater Quality Laboratory Analytical Results

Gates/Mill City Phase II Subsurface Characterization

Lab Report	Lab Sample ID	Reference	Lab
GM1	31092	23-15512	Edge Analytical
GM4	31097	23-15516	Edge Analytical
GM5	31106	23-15521	Edge Analytical
WW Influent	1045	CITMILC	Waterlab Corp.

	Standard	Criteria	Unit	Sample Location			
				Untreated Wastewater	GM1	GM4	GM5
Geochemical and Inorganic Constituents							
Antimony (Total)	0.006	MCL	mg/L	< 0.005U	< 0.001U	< 0.001U	< 0.001U
Aluminum (Total)	0.05 - 0.2	SMCL	mg/L	**0.275**	**0.52**	**3.8**	**2.26**
Arsenic (Total)	0.01	MCL	mg/L	< 0.002U	<0.0005U	**0.0017**	**0.00095**
Barium (Total)	2	MCL	mg/L	**0.0109**	**0.0035**	**0.0211**	**0.012**
Beryllium (Total)	0.004	MCL	mg/L	< 0.001U	< 0.0003U	< 0.0003U	< 0.0003U
Cadmium (Total)	0.005	MCL	mg/L	< 0.001U	< 0.00025U	**0.00019**	< 0.00025U
Chloride	250	SMCL	mg/L	--	**1.4**	**2.1**	**1.4**
Chromium (Total)	0.1	MCL	mg/L	< 0.02U	< 0.001U	**0.0019**	**0.0032**
Copper (Total)	1.3	MCL	mg/L	< 0.002U	**0.002**	**0.0367**	**0.0142**
Cyanide (Total)	0.2	MCL	mg/L	--	< 0.005U	< 0.005U	< 0.005U
Fluoride (Total)	4	MCL	mg/L	**7.41**	ND < 0.1U	ND < 0.1U	ND < 0.1U
Iron (Total)	0.3	SMCL	mg/L	**0.286**	**0.62**	**3.63**	**2.61**
Lead (Total)	0.015	MCL	mg/L	< 0.001U	**0.00027**	**0.00087**	**0.0006**
Manganese (Total)	0.05	SMCL	mg/L	< 0.05U	**0.0776**	**0.449**	**0.106**
Mercury (Total)	0.002	MCL	mg/L	< 0.001U	< 0.0002U	< 0.0002U	< 0.0002U
Nitrite as N	1	MCL	mg/L	< 0.2U	< 0.01U	< 0.01U	< 0.01U
Nitrate as N	10	MCL	mg/L	< 0.2U	**1.10**	**0.02**	**0.46**
Selenium (Total)	0.05	MCL	mg/L	< 0.005U	< 0.001U	< 0.001U	< 0.001U
Silver (Total)	0.1	SMCL	mg/L	< 0.01U	< 0.0002U	< 0.0002U	< 0.0002U
Sulfate	250	SMCL	mg/L	--	**1.6**	**0.9**	**0.3**
Thallium (Total)	0.002	MCL	mg/L	< 0.001U	< 0.0001U	< 0.0001U	< 0.001U
Total Dissolved Solids	500	SMCL	mg/L	--	**78**	**147**	**84**
Zinc (Total)	5	SMCL	mg/L	**0.0547**	**0.0033**	**0.0087**	**0.0059**
Synthetic Organic Compounds (SOCs)							
2, 4-D	0.07	MCL	mg/L	< 0.002U	< 0.0001U	< 0.0001U	< 0.0001U
2, 4, 5-TP (Silvex)	0.05	MCL	mg/L	< 0.005U	< 0.0001U	< 0.0001U	< 0.0001U
Alachlor (Alanex)	0.002	MCL	mg/L	< 0.0002U	< 0.00005U	< 0.00005U	< 0.00005U
Atrazine	0.003	MCL	mg/L	< 0.0003U	< 0.00005U	< 0.00005U	< 0.00005U
Benzo(a)Pyrene	0.0002	MCL	mg/L	< 0.0001U	< 0.00005U	< 0.00005U	< 0.00005U
BHC-gamma (Lindane)	0.0002	MCL	mg/L	< 0.00001U	< 0.00005U	< 0.00005U	< 0.00005U
Carbofuran	0.04	MCL	mg/L	< 0.004U	< 0.001U	< 0.001U	< 0.001U
Chlordane	0.002	MCL	mg/L	< 0.0002U	< 0.0001U	< 0.0001U	< 0.0001U
Dalapon	0.2	MCL	mg/L	< 0.005U	< 0.0005U	< 0.0005U	< 0.0005U
Di(2-ethylhexyl)adipate *(adipates)*	0.4	MCL	mg/L	< 0.004U	< 0.00005U	< 0.00005U	< 0.00005U
Di(2-ethylhexyl)phthalate *(phthalates)*	0.006	MCL	mg/L	**0.00901**	< 0.0001U	< 0.0001U	< 0.0001U
Dibromochloropropane (DBCP)	0.0002	MCL	mg/L	< 0.0000U	< 0.00002U	< 0.00002U	< 0.00002U
Dinoseb	0.007	MCL	mg/L	< 0.001U	< 0.0001U	< 0.0001U	< 0.0001U
Diquat	0.02	MCL	mg/L	< 0.01U	< 0.0004U	< 0.0004U	< 0.0004U
Ethylene Dibromide (EDB)	0.00005	MCL	mg/L	< 0.0000U	< 0.00002U	< 0.00002U	< 0.00002U

Endothall	0.1	MCL	mg/L	< 0.01U	< 0.005U	< 0.005U	< 0.005U
Endrin	0.002	MCL	mg/L	< 0.00001U	< 0.00005U	< 0.00005U	< 0.00005U
Glyphosate	0.7	MCL	mg/L	< 0.05U	< 0.005U	< 0.005U	< 0.005U
Heptachlor	0.0004	MCL	mg/L	< 0.00001U	< 0.00005U	< 0.00005U	< 0.00005U
Heptachlor Epoxide	0.0002	MCL	mg/L	< 0.00001U	< 0.00005U	< 0.00005U	< 0.00005U
Hexachlorobenzene (HCB)	0.001	MCL	mg/L	< 0.0003U	< 0.00005U	< 0.00005U	< 0.00005U
Hexachlorocyclopentadiene	0.05	MCL	mg/L	< 0.005U	< 0.00005U	< 0.00005U	< 0.00005U
Methoxychlor	0.04	MCL	mg/L	< 0.0000U	< 0.00005U	< 0.00005U	< 0.00005U
Pentachlorophenol	0.001	MCL	mg/L	< 0.0005U	< 0.00004	< 0.00004	< 0.00004
Picloram	0.5	MCL	mg/L	< 0.005U	< 0.0001U	< 0.0001U	< 0.0001U
Simazine	0.004	MCL	mg/L	< 0.0004U	< 0.00005U	< 0.00005U	< 0.00005U
Total Polychlorinated Biphenyls (PCBs)	0.0005	MCL	mg/L	< 0.0002U	< 0.0002U	< 0.0002U	< 0.0002U
Toxaphene	0.003	MCL	mg/L	< 0.0003U	< 0.00 1U	< 0.00 1U	< 0.00 1U
Vydate (Oxamyl)	0.2	MCL	mg/L	< 0.004U	< 0.00 1U	< 0.00 1U	< 0.00 1U
Volatile Organic Compounds (VOCs)							
1, 1-Dichloroethylene	0.007	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
1, 2-Dichloroethane (EDC)	0.005	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
1, 2-Dichloropropane	0.005	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
1, 2 ,4-Trichlorobenzene	0.07	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
1, 1, 1-Trichloroethane	0.2	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
1, 1, 2-Trichloroethane	0.005	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Benzene	0.005	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Chlorobenzene (monochlorobenzene)	0.1	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Carbon Tetrachloride	0.005	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
cis-1,2-Dichloroethylene	0.07	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Ethylbenzene	0.7	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Methylene Chloride	0.005	MCL	mg/L	--	< 0.0005U	< 0.0005U	< 0.0005U
o-Dichlorobenzene (1, 2-DCB)	0.6	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
p-Dichlorobenzene (1, 4-DCB)	0.075	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Styrene	0.1	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Tetrachloroethylene (PCE)	0.005	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Toluene	1	MCL	mg/L	**0.0496**	< 0.0005U	< 0.0005U	< 0.0005U
Total Xylenes	10	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
trans-1,2-Dichloroethylene	0.1	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Trichloroethylene (TCE)	0.005	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Vinyl chloride	0.002	MCL	mg/L	< 0.0005U	< 0.0005U	< 0.0005U	< 0.0005U
Radionuclides							
Alpa, Gross	15	MCL	pCi/L	**-5**	< 3U	< 3U	< 3U
Beta, Gross	50	MCL	pCi/L	**14.8**	< 4U	< 4U	< 4U
Radium 226, 228 Combined	5	MCL	pCi/L	**2.6**	< 1U	< 1U	< 1U
Uranium	30	MCL	mg/L	< 0.0003U	< 0.001U	< 0.001U	< 0.001U

Notes

MCL = maximum contaminant level for drinking water

Bold = Detected

-- = not tested

Constituent Detected above MCL and/or SMCL

* = Radium 226/228 Combo

LRL = lower reporting limit

XXX U = indicates that the constituent was not detected above the method reporting limit of XXX

ATTACHMENT E

Groundwater Sampling Field Forms

Groundwater Sampling Field Log

Mill City, Oregon

Groundwater Sampling

Date: 5/29/23

Well ID: GM1 MW1

Total Depth: 40.2 (ft)	17.9 (-) DTW: (ft) (stickup 0.5' from TOC)	945 Time	22.3 =	(X) 0.16 (X) 0.65 gal/feet	3.6 = Well Casing Volume

Field Conditions: 60F, sunny

Decontamination: Alconox + tap wash; Tap rinse; DI rinse

PURGE INFORMATION

✓	Purge Method: Waterra Hydrolift Pump
	Purge Method:
✓	Refer to calibration log this date, YSI # 4

Pump Suction Depth (ft BTOC): ~34.2 — Purge water disposal: Drums

Type of Flow Through Cell:		10 oz cup	X	YSI ProQuattro Flow Through Cell

Comments/Exceptions to SAP:

Time	Purge Volume (gallons)	Temp. (°C)	SC (uS/cm)	DO (mg/L)	pH	ORP (mV)	Purge Rate (mL/min)	DTW (ft BTOC)	Pump Speed/*Clarity/ Color/Remarks (NTU)
Stabilization Criteria		± 0.2	±3% (SC>100) ±5% (SC≤100)	± 0.3	± 0.1	± 10	--	--	<100 NTU ideal
10:35	Pump On, Water Reaches the Purge Bucket							Initial	
10:40	0.5	12.0	94.9	7.40	6.76	139.9	0.75	18.0	med/32.3 NTU/ No color
10:50	2.5	11.7	94.8	7.11	6.62	92.6	"	"	"
10:55	4.0	11.8	94.0	6.95	6.63	90.5	"	"	"
11:05	4.5	11.6	93.7	6.25	6.48	91.6	"	"	med/24.5 NTU/No color
11:10	5.5	11.7	93.3	6.24	6.66	92.9	"	"	"
11:15	6.5	11.7	93.4	6.13	6.53	93.4	"	"	"
11:20	7.5	11.7	93.3	6.02	6.52	93.8	"	"	"
:									
:									
:									
11:20	Start Sampling								
11:25	End Sampling								

* **VC**=Very cloudy **Cl**=Cloudy **SC**=Slightly Cloudy **VSC**=Very Slightly Cloudy **AC**=Almost Clear **C**=Clear **CC**=Crystal Clear

Laboratory Analytical Program

Mill City, Oregon

Groundwater Sampling

Date: 5 / 29 / 23	**Time:** 11 : 20				
Sampling Method (circle one):	(A) B	dedicated purge tube disconnected from flow through cell other:			
Sample I.D. GWI MW10523 GWXMWXMMYY	Number of sample containers (circle)	Volume of each container	Container Type	Pres.	Analytical Method
QAQC: **Sample ID & Time--->** Dup = MW-14-MMYY	Rotate dup location				

Sampling Criteria (circle one):

Collect anytime: stabile parameters over 15 minutes(4 readings) with controlled drawdown	(1)
After 3 well casing volumes: stabile parameters but uncontrolled/falling water level	2
After 5 well casing volumes: unstabile parameters with or without drawdown control	3
Pump dry: return anytime if there is adequate volume for containers within 24 hours	4

Comments:

COC: Client = Keller, Sampler = GSI, 650 NE Holladay Street, Portland, OR 97232

Lab: Edge Analytical (Wilsonville), 9725 SW Commerce Cir Suite A2, Willsonville, OR 97070

Groundwater Sampling Field Log

Mill City, Oregon

Groundwater Sampling

Date: 5/29/23

Well ID: GMS MW1

Total Depth: 75.7 (ft)	60.0 (-) DTW: (ft)	1220 Time	15.7 =	(X) 0.16 (X) 0.65 gal/feet	2.5 = Well Casing Volume

Field Conditions:

Decontamination: Alconox + tap wash; Tap rinse; DI rinse

PURGE INFORMATION

✓	Purge Method: Waterra Hydrolift Pump
	Purge Method:
✓	Refer to calibration log this date, YSI # 4

Pump Suction Depth (ft BTOC): Purge water disposal: Drums

Type of Flow Through Cell:		10 oz cup	X	YSI ProQuattro Flow Through Cell

Comments/Exceptions to SAP:

Time	Purge Volume (gallons)	Temp. (°C)	SC (uS/cm)	DO (mg/L)	pH	ORP (mV)	Purge Rate (mL/min)	DTW (ft BTOC)	Pump Speed/*Clarity/ Color/Remarks (NTU)
Stabilization Criteria		± 0.2	±3% (SC>100) ±5% (SC≤100)	± 0.3	± 0.1	± 10	--	--	<100 NTU ideal
12:30	Pump On, Water Reaches the Purge Bucket							Initial	
12:40	0.25	12.6	83.1	9.30	7.47	-27.2	0.16	"	lowmed/351 NTU/brown
12:45	1.5	14.6	79.9	8.77	7.49	-26.6	"	"	med/330 NTU/brown
12:57	3.0	11.7	80.2	8.99	7.35	-4.8	0.19	"	"
13:02	4.0	14.8	74.6	6.93	7.35	-4.3	"	"	"
13:14	5.75	11.4	80.1	9.22	7.44	4.3	"	"	" / 130 NTU / "
13:18	7.0	11.0	80.2	9.36	7.40	4.5	"	"	"
13:23	8.5	10.9	80.5	9.55	7.36	6.1	"	"	" / 125 NTU / "
13:27	10.0	11.1	80.3	9.42	7.32	6.7	"	"	" / 124 NTU / "
:									
:									
13:27	Start Sampling								
13:30	End Sampling								

* **VC**=Very cloudy **Cl**=Cloudy **SC**=Slightly Cloudy **VSC**=Very Slightly Cloudy **AC**=Almost Clear **C**=Clear **CC**=Crystal Clear

Laboratory Analytical Program

Mill City, Oregon

Groundwater Sampling

Date: 5/29/23	**Time:** 13:30				
Sampling Method (circle one):	(A) dedicated purge tube disconnected from flow through cell				
	B other:				
Sample I.D. GMS MW1 0523 GWXMWXMMYY	Number of sample containers (circle)	Volume of each container	Container Type	Pres.	Analytical Method
QAQC: **Sample ID & Time--->** Dup = MW-14-MMYY	Rotate dup location				

Sampling Criteria (circle one):

Collect anytime: stabile parameters over 15 minutes(4 readings) with controlled drawdown	(1)
After 3 well casing volumes: stabile parameters but uncontrolled/falling water level	2
After 5 well casing volumes: unstabile parameters with or without drawdown control	3
Pump dry: return anytime if there is adequate volume for containers within 24 hours	4

Comments:

COC: Client = Keller, Sampler = GSI, 650 NE Holladay Street, Portland, OR 97232

Lab: Edge Analytical (Wilsonville), 9725 SW Commerce Cir Suite A2, Willsonville, OR 97070

Groundwater Sampling Field Log

Mill City, Oregon

Groundwater Sampling

Date: 5/29/23

Well ID: GM4 MW1

Total Depth: 41.6 (ft)	15.0 (-) DTW: (ft)	1415 Time	26.6 =	(X) 0.16 (X) 0.65 gal/feet	4.3 = Well Casing Volume

Field Conditions: 65F sunny

Decontamination: Alconox + tap wash; Tap rinse; DI rinse

PURGE INFORMATION

✓	Purge Method: Waterra Hydrolift Pump
	Purge Method:
✓	Refer to calibration log this date, YSI # 4

Pump Suction Depth (ft BTOC): Purge water disposal: Drums

Type of Flow Through Cell:		10 oz cup	X	YSI ProQuattro Flow Through Cell

Comments/Exceptions to SAP:

Time	Purge Volume (gallons)	Temp. (°C)	SC (uS/cm)	DO (mg/L)	pH	ORP (mV)	Purge Rate (mL/min)	DTW (ft BTOC)	Pump Speed/*Clarity/ Color/Remarks (NTU)
Stabilization Criteria		± 0.2	±3% (SC>100) ±5% (SC≤100)	± 0.3	± 0.1	± 10	--	--	<100 NTU ideal
14:20	Pump On, Water Reaches the Purge Bucket							Initial	
14:25	2.0	13.9	206.8	0.93	7.60	-145.7	0.5	"	med/397 NTU/brown-gray
14:30	5.0	13.7	207.2	0.88	7.40	-184.5	"	"	" /272 NTU/ "
14:35	7.0	13.8	205.6	0.87	7.54	-204.7	"	"	" /183 NTU/ "
14:40	10.0	13.8	204.5	0.82	7.51	-206.8	"	"	" /132 NTU/ "
14:45	12.5	13.7	204.1	0.81	7.50	-207.4	"	"	" /125 NTU/ "
14:50	16.0	13.7	204.2	0.80	7.48	-200.5	"	"	" /86.6 NTU/ "
:									
:									
:									
:									
14:50	Start Sampling								
14:55	End Sampling								

* **VC**=Very cloudy **Cl**=Cloudy **SC**=Slightly Cloudy **VSC**=Very Slightly Cloudy **AC**=Almost Clear **C**=Clear **CC**=Crystal Clear

Laboratory Analytical Program
Mill City, Oregon
Groundwater Sampling

Date: 5 / 29 / 23	Time: 14 : 55				
Sampling Method (circle one):	(A) B	dedicated purge tube disconnected from flow through cell other:			
Sample I.D. GM4MW1 0523 GWXMWXMMYY	Number of sample containers (circle)	Volume of each container	Container Type	Pres.	Analytical Method
QAQC: **Sample ID & Time--->** Dup = MW-14-MMYY	Rotate dup location				

Sampling Criteria (circle one):	
Collect anytime: stabile parameters over 15 minutes(4 readings) with controlled drawdown	(1)
After 3 well casing volumes: stabile parameters but uncontrolled/falling water level	2
After 5 well casing volumes: unstabile parameters with or without drawdown control	3
Pump dry: return anytime if there is adequate volume for containers within 24 hours	4

Comments:

COC: Client = Keller, Sampler = GSI, 650 NE Holladay Street, Portland, OR 97232

Lab: Edge Analytical (Wilsonville), 9725 SW Commerce Cir Suite A2, Willsonville, OR 97070

ATTACHMENT F

MOUNDSOLV Model Results

GeoSystems Analysis, Inc.
Innovations in Hydrology

MEMORANDUM

August 10, 2023

TO: Matt Kohlbecker, GSI Water Solutions, Inc.

FROM: Jason Keller, GeoSystems Analysis, Inc.

RE: Gates – Mill City Groundwater Mounding Analysis

INTRODUCTION

Geosystems Analysis, Inc. (GSA) conducted a groundwater mounding analysis for the alluvial aquifer beneath Gates and Mill City, Oregon in support of the treated wastewater infiltration feasibility assessment being completed by GSI Water Solutions and Keller and Associates. Three potential infiltration basin locations were simulated (Figure 1):

- Baughman Lucas (GM1)
- 4th Ave Right of Way (ROW) (GM4)
- Weyerhaeuser (GM5)

A subsurface characterization program was completed by GSI and GSA, consisting of shallow (i.e., test pit) and deep (i.e., borehole) soil texture characterization, depth to groundwater measurements, soil saturated hydraulic conductivity (K_{sat}) measurements, and aquifer horizontal saturated hydraulic conductivity $K_{sat\text{-}h}$ measurements (GSI/GSA, 2023; GSI, 2023). Information collected from the subsurface characterization program was applied in the groundwater mounding analysis presented herein.

1412 13th St., Suite 400
Hood River, Oregon 97031
phone:541-399-3399
WWW.GEOSYSTEMSANALYSIS.COM

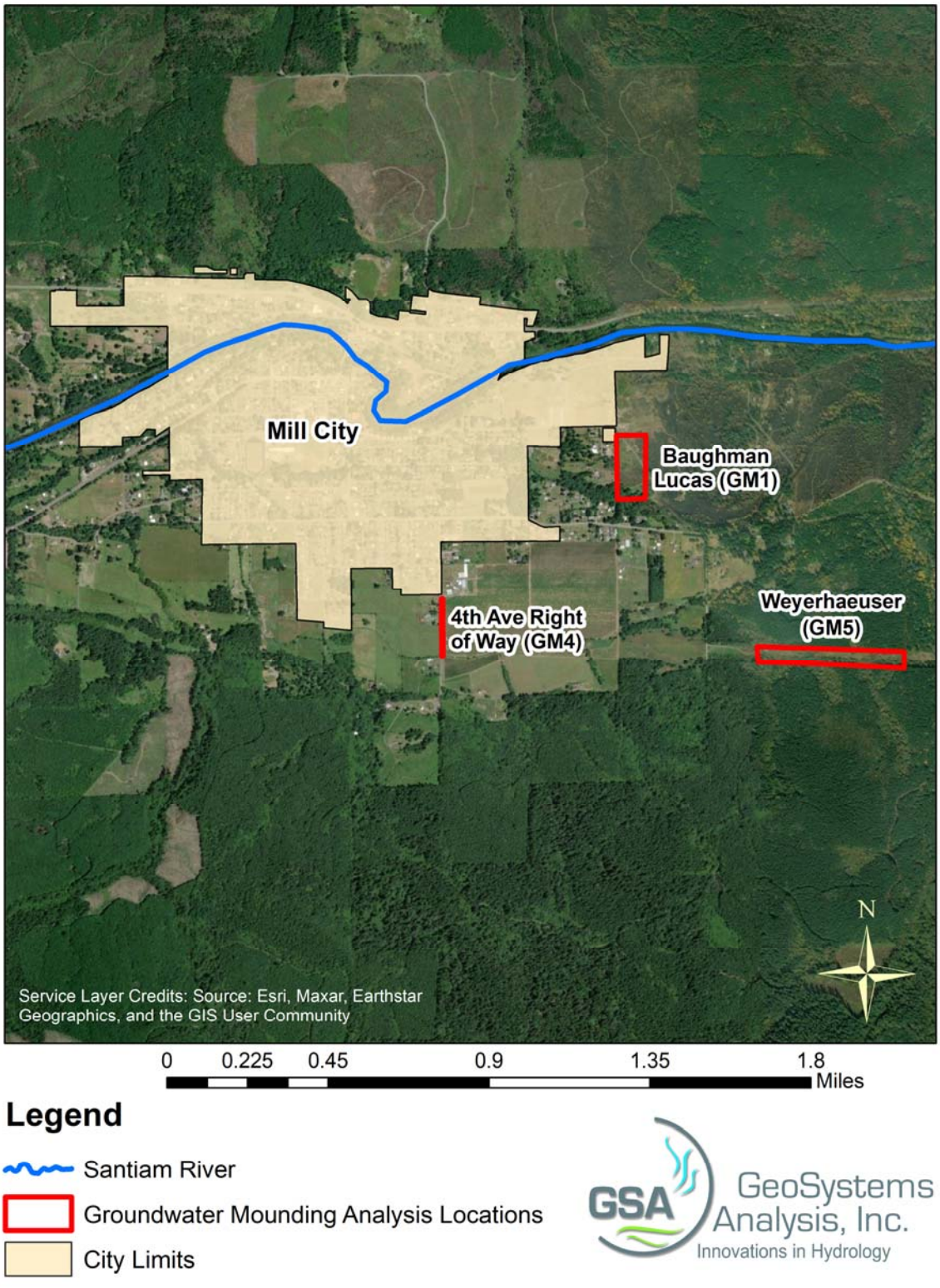

Figure 1. Potential infiltration basin locations

METHODS

The Zlotnik (2017) analytical solution for groundwater mounding as applied in MOUNDSOLV (Hydrosolve, 2023) was used to estimate the steady-state groundwater mound that may develop beneath the potential infiltration facilities in response to recharge of treated wastewater. The Zlotnik analytical solution considers both horizontal and dipping aquifers that are assumed to be of infinite extent, homogenous, and isotropic. Required model parameters for steady-state simulations include:

- Recharge rate.
- Recharge basin infiltration area.
- Aquifer horizontal saturated hydraulic conductivity ($K_{sat\text{-}h}$).
- Aquifer initial saturated thickness.
- Aquifer gradient.

The recharge rate was set equal to the projected year 2045 effluent generation rate of 0.2375 million gallons per day (MGD) (M. Kohlbecker, personal communication, April 12, 2023) and was assumed to be continuous in time. For this initial feasibility assessment, the infiltration facility was conservatively assumed to consist of one, square shaped basin. The infiltration area was sized to accept 0.2375 MGD assuming a long-term infiltration rate equal to 15 percent of the mean measured near surface K_{sat} for the site, as measured by GSA (2023). The 15 percent K_{sat} reduction factor was applied to account for potential surface clogging (EPA, 1984).

Aquifer $K_{sat\text{-}h}$ was assigned from aquifer slug test measurements performed by GSI (2023). Initial (pre-infiltration) depth to groundwater and aquifer saturated thickness was estimated from observed depth to groundwater (GSI, 2023) and publicly available deep borehole logs (M. Kohlbecker, personal communication, June 20, 2023). The regional aquifer gradient and direction was calculated from reported static groundwater levels spatially interpolated by GSI. Groundwater mounding model parameters for each site are summarized in Table 1.

Table 1. Groundwater mounding model parameters

Parameter	Site		
	GM1	GM4	GM5
Recharge Volume	0.2375 MGD	0.2375 MGD	0.2375 MGD
Recharge Duration	Continuous	Continuous	Continuous
Infiltration Area	0.81 acres	6.23 acres	26.99 acres
Long Term Infiltration Rate	0.90 ft/day	0.12 ft/day	0.03 ft/day
Aquifer Horizontal Hydraulic Conductivity (K_{sat-h})	370 ft/day	3.54 ft/day	33.0 ft/day
Depth to Water Table	15.4 ft bgs	30.0 ft bgs	58.3 ft bgs
Aquifer Initial Saturated Thickness	44.6 ft	147 ft	122 ft
Aquifer Gradient and Direction	0.0139 ft/ft N-NW	0.0139 ft/ft N-NW	0.0139 ft/ft N-NW

RESULTS

Model predicted steady-state groundwater mounding are presented for sites GM1, GM4, and GM5.

Site GM1

Site GM1 model predicted steady-state maximum mound height above the pre-infiltration water table and depth to the mound below ground surface are presented in Table 2. Model predicted steady-state mounding extent is provided in Figure 2. The predicted steady-state maximum mound height was relatively minor (1.6 ft) due to the high aquifer K_{sat-h} measured beneath the site (Table 1). The pre-infiltration depth to groundwater at GM1 is relatively shallow (Table 1), resulting in a maximum predicted depth to the groundwater mound of 13.8 ft bgs. The predicted groundwater mounding is less than 1 ft at approximately 500 ft from the center of the simulated basin.

Table 2. Site GM1 model predicted steady-state maximum mound height and depth below surface

Maximum Mounding Height (ft above pre-infiltration water table)	Depth to Maximum Groundwater Mound (ft bgs)
1.6	13.8

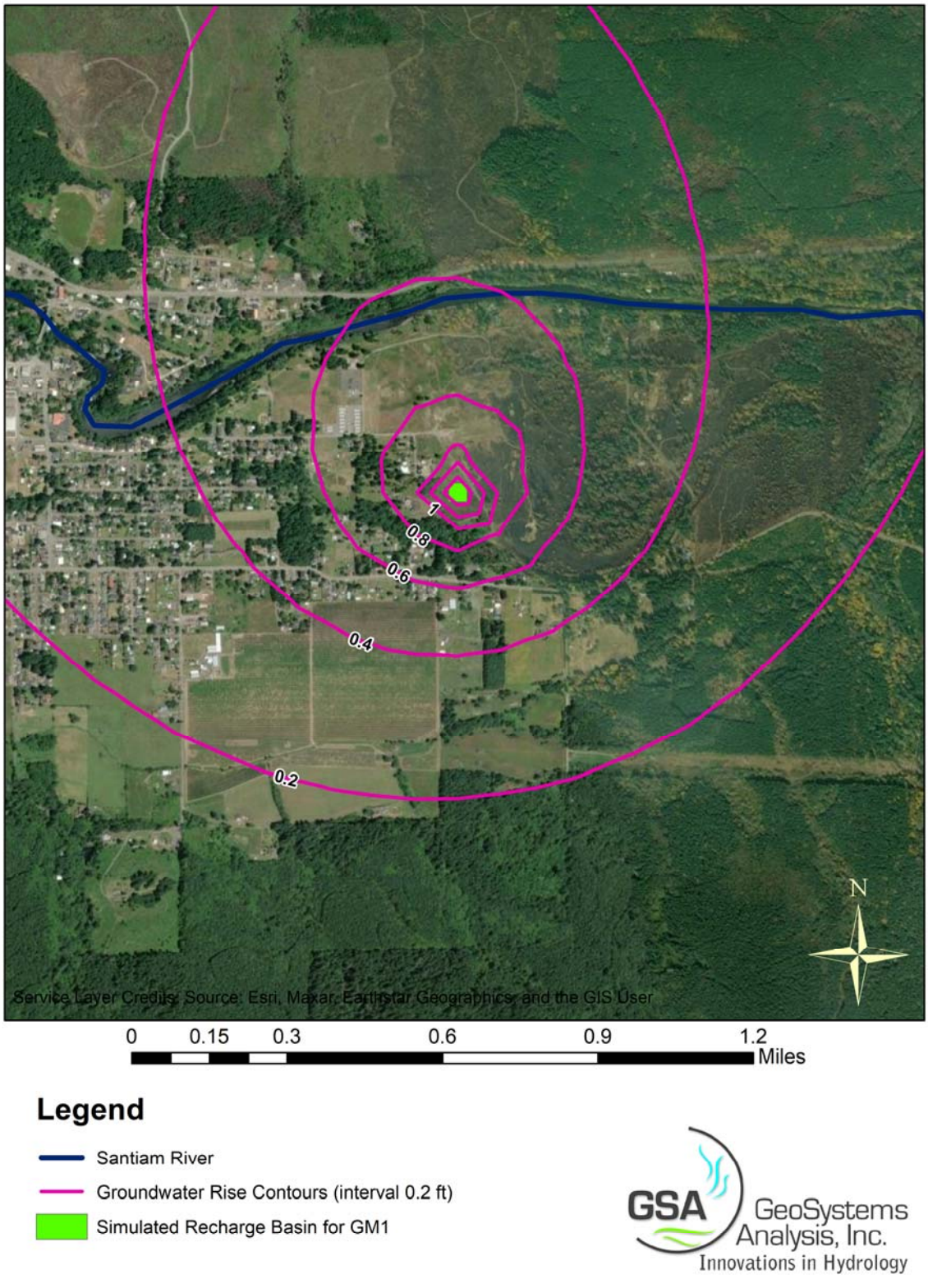

Figure 2. Site GM1 model predicted steady-state groundwater mounding extent

Site GM4

Site GM4 model predicted steady-state maximum mound height above the pre-infiltration water table and depth to the mound below ground surface are presented in Table 3. Model predicted steady-state mounding extent is provided in Figure 3. A relatively large maximum mound height of 47.4 ft was predicted, primarily due to the relatively low measured aquifer $K_{sat\text{-}h}$ (Table 1). Considering the pre-infiltration depth to groundwater of 30 ft bgs, the model predicted mound height equates to mounding to the basin surface. Preferably, the groundwater mound should be at least 10 ft or greater below the surface to prevent the groundwater mound from impacting infiltration rates or resulting in the daylighting of groundwater outside of the basin footprint. Predicted mounding of 30 ft or greater, which would result in mounding to the surface, is predicted to extend approximately 1,400 ft from the center of the simulated basin.

The GM4 groundwater mounding model was applied to evaluate: 1) the steady-state infiltration rate that can be achieved while maintaining a maximum mound height that is 10 ft bgs, and; 2) the basin infiltration area necessary to infiltrate 0.2375 MGD while maintaining a maximum mound height that is 10 ft bgs. Results of this analysis are presented in Table 3. The model predicted a maximum steady-state infiltration rate of 0.10 MGD, 42% of the target rate of 0.2375 MGD. Alternatively, the model predicted an infiltration area of 1,873 acres to infiltrate 0.2375 MGD while maintaining a groundwater mound that is not shallower than 10 ft bgs. These model results are due to a combination of the shallow depth to pre-infiltration water table of 30 ft bgs and the relatively low aquifer $K_{sat\text{-}h}$ (Table 1).

Table 3. Site GM4 model predicted steady-state maximum mound height and depth below surface

Scenario	Maximum Mounding Height (ft above pre-infiltration water table)	Depth to Maximum Groundwater Mound (ft bgs)
Base Case (Table 1)	47.4	0
0.065 MGD Infiltration	20	10
364,064 Infiltration Area	20	10

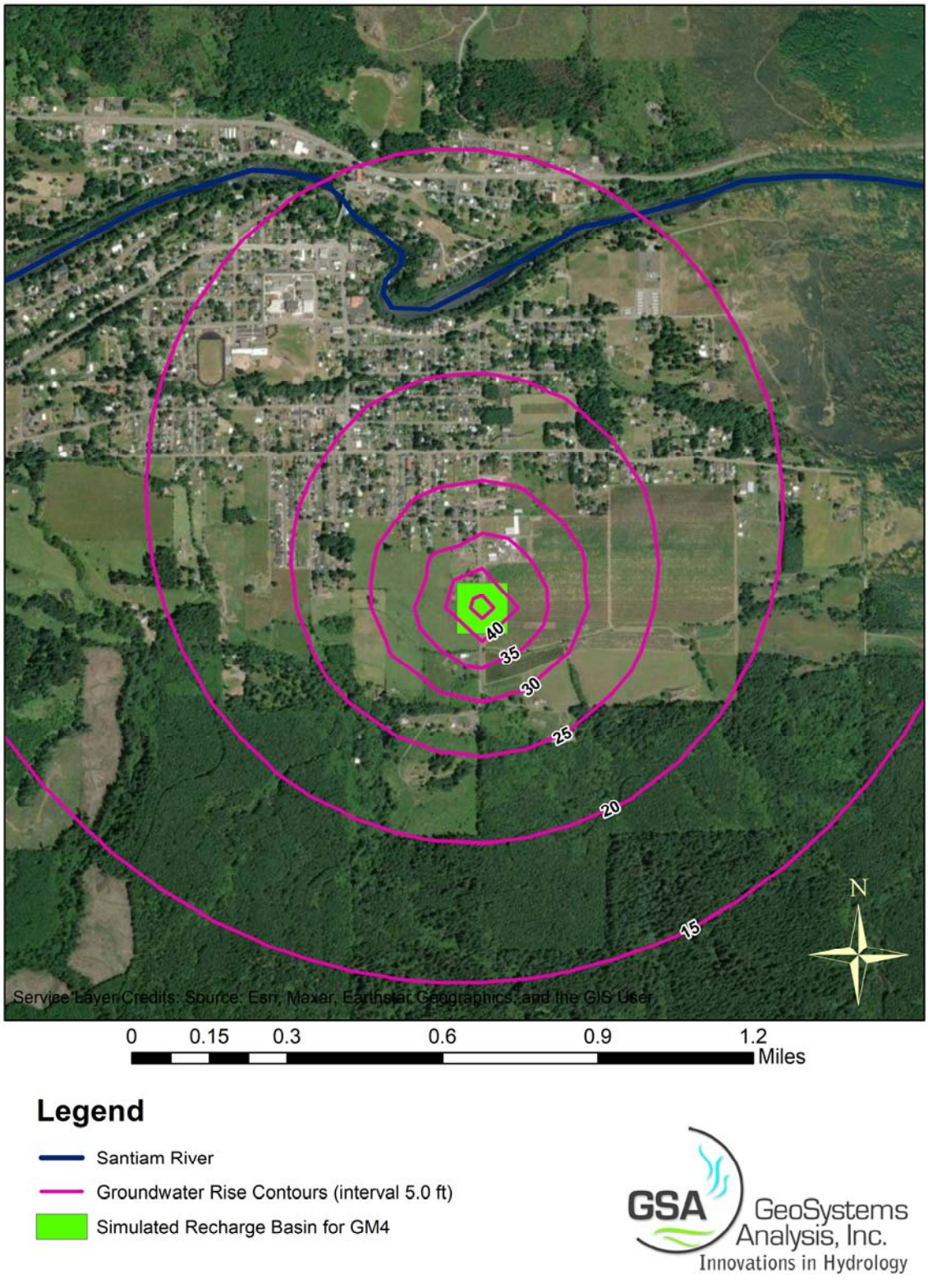

Figure 3. Site GM4 model predicted steady-state groundwater mounding extent for the base case scenario

Site GM5

Site GM5 model predicted steady-state maximum mound height above the pre-infiltration water table and depth to the mound below ground surface are presented in Table 4. Model predicted steady-state mounding extent is provided in Figure 4. The predicted steady-state maximum mound height was 5.0 ft, resulting in a maximum predicted depth to the groundwater mound of 53.3 ft bgs. The smaller predicted groundwater mound compared to site GM4 is due to a larger measured aquifer $K_{sat\text{-}h}$ and larger basin infiltration area (Table 1). It's important to note that the mounding model does not consider the impact of potential low permeability soils above the water table. Near surface and deeper subsurface characterization at GM5 indicates the soil profile to groundwater consists of thick, continuous layers of finer-textured, low permeability soils that are likely to create perched water conditions above the water table (GSI/GSA, 2023; GSI, 2023), potentially reducing basin infiltration rates.

Table 4. Site GM5 model predicted steady-state maximum mound height and depth below surface

Maximum Mounding Height (ft above pre-infiltration water table)	Depth to Maximum Groundwater Mound (ft bgs)
5.0	53.3

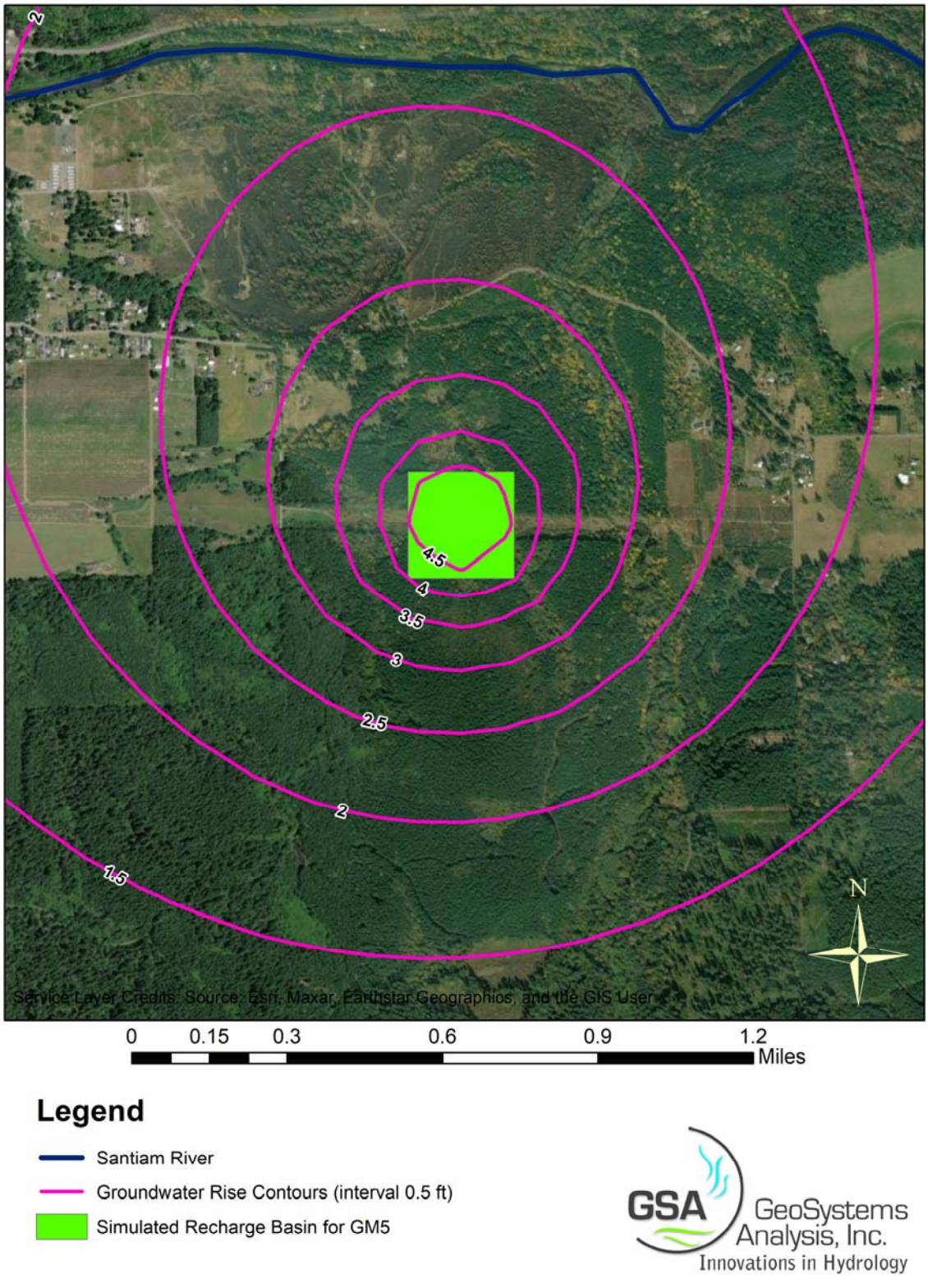

Figure 4. Site GM5 model predicted steady-state groundwater mounding extent

CONCLUSIONS

The mounding model analysis predicts that maximum groundwater mounding at site GM4 extends to the surface at a distance of approximately 1,400 ft from the center of the basin at the target infiltration rate of 0.2375 MGD, indicating groundwater mounding at this location may be prohibitive to infiltration basin operations. Reducing the infiltration rate at GM4 to 42% of the target infiltration rate or having an excessively large infiltration area in excess of 1,873 acres would be necessary to maintain a steady-state maximum groundwater mound of 10 ft bgs. Model predicted steady-state maximum groundwater mounding at sites GM1 and GM5 were predicted to result in minimum depth to water of 13.8 ft and 53.3 ft bgs, respectively, indicating groundwater mounding at these locations may not impact infiltration rates. However, the unsaturated zone at GM5 consists of mostly continuous finer-textured, low permeability soils that may create perched water conditions within the unsaturated zone and potentially reduce basin infiltration rates.

REFERENCES

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GSI, see GSI Water Solutions, Inc.

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