SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

May 25, 2017

Mr. Robert Edwards, PE
City of Edmonds Public Works Department
121 Fifth Avenue North
Edmonds, WA 98020

RE: WATER QUALITY SAMPLING RESULTS IN SUPPORT OF THE WILLOW CREEK DAYLIGHTING/EDMONDS MARSH RESTORATION PROJECT

Dear Mr. Edwards:

This letter report is an interim submittal and update on the Willow Creek Daylighting / Edmonds Marsh Restoration Project, water quality and sediment quality sampling program. The City of Edmonds (City) is currently conducting studies and developing plans to daylight Willow Creek from Edmonds Marsh through Marina Beach Park. The water quality and sediment sampling performed and described below is funded in part by the Salmon Recovery Funding Board, Grant 14-1299. Shannon & Wilson, Inc. (Shannon & Wilson) was contracted by the City in December 2016 to collect information regarding water and sediment quality in the project area in a manner consistent with the requirements of the Phase II stormwater discharge monitoring guidelines. This letter provides the findings of the first two water quality sampling events in December 2016 and March 2017.

OVERVIEW

The City is currently operating under a Washington Department of Ecology (WDOE) Phase II Municipal Stormwater Permit, and is executing a series of programs to improve stormwater quality in its drainage basins. Within the Phase II Municipal Stormwater Permit, there are a range of requirements for stormwater monitoring, with implementation of monitoring programs designated as the responsibility of the City (permittee). To date, an integrated stormwater and sediment quality sampling program has not been developed for the Willow Creek, Shellabarger Creek, and Marina Beach Park drainage basin.

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Neither the Upper Willow nor Shellabarger Creek drainage basins contain significant industrial development, with the exception of the Unocal property, State Route 104, the BNSF Railway, and the Port of Edmonds at the downstream end of the marsh. Stormwater pollutants that may enter upstream from the marsh are likely the typical ones found in urban and roadway runoff and residential development (e.g., petroleum products, heavy metals, bacteria and fecal coliform, nutrients, waste, and suspended sediments). Pollutants that may enter the marsh from adjacent BNSF Railway and Unocal property petroleum operations are similar, but more likely petroleum-based products.

Water quality standards are mandated by the federal Clean Water Act. In Washington, the WDOE is responsible for establishing water quality criteria under the Clean Water Act for toxic pollutants to protect aquatic life and beneficial use by people. These criteria, which are not to be exceeded in waters of the state, are developed based on criteria recommended by the U.S. Environmental Protection Agency (EPA), and provided in Chapter 173-201A of the Washington Administrative Code. Table 1 summarizes the WDOE fresh and saline water quality criteria for protection of aquatic life in fresh water for the water quality constituents outlined in our scope of services. Where standards for fresh water varied based on type of salmon use, the criterion is reported using the "core summer salmonid habitat"[1] value.

In addition to mandating water quality standards, the Clean Water Act requires that states restore their waters to be "fishable and swimmable." Under Section 303(d) of the Clean Water Act, states are required to submit lists of impaired waters to the EPA and establish Total Maximum Daily Loads (TMDL) for these waters. Willow Creek and Shellabarger Creek are not identified by WDOE TMDL as impaired waters, but this may only indicate a lack of data, not confirmation that water quality standards are met. The marine waters at Marina Beach Park are listed as impaired based on past exceedances of the bacteria criterion, specifically for fecal coliform. A TMDL defines the amount of pollution that can be present in the waterbody without causing water quality standards to be violated. There is no TMDL approved or under development for this area of Puget Sound.

[1] WDOE's Water Quality Atlas identifies the category of aquatic life use as "Core summer salmonid habitat" for Willow and Shellabarger Creeks.
https://fortress.wa.gov/ecy/waterqualityatlas/map.aspx?CustomMap=y&RT=0&Layers=23,29&Filters=n,n,n,n

METHODS

Water and sediment quality sampling will be performed along Willow Creek, Shellabarger Creek, Edmonds Marsh, and the Marina Beach Park. Water quality samples are collected four times per year and one sediment sampling event is planned for the summer of 2017. Field measurement or laboratory analysis of the following parameters will be conducted:

- Temperature
- Dissolved Oxygen
- pH
- Turbidity
- Conductivity
- Total Suspended Solids
- Total Phosphorus
- Total Persulphate Nitrogen
- Chloride
- Hardness
- Metals (Priority Pollutant Metals)
- Fecal Coliform

To characterize water quality, Shannon & Wilson collected water samples from each site on December 21, 2016, and March 30, 2017, for chemical analysis (see Figure A). Collected water samples were placed in a cooler on ice for delivery following chain-of-custody procedures to Fremont Analytical for laboratory analysis. Each sample was analyzed for the suite of parameters listed above. A summary of water samples collected and laboratory methods used is provided in Appendix B.

Shannon & Wilson did not sample or test for total petroleum hydrocarbons (TPHs) or polyaromatic hydrocarbons (PAHs) as part of the water quality sampling effort, because there are no water quality standards for these contaminants. Future sediment quality sampling efforts will include testing for TPHs and PAHs.

RESULTS

The results of water chemistry analyses are contained in Appendix B and summarized in Table 1. The table also includes the corresponding fresh and saline water WDOE criterion for protection of aquatic life. Laboratory testing shows three of the measured or tested parameters exceed the water quality standards: dissolved oxygen (DO), pH, and fecal coliform. DO measured low at freshwater sampling site WC-03 (near the Harbor Square stormwater outfall) in December 2016; this value (3.49 milligrams per liter) may be a sampling or testing error. pH measured slightly below standard at two sites (WC-03 and WC-02) in December 2016 and March 2017, respectively. Fecal coliform results consistently exceeded the standards during both sampling events at sampling sites WC-03, WC-04, WC-05, WC-06, and WC-07 during each event. The average of the exceedances was more than four times the standard in December 2016.

According to communications from the City, there have been some sewer line failures near Shellabarger Creek.

FUTURE TESTING

Shannon & Wilson has planned additional water quality and a single sediment and benthic sampling event in the last week of June 2017, and a final water quality sampling event in late September 2017.

CLOSURE

The findings and conclusions documented in this letter report have been prepared for specific application to this project, and have been developed in a manner consistent with that level of care and skill normally exercised by members of the environmental science profession currently practicing under similar conditions in the area, and in accordance with the terms and conditions set forth in our agreement. The conclusions presented in this letter are professional opinions based on interpretation of information currently available to us, and are made within the operational scope, budget, and schedule constraints of this project. No warranty, express or implied, is made.

If you have any questions, please contact me at (206) 695-6885.

Sincerely,

SHANNON & WILSON, INC.

Digitally signed by David Cline
DN: cn=David Cline, o=Shannon & Wilson, ou=Seattle, email=drc@shanwil.com, c=US
Date: 2017.05.25 16:59:01 -07'00'

David R. Cline, PE, CFM
Vice President

DRC/SWG:ajs

Enc: Table 1 – Water Chemistry Analytical Results
Figure A – Existing Conditions and Sampling Locations
Appendix A – Site Photographs
Appendix B – Laboratory Testing Reports and Chains of Custody
Appendix C – Important Information About Your Geotechnical/Environmental Report

TABLE 1
WATER CHEMISTRY ANALYTICAL RESULTS

Analyte/Parameter	Test Method	WA State Water Quality Standards[1]		Sample ID (December 2016)							Sample ID (March 2017)						
		Fresh Water	Saline Water	WC-01	WC-02	WC-03	WC-04	WC-05	WC-06	WC-07	WC-01	WC-02	WC-03	WC-04	WC-05	WC-06	WC-07
Field Instrument Testing																	
Temperature (°C)	YSI Multiparameter Meter	17.5[2]	16	4.2	5.0	6.9	8.1	7.1	7.7	8.7	8.6	9.2	8.6	10.0	9.8	10.2	10.5
Dissolved Oxygen (milligrams/liter)	YSI Multiparameter Meter	9.5[5]	7.0[4]	8.09	12.05	**3.49**	11.78	18.36	13.29	14.70	12.14	10.8	12.63	9.83	10.35	10.16	10.75
Specific Conductivity (millisiemens/cm)	YSI Multiparameter Meter	-	-	47.03	0.67	0.25	0.28	0.01	0.24	0.28	41.46	21.43	0.12	0.21	0.18	0.18	0.21
Total Dissolved Solids (grams/liter)	YSI Multiparameter Meter	-	-	30.59	0.44	0.16	0.18	0.01	0.16	0.18	26.94	13.29	0.08	0.13	0.12	0.12	0.14
Salinity (parts per thousand)[3]	YSI Multiparameter Meter	<0.5	>0.5	30.35	0.33	0.12	0.13	-	-	0.13	26.36	12.36	0.06	0.10	0.09	0.09	0.11
pH	YSI Multiparameter Meter	6.5 to 8.5[6]	7.0 to 8.5[7]	7.23	6.78	**6.34**	6.71	6.80	7.65	7.30	7.40	**6.87**	7.00	7.25	7.27	7.15	7.13
Oxidation-Reduction Potential (ORP mV)	YSI Multiparameter Meter	-	-	399.4	304.5	215.7	226.7	200.9	180.2	216.4	230.8	191.4	93.1	115.1	109.2	120.3	131.4
Lab Testing																	
Fecal Coliform (CFU/100ml)	Fecal Coliform by SM 9222D	50[8]	14[9]	8.00	6.00	**110**	**424**	**88.0**	41.0	**224**	2.00	**101**	6.00	**95.0**	**36.0**	**32.0**	**62.0**
Chloride (milligrams/liter)	EPA Method 300.0	230/860	-	24,300	100	31.7	8.52	10.9	9.93	8.18	16,900	7,320	7.48	5.39	7.48	7.55	5.47
Total Hardness (as CaCO3) (milligrams/liter)	EPA Method 200.8/SM 2340B	-	-	4,840	121	48.8	109	94.8	103	114	5,060	2,320	20.9	91.0	83.5	92.2	91.4
Total Mercury	EPA Method 245.1	0.012/2.1	0.025/1.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Antimony	EPA Method 200.8	-	-	0.265	ND	0.246	0.226	ND	0.231	ND	ND	ND	0.341	ND	ND	0.202	ND
Total Arsenic	EPA Method 200.8	190/360	36/69	1.12	1.81	ND	2.21	1.98	ND	2.15	3.36	2.18	ND	2.12	1.66	2.52	2.82
Total Beryllium	EPA Method 200.8	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Cadmium	EPA Method 200.8	0.65/3.1	9.3/42.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Chromium	EPA Method 200.8	10/15	50/1,100	0.938	1.65	1.22	1.52	2.68	1.39	1.20	1.84	0.943	2.06	1.65	2.08	2.67	1.47
Total Copper	EPA Method 200.8	9.9/15	3.1/4.8	2.46	1.57	2.87	3.30	5.08	1.64	1.42	2.94	1.90	2.60	2.44	2.81	2.09	1.92
Total Lead	EPA Method 200.8	2.1/54	8.1/210	ND	0.513	0.927	0.746	**2.24**	ND	ND	0.598	0.57	0.751	0.617	ND	ND	ND
Total Nickel	EPA Method 200.8	130/1200	8.2/74	1.56	1.64	1.94	1.49	3.20	1.64	1.20	1.69	1.10	1.33	1.38	2.41	1.50	1.55
Total Selenium	EPA Method 200.8	5/20	71/290	6.51	ND	ND	ND	ND	ND	ND	6.87	3.03	ND	ND	ND	ND	ND
Total Silver	EPA Method 200.8	2.6	1.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Thallium	EPA Method 200.8	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Zinc	EPA Method 200.8	90/99	81/90	33.8	12.9	26.7	27.8	42.9	14.9	12.8	12.7	6.53	15.3	13.5	6.44	8.18	8.04
Total Phosphorus (milligrams/liter)	EPA Method 365.3	4 or less	-	ND	ND	0.230	ND	0.827	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Suspended Solids (milligrams/liter)	SM 2540D	-	-	ND	5.00	11.0	6.00	581	ND	ND	14.0	5.00	7.00	ND	9.00	5.00	ND

Notes:

All units are micrograms per liter (µg/L) unless otherwise noted.

Bold text indicates a water quality exceedance

-- Not available

ND = Non-Detect

= Saline sample compared to saline water standards

= Sample varies with tide and stream flow. Compared to saline water standards.

= Freshwater sample compared to freshwater standards

1 Surface water criteria sourced from the Washington Administrative Code, Table 240 of WAC 173-201A-240 and http://www.ecy.wa.gov/programs/wq/swqs/criteria.html. If applicable, criteria presented as chonic/acute (10/100) concentration.

2 Temperature criteria based on "Core summer salmonid habitat" category of aquatic life use: http://www.ecy.wa.gov/programs/wq/swqs/AquaticLifeTempSupp.html#beneuse

3 0.5 ppt is the threshold used by Washington Department of Ecology in determining whether a wetland is estuarine. Needs to be measured near the bottom during periods of annual low flow.

4 Per Ecology's Water Quality Atlas, the marine water has "Extraordinary" aquatic life use. http://www.ecy.wa.gov/programs/wq/swqs/criteria-marine/wac173201a_210-do.html

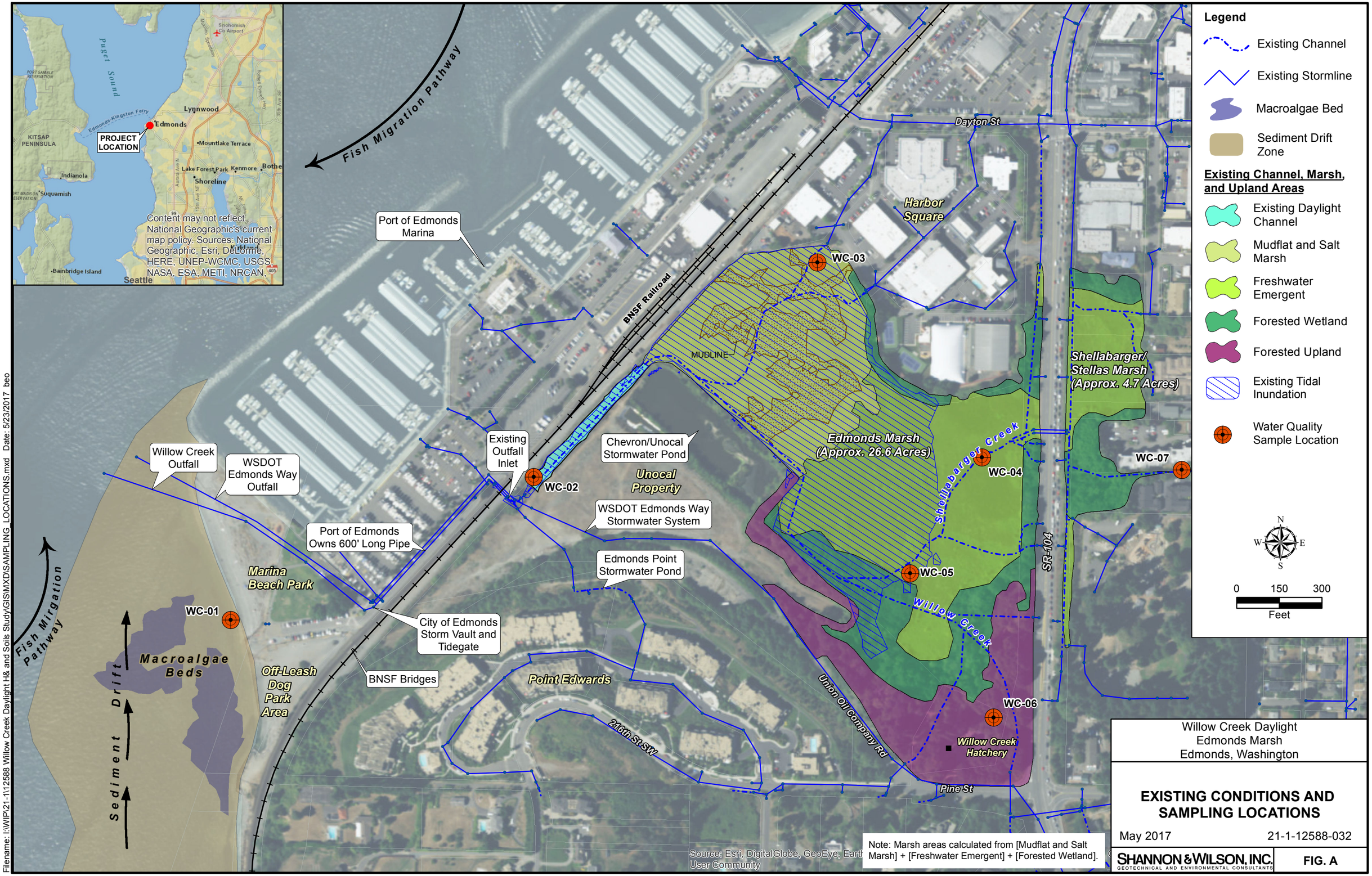
5 Dissolved oxygen criteria based on "Core summer salmonid habitat" category of aquatic life use: http://www.ecy.wa.gov/programs/wq/swqs/criteria-freshwater/wac173201a_200-do.html

6 Human-caused variation within the above range of less than 0.2 units is allowed. http://www.ecy.wa.gov/programs/wq/swqs/criteria-freshwater/wac173201a_200-ph.html

7 Human-caused variation within the above range of less than 0.2 units is allowed. http://www.ecy.wa.gov/programs/wq/swqs/criteria-marine/wac173201a_210-ph.html

8 Fecal coliform standard based on "Extraordinary Primary Contact Recreation" category, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 100 colonies/100 mL.
http://www.ecy.wa.gov/programs/wq/swqs/criteria-freshwater/wac173201a_200-bacteria.html

9 Fecal coliform standard based on "Primary Contact Recreation" category, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 43 colonies /100 mL.



Note: Marsh areas calculated from [Mudflat and Salt Marsh] + [Freshwater Emergent] + [Forested Wetland].

Willow Creek Daylight
Edmonds Marsh
Edmonds, Washington

EXISTING CONDITIONS AND SAMPLING LOCATIONS

May 2017 21-1-12588-032

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. A

Filename: I:\WIP\21-1\12588 Willow Creek Daylight H& and Soils Study\GIS\MXD\SAMPLING_LOCATIONS.mxd Date: 5/23/2017 beo

APPENDIX A

SITE PHOTOGRAPHS

Sample location WC-01. Photo taken April 13, 2012.

Sample location WC-02. Photo taken December 21, 2016.

Sample location WC-03. Photo taken December 21, 2016.

Sample location WC-04. Photo taken December 21, 2016.

Sample location WC-05. Photo taken December 21, 2016.

Sample location WC-06. Photo taken December 21, 2016.

Sample location WC-07. Photo taken December 21, 2016.

APPENDIX B

LABORATORY TESTING REPORTS AND CHAINS OF CUSTODY

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Shannon & Wilson
Dave Cline
400 N. 34th Street, Suite 100
Seattle, WA 98103

RE: Willow Creek
Work Order Number: 1612224

December 29, 2016

Attention Dave Cline:

Fremont Analytical, Inc. received 7 sample(s) on 12/21/2016 for the analyses presented in the following report.

Fecal Coliform by SM 9222D
Ion Chromatography by EPA Method 300.0
Mercury by EPA Method 245.1
Total Metals by EPA Method 200.8
Total Hardness by EPA Method 200.8/SM 2340B
Total Phosphorous by EPA Method 365.3
Total Suspended Solids (TSS) by SM 2540D

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Mike Ridgeway
Laboratory Director

Date: *12/29/2016*

CLIENT: Shannon & Wilson
Project: Willow Creek
Work Order: 1612224

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1612224-001	WC-01-DEC16	12/21/2016 9:32 AM	12/21/2016 1:53 PM
1612224-002	WC-02-DEC16	12/21/2016 10:08 AM	12/21/2016 1:53 PM
1612224-003	WC-03-DEC16	12/21/2016 10:50 AM	12/21/2016 1:53 PM
1612224-004	WC-04-DEC16	12/21/2016 11:32 AM	12/21/2016 1:53 PM
1612224-005	WC-05-DEC16	12/21/2016 11:50 AM	12/21/2016 1:53 PM
1612224-006	WC-06-DEC16	12/21/2016 12:20 PM	12/21/2016 1:53 PM
1612224-007	WC-07-DEC16	12/21/2016 12:41 PM	12/21/2016 1:53 PM

Case Narrative

WO#: **1612224**
Date: **12/29/2016**

CLIENT: Shannon & Wilson
Project: Willow Creek

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.
1612224-001E
TEST_SUB has been Sub Contracted.
1612224-002E
TEST_SUB has been Sub Contracted.
1612224-003E
TEST_SUB has been Sub Contracted.
1612224-004E
TEST_SUB has been Sub Contracted.
1612224-005E
TEST_SUB has been Sub Contracted.
1612224-006E
TEST_SUB has been Sub Contracted.
1612224-007E
TEST_SUB has been Sub Contracted.
1612224-001E
TEST_SUB has been Sub Contracted.
1612224-002E
TEST_SUB has been Sub Contracted.
1612224-003E
TEST_SUB has been Sub Contracted.
1612224-004E
TEST_SUB has been Sub Contracted.
1612224-005E
TEST_SUB has been Sub Contracted.
1612224-006E
TEST_SUB has been Sub Contracted.
1612224-007E
TEST_SUB has been Sub Contracted.

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Analytical Report

Work Order: **1612224**
Date Reported: **12/29/2016**

Client: Shannon & Wilson
Project: Willow Creek
Lab ID: 1612224-001
Client Sample ID: **WC-01-DEC16**

Collection Date: 12/21/2016 9:32:00 AM
Matrix: Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R33595		Analyst: MW
Coliform, Fecal	8.00	1.00		CFU/100ml	1	12/21/2016 2:30:56 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R33562		Analyst: KT
Chloride	24,300	500	D	mg/L	5000	12/22/2016 2:20:00 PM
Mercury by EPA Method 245.1				Batch ID: 15768		Analyst: WF
Mercury	ND	0.100		µg/L	1	12/27/2016 3:33:25 PM
Total Hardness by EPA Method 200.8/SM 2340B				Batch ID: 15759		Analyst: TN
Total Hardness (as CaCO3)	4,840	4.00	D	mg/L CaCO3	5	12/23/2016 2:12:09 PM
Total Metals by EPA Method 200.8				Batch ID: 15759		Analyst: TN
Antimony	0.265	1.00	JD	µg/L	5	12/28/2016 12:14:13 PM
Arsenic	1.12	5.00	JD	µg/L	5	12/28/2016 12:14:13 PM
Beryllium	ND	1.00	D	µg/L	5	12/28/2016 12:14:13 PM
Cadmium	ND	1.00	D	µg/L	5	12/28/2016 12:14:13 PM
Chromium	0.938	2.50	JD	µg/L	5	12/28/2016 12:14:13 PM
Copper	2.46	2.50	JD	µg/L	5	12/28/2016 12:14:13 PM
Lead	ND	2.50	D	µg/L	5	12/28/2016 12:14:13 PM
Nickel	1.56	2.50	JD	µg/L	5	12/28/2016 12:14:13 PM
Selenium	6.51	5.00	D	µg/L	5	12/28/2016 12:14:13 PM
Silver	ND	1.00	D	µg/L	5	12/28/2016 12:14:13 PM
Thallium	ND	1.00	D	µg/L	5	12/28/2016 12:14:13 PM
Zinc	33.8	7.50	D	µg/L	5	12/28/2016 12:14:13 PM
NOTES: Diluted due to matrix.						
Total Phosphorous by EPA Method 365.3				Batch ID: 15788		Analyst: KT
Phosphorus, Total (As P)	ND	0.200		mg/L	1	12/28/2016 2:03:00 PM
Total Suspended Solids (TSS) by SM 2540D				Batch ID: R33542		Analyst: KT
Total Suspended Solids	ND	5.00		mg/L	1	12/22/2016 12:22:00 PM

Analytical Report

Work Order: **1612224**
Date Reported: **12/29/2016**

Client: Shannon & Wilson
Project: Willow Creek
Lab ID: 1612224-002
Client Sample ID: **WC-02-DEC16**

Collection Date: 12/21/2016 10:08:00 AM
Matrix: Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R33595		Analyst: MW
Coliform, Fecal	6.00	1.00		CFU/100ml	1	12/21/2016 2:30:56 PM
NOTES: Confluent growth observed.						
Ion Chromatography by EPA Method 300.0				Batch ID: R33562		Analyst: KT
Chloride	100	1.00	D	mg/L	10	12/22/2016 11:50:00 AM
Mercury by EPA Method 245.1				Batch ID: 15768		Analyst: WF
Mercury	ND	0.100		µg/L	1	12/27/2016 3:35:06 PM
Total Hardness by EPA Method 200.8/SM 2340B				Batch ID: 15759		Analyst: TN
Total Hardness (as CaCO3)	121	4.00	D	mg/L CaCO3	5	12/23/2016 2:15:44 PM
Total Metals by EPA Method 200.8				Batch ID: 15759		Analyst: TN
Antimony	ND	0.200		µg/L	1	12/28/2016 12:17:49 PM
Arsenic	1.81	1.00		µg/L	1	12/28/2016 12:17:49 PM
Beryllium	ND	0.200		µg/L	1	12/28/2016 12:17:49 PM
Cadmium	ND	0.200		µg/L	1	12/28/2016 12:17:49 PM
Chromium	1.65	0.500		µg/L	1	12/28/2016 12:17:49 PM
Copper	1.57	0.500		µg/L	1	12/28/2016 12:17:49 PM
Lead	0.513	0.500		µg/L	1	12/28/2016 12:17:49 PM
Nickel	1.64	0.500		µg/L	1	12/28/2016 12:17:49 PM
Selenium	ND	1.00		µg/L	1	12/28/2016 12:17:49 PM
Silver	ND	0.200		µg/L	1	12/28/2016 12:17:49 PM
Thallium	ND	0.200		µg/L	1	12/28/2016 12:17:49 PM
Zinc	12.9	1.50		µg/L	1	12/28/2016 12:17:49 PM
Total Phosphorous by EPA Method 365.3				Batch ID: 15788		Analyst: KT
Phosphorus, Total (As P)	ND	0.200		mg/L	1	12/28/2016 2:11:00 PM
Total Suspended Solids (TSS) by SM 2540D				Batch ID: R33542		Analyst: KT
Total Suspended Solids	5.00	5.00		mg/L	1	12/22/2016 12:24:00 PM

Analytical Report

Work Order: **1612224**
Date Reported: **12/29/2016**

Client: Shannon & Wilson
Project: Willow Creek
Lab ID: 1612224-003
Client Sample ID: **WC-03-DEC16**

Collection Date: 12/21/2016 10:50:00 AM
Matrix: Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R33595		Analyst: MW
Coliform, Fecal	110	1.00		CFU/100ml	1	12/21/2016 2:30:56 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R33562		Analyst: KT
Chloride	31.7	0.500	D	mg/L	5	12/22/2016 1:14:00 PM
Mercury by EPA Method 245.1				Batch ID: 15768		Analyst: WF
Mercury	ND	0.100		µg/L	1	12/27/2016 3:36:47 PM
Total Hardness by EPA Method 200.8/SM 2340B				Batch ID: 15759		Analyst: TN
Total Hardness (as CaCO3)	48.8	4.00	D	mg/L CaCO3	5	12/23/2016 2:19:20 PM
Total Metals by EPA Method 200.8				Batch ID: 15759		Analyst: TN
Antimony	0.246	0.200		µg/L	1	12/28/2016 12:21:25 PM
Arsenic	ND	1.00		µg/L	1	12/28/2016 12:21:25 PM
Beryllium	ND	0.200		µg/L	1	12/28/2016 12:21:25 PM
Cadmium	ND	0.200		µg/L	1	12/28/2016 12:21:25 PM
Chromium	1.22	0.500		µg/L	1	12/28/2016 12:21:25 PM
Copper	2.87	0.500		µg/L	1	12/28/2016 12:21:25 PM
Lead	0.927	0.500		µg/L	1	12/28/2016 12:21:25 PM
Nickel	1.94	0.500		µg/L	1	12/28/2016 12:21:25 PM
Selenium	ND	1.00		µg/L	1	12/28/2016 12:21:25 PM
Silver	ND	0.200		µg/L	1	12/28/2016 12:21:25 PM
Thallium	ND	0.200		µg/L	1	12/28/2016 12:21:25 PM
Zinc	26.7	1.50		µg/L	1	12/28/2016 12:21:25 PM
Total Phosphorous by EPA Method 365.3				Batch ID: 15788		Analyst: KT
Phosphorus, Total (As P)	0.230	0.200		mg/L	1	12/28/2016 2:14:00 PM
Total Suspended Solids (TSS) by SM 2540D				Batch ID: R33542		Analyst: KT
Total Suspended Solids	11.0	5.00		mg/L	1	12/22/2016 12:26:00 PM

Analytical Report

Work Order: **1612224**
Date Reported: **12/29/2016**

Client: Shannon & Wilson
Project: Willow Creek
Lab ID: 1612224-004
Client Sample ID: **WC-04-DEC16**

Collection Date: 12/21/2016 11:32:00 AM
Matrix: Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R33595		Analyst: MW
Coliform, Fecal	424	1.00		CFU/100ml	1	12/21/2016 2:30:56 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R33562		Analyst: KT
Chloride	8.52	0.100		mg/L	1	12/22/2016 12:12:00 PM
Mercury by EPA Method 245.1				Batch ID: 15768		Analyst: WF
Mercury	ND	0.100		µg/L	1	12/27/2016 3:41:53 PM
Total Hardness by EPA Method 200.8/SM 2340B				Batch ID: 15759		Analyst: TN
Total Hardness (as CaCO3)	109	4.00	D	mg/L CaCO3	5	12/23/2016 2:22:56 PM
Total Metals by EPA Method 200.8				Batch ID: 15759		Analyst: TN
Antimony	0.226	0.200		µg/L	1	12/28/2016 12:25:01 PM
Arsenic	2.21	1.00		µg/L	1	12/28/2016 12:25:01 PM
Beryllium	ND	0.200		µg/L	1	12/28/2016 12:25:01 PM
Cadmium	ND	0.200		µg/L	1	12/28/2016 12:25:01 PM
Chromium	1.52	0.500		µg/L	1	12/28/2016 12:25:01 PM
Copper	3.30	0.500		µg/L	1	12/28/2016 12:25:01 PM
Lead	0.746	0.500		µg/L	1	12/28/2016 12:25:01 PM
Nickel	1.49	0.500		µg/L	1	12/28/2016 12:25:01 PM
Selenium	ND	1.00		µg/L	1	12/28/2016 12:25:01 PM
Silver	ND	0.200		µg/L	1	12/28/2016 12:25:01 PM
Thallium	ND	0.200		µg/L	1	12/28/2016 12:25:01 PM
Zinc	27.8	1.50		µg/L	1	12/28/2016 12:25:01 PM
Total Phosphorous by EPA Method 365.3				Batch ID: 15788		Analyst: KT
Phosphorus, Total (As P)	ND	0.200		mg/L	1	12/28/2016 2:17:00 PM
Total Suspended Solids (TSS) by SM 2540D				Batch ID: R33542		Analyst: KT
Total Suspended Solids	6.00	5.00		mg/L	1	12/22/2016 12:28:00 PM

Analytical Report

Work Order: **1612224**
Date Reported: **12/29/2016**

Client: Shannon & Wilson
Project: Willow Creek
Lab ID: 1612224-005
Client Sample ID: **WC-05-DEC16**

Collection Date: 12/21/2016 11:50:00 AM
Matrix: Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R33595		Analyst: MW
Coliform, Fecal	88.0	1.00		CFU/100ml	1	12/21/2016 2:30:56 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R33562		Analyst: KT
Chloride	10.9	0.200	D	mg/L	2	12/22/2016 12:23:00 PM
Mercury by EPA Method 245.1				Batch ID: 15768		Analyst: WF
Mercury	ND	0.100		µg/L	1	12/27/2016 3:43:36 PM
Total Hardness by EPA Method 200.8/SM 2340B				Batch ID: 15759		Analyst: TN
Total Hardness (as CaCO3)	94.8	4.00	D	mg/L CaCO3	5	12/23/2016 2:26:32 PM
Total Metals by EPA Method 200.8				Batch ID: 15759		Analyst: TN
Antimony	ND	0.200		µg/L	1	12/28/2016 12:28:37 PM
Arsenic	1.98	1.00		µg/L	1	12/28/2016 12:28:37 PM
Beryllium	ND	0.200		µg/L	1	12/28/2016 12:28:37 PM
Cadmium	ND	0.200		µg/L	1	12/28/2016 12:28:37 PM
Chromium	2.68	0.500		µg/L	1	12/28/2016 12:28:37 PM
Copper	5.08	0.500		µg/L	1	12/28/2016 12:28:37 PM
Lead	2.24	0.500		µg/L	1	12/28/2016 12:28:37 PM
Nickel	3.20	0.500		µg/L	1	12/28/2016 12:28:37 PM
Selenium	ND	1.00		µg/L	1	12/28/2016 12:28:37 PM
Silver	ND	0.200		µg/L	1	12/28/2016 12:28:37 PM
Thallium	ND	0.200		µg/L	1	12/28/2016 12:28:37 PM
Zinc	42.9	1.50		µg/L	1	12/28/2016 12:28:37 PM
Total Phosphorous by EPA Method 365.3				Batch ID: 15788		Analyst: KT
Phosphorus, Total (As P)	0.827	0.200		mg/L	1	12/28/2016 2:19:00 PM
Total Suspended Solids (TSS) by SM 2540D				Batch ID: R33542		Analyst: KT
Total Suspended Solids	581	5.00		mg/L	1	12/22/2016 12:30:00 PM

Analytical Report

Work Order: **1612224**
Date Reported: **12/29/2016**

Client: Shannon & Wilson
Project: Willow Creek
Lab ID: 1612224-006
Client Sample ID: **WC-06-DEC16**

Collection Date: 12/21/2016 12:20:00 PM
Matrix: Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R33595		Analyst: MW
Coliform, Fecal	41.0	1.00		CFU/100ml	1	12/21/2016 2:30:56 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R33562		Analyst: KT
Chloride	9.93	0.100		mg/L	1	12/22/2016 12:34:00 PM
Mercury by EPA Method 245.1				Batch ID: 15768		Analyst: WF
Mercury	ND	0.100		µg/L	1	12/27/2016 3:45:18 PM
Total Hardness by EPA Method 200.8/SM 2340B				Batch ID: 15759		Analyst: TN
Total Hardness (as CaCO3)	103	4.00	D	mg/L CaCO3	5	12/23/2016 2:30:08 PM
Total Metals by EPA Method 200.8				Batch ID: 15759		Analyst: TN
Antimony	0.231	0.200		µg/L	1	12/28/2016 12:32:12 PM
Arsenic	ND	1.00		µg/L	1	12/28/2016 12:32:12 PM
Beryllium	ND	0.200		µg/L	1	12/28/2016 12:32:12 PM
Cadmium	ND	0.200		µg/L	1	12/28/2016 12:32:12 PM
Chromium	1.39	0.500		µg/L	1	12/28/2016 12:32:12 PM
Copper	1.64	0.500		µg/L	1	12/28/2016 12:32:12 PM
Lead	ND	0.500		µg/L	1	12/28/2016 12:32:12 PM
Nickel	1.64	0.500		µg/L	1	12/28/2016 12:32:12 PM
Selenium	ND	1.00		µg/L	1	12/28/2016 12:32:12 PM
Silver	ND	0.200		µg/L	1	12/28/2016 12:32:12 PM
Thallium	ND	1.00	D	µg/L	5	12/23/2016 2:30:08 PM
Zinc	14.9	1.50		µg/L	1	12/28/2016 12:32:12 PM
Total Phosphorous by EPA Method 365.3				Batch ID: 15788		Analyst: KT
Phosphorus, Total (As P)	ND	0.200		mg/L	1	12/28/2016 2:22:00 PM
Total Suspended Solids (TSS) by SM 2540D				Batch ID: R33542		Analyst: KT
Total Suspended Solids	ND	5.00		mg/L	1	12/22/2016 12:32:00 PM

Analytical Report

Work Order: **1612224**
Date Reported: **12/29/2016**

Client: Shannon & Wilson
Project: Willow Creek
Lab ID: 1612224-007
Client Sample ID: **WC-07-DEC16**

Collection Date: 12/21/2016 12:41:00 PM
Matrix: Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R33595		Analyst: MW
Coliform, Fecal	224	1.00		CFU/100ml	1	12/21/2016 2:30:56 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R33562		Analyst: KT
Chloride	8.18	0.100		mg/L	1	12/22/2016 12:45:00 PM
Mercury by EPA Method 245.1				Batch ID: 15768		Analyst: WF
Mercury	ND	0.100		µg/L	1	12/27/2016 3:47:01 PM
Total Hardness by EPA Method 200.8/SM 2340B				Batch ID: 15759		Analyst: TN
Total Hardness (as CaCO3)	114	4.00	D	mg/L CaCO3	5	12/23/2016 2:33:43 PM
Total Metals by EPA Method 200.8				Batch ID: 15759		Analyst: TN
Antimony	ND	0.200		µg/L	1	12/28/2016 12:35:48 PM
Arsenic	2.15	1.00		µg/L	1	12/28/2016 12:35:48 PM
Beryllium	ND	0.200		µg/L	1	12/28/2016 12:35:48 PM
Cadmium	ND	0.200		µg/L	1	12/28/2016 12:35:48 PM
Chromium	1.20	0.500		µg/L	1	12/28/2016 12:35:48 PM
Copper	1.42	0.500		µg/L	1	12/28/2016 12:35:48 PM
Lead	ND	0.500		µg/L	1	12/28/2016 12:35:48 PM
Nickel	1.20	0.500		µg/L	1	12/28/2016 12:35:48 PM
Selenium	ND	1.00		µg/L	1	12/28/2016 12:35:48 PM
Silver	ND	0.200		µg/L	1	12/28/2016 12:35:48 PM
Thallium	ND	0.200		µg/L	1	12/28/2016 12:35:48 PM
Zinc	12.8	1.50		µg/L	1	12/28/2016 12:35:48 PM
Total Phosphorous by EPA Method 365.3				Batch ID: 15788		Analyst: KT
Phosphorus, Total (As P)	ND	0.200		mg/L	1	12/28/2016 2:29:00 PM
Total Suspended Solids (TSS) by SM 2540D				Batch ID: R33542		Analyst: KT
Total Suspended Solids	ND	5.00		mg/L	1	12/22/2016 12:34:00 PM

Work Order: 1612224
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Fecal Coliform by SM 9222D

Sample ID **MB-R33595** SampType: **MBLK** Units: **CFU/100ml** Prep Date: **12/21/2016** RunNo: **33595**
Client ID: **MBLKW** Batch ID: **R33595** Analysis Date: **12/21/2016** SeqNo: **637403**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Coliform, Fecal	ND	1.00									

Work Order: 1612224
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Total Hardness by EPA Method 200.8/SM 2340B

Sample ID **MB-15759**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **12/23/2016**	RunNo: **33572**
Client ID: **MBLKW**	Batch ID: **15759**		Analysis Date: **12/23/2016**	SeqNo: **637065**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium	ND	0.100									
Magnesium	ND	0.100									

Sample ID **LCS-15759**	SampType: **LCS**	Units: **mg/L**	Prep Date: **12/23/2016**	RunNo: **33572**
Client ID: **LCSW**	Batch ID: **15759**		Analysis Date: **12/23/2016**	SeqNo: **637066**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium	1.05	0.100	1.000	0	105	50	150				
Magnesium	0.899	0.100	1.000	0	89.9	50	150				

Sample ID **1612240-001ADUP**	SampType: **DUP**	Units: **mg/L CaCO3**	Prep Date: **12/23/2016**	RunNo: **33572**
Client ID: **BATCH**	Batch ID: **15759**		Analysis Date: **12/23/2016**	SeqNo: **637070**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Hardness (as CaCO3)	68.0	0.800						67.65	0.559	20	

Sample ID **1612240-001AMS**	SampType: **MS**	Units: **mg/L**	Prep Date: **12/23/2016**	RunNo: **33572**
Client ID: **BATCH**	Batch ID: **15759**		Analysis Date: **12/23/2016**	SeqNo: **637071**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium	24.3	0.100	5.000	19.52	95.8	50	150				
Magnesium	8.90	0.100	5.000	4.590	86.2	50	150				

Sample ID **1612240-001AMSD**	SampType: **MSD**	Units: **mg/L**	Prep Date: **12/23/2016**	RunNo: **33572**
Client ID: **BATCH**	Batch ID: **15759**		Analysis Date: **12/23/2016**	SeqNo: **637072**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium	21.7	0.100	5.000	19.52	44.0	50	150	24.31	11.3	20	S
Magnesium	8.25	0.100	5.000	4.590	73.1	50	150	8.900	7.62	20	

Work Order: 1612224
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Total Hardness by EPA Method 200.8/SM 2340B

Sample ID **1612240-001AMSD**	SampType: **MSD**			Units: **mg/L**		Prep Date: **12/23/2016**		RunNo: **33572**			
Client ID: **BATCH**	Batch ID: **15759**					Analysis Date: **12/23/2016**		SeqNo: **637072**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

NOTES:
S - Outlying spike recovery(ies) observed. A duplicate analysis was performed and recovered within range.

Work Order: 1612224
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID	**MB-R33562**	SampType:	**MBLK**	Units:	**mg/L**	Prep Date:	**12/22/2016**	RunNo:	**33562**
Client ID:	**MBLKW**	Batch ID:	**R33562**			Analysis Date:	**12/22/2016**	SeqNo:	**636778**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	ND	0.100									

Sample ID	**LCS-R33562**	SampType:	**LCS**	Units:	**mg/L**	Prep Date:	**12/22/2016**	RunNo:	**33562**
Client ID:	**LCSW**	Batch ID:	**R33562**			Analysis Date:	**12/22/2016**	SeqNo:	**636779**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	2.86	0.100	3.000	0	95.4	90	110				

Sample ID	**1612224-005CDUP**	SampType:	**DUP**	Units:	**mg/L**	Prep Date:	**12/22/2016**	RunNo:	**33562**
Client ID:	**WC-05-DEC16**	Batch ID:	**R33562**			Analysis Date:	**12/22/2016**	SeqNo:	**636787**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	11.0	0.200						10.89	1.25	20	D

Sample ID	**1612224-005CMS**	SampType:	**MS**	Units:	**mg/L**	Prep Date:	**12/22/2016**	RunNo:	**33562**
Client ID:	**WC-05-DEC16**	Batch ID:	**R33562**			Analysis Date:	**12/22/2016**	SeqNo:	**636788**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	15.0	0.200	6.000	10.89	68.8	80	120				DS

NOTES:
S - Spike recovery indicates a possible matrix effect. The method is in control as indicated by the Laboratory Control Sample (LCS).

Sample ID	**1612224-005CMSD**	SampType:	**MSD**	Units:	**mg/L**	Prep Date:	**12/22/2016**	RunNo:	**33562**
Client ID:	**WC-05-DEC16**	Batch ID:	**R33562**			Analysis Date:	**12/22/2016**	SeqNo:	**636789**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	15.0	0.200	6.000	10.89	68.0	80	120	15.02	0.311	20	DS

NOTES:
S - Spike recovery indicates a possible matrix effect. The method is in control as indicated by the Laboratory Control Sample (LCS).

Work Order: 1612224
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Total Phosphorous by EPA Method 365.3

Sample ID	**MB-15788**	SampType:	**MBLK**			Units:	**mg/L**	Prep Date:	**12/28/2016**	RunNo:	**33607**	
Client ID:	**MBLKW**	Batch ID:	**15788**					Analysis Date:	**12/28/2016**	SeqNo:	**637744**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)		ND	0.200									

Sample ID	**LCS-15788**	SampType:	**LCS**			Units:	**mg/L**	Prep Date:	**12/28/2016**	RunNo:	**33607**	
Client ID:	**LCSW**	Batch ID:	**15788**					Analysis Date:	**12/28/2016**	SeqNo:	**637745**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)		2.13	0.200	2.000	0	107	65	135				

Sample ID	**1612224-001BDUP**	SampType:	**DUP**			Units:	**mg/L**	Prep Date:	**12/28/2016**	RunNo:	**33607**	
Client ID:	**WC-01-DEC16**	Batch ID:	**15788**					Analysis Date:	**12/28/2016**	SeqNo:	**637747**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)		ND	0.200						0		30	

Sample ID	**1612224-001BMS**	SampType:	**MS**			Units:	**mg/L**	Prep Date:	**12/28/2016**	RunNo:	**33607**	
Client ID:	**WC-01-DEC16**	Batch ID:	**15788**					Analysis Date:	**12/28/2016**	SeqNo:	**637748**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)		2.07	0.200	2.000	0.05180	101	65	135				

Sample ID	**1612224-001BMSD**	SampType:	**MSD**			Units:	**mg/L**	Prep Date:	**12/28/2016**	RunNo:	**33607**	
Client ID:	**WC-01-DEC16**	Batch ID:	**15788**					Analysis Date:	**12/28/2016**	SeqNo:	**637749**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)		2.10	0.200	2.000	0.05180	102	65	135	2.067	1.47	30	

Work Order: 1612224
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Total Suspended Solids (TSS) by SM 2540D

Sample ID	MB-R33542	SampType:	MBLK			Units:	mg/L	Prep Date:	12/22/2016	RunNo:	33542	
Client ID:	MBLKW	Batch ID:	R33542					Analysis Date:	12/22/2016	SeqNo:	636390	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Suspended Solids		ND	5.00									

Sample ID	LCS-R33542	SampType:	LCS			Units:	mg/L	Prep Date:	12/22/2016	RunNo:	33542	
Client ID:	LCSW	Batch ID:	R33542					Analysis Date:	12/22/2016	SeqNo:	636391	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Suspended Solids		268	10.0	300.0	0	89.3	65	135				

Sample ID	1612215-001ADUP	SampType:	DUP			Units:	mg/L	Prep Date:	12/22/2016	RunNo:	33542	
Client ID:	BATCH	Batch ID:	R33542					Analysis Date:	12/22/2016	SeqNo:	636393	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Suspended Solids		ND	5.00						0		30	

Sample ID	1612226-001BDUP	SampType:	DUP			Units:	mg/L	Prep Date:	12/22/2016	RunNo:	33542	
Client ID:	BATCH	Batch ID:	R33542					Analysis Date:	12/22/2016	SeqNo:	636409	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Suspended Solids		ND	5.00						0		30	

Work Order: 1612224
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Total Metals by EPA Method 200.8

Sample ID **MB-15759** SampType: **MBLK** Units: **µg/L** Prep Date: **12/23/2016** RunNo: **33571**
Client ID: **MBLKW** Batch ID: **15759** Analysis Date: **12/23/2016** SeqNo: **637020**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	ND	0.200									
Arsenic	ND	1.00									
Beryllium	ND	0.200									
Cadmium	ND	0.200									
Chromium	ND	0.500									
Copper	ND	0.500									
Lead	ND	0.500									
Nickel	ND	0.500									
Selenium	ND	1.00									
Silver	ND	0.200									
Thallium	ND	0.200									
Zinc	ND	1.50									

Sample ID **LCS-15759** SampType: **LCS** Units: **µg/L** Prep Date: **12/23/2016** RunNo: **33571**
Client ID: **LCSW** Batch ID: **15759** Analysis Date: **12/23/2016** SeqNo: **637021**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	4.98	0.200	5.000	0	99.5	85	115				
Arsenic	102	1.00	100.0	0	102	85	115				
Beryllium	5.12	0.200	5.000	0	102	85	115				
Cadmium	4.81	0.200	5.000	0	96.3	85	115				
Chromium	108	0.500	100.0	0	108	85	115				
Copper	105	0.500	100.0	0	105	85	115				
Lead	52.6	0.500	50.00	0	105	85	115				
Nickel	106	0.500	100.0	0	106	85	115				
Selenium	9.77	1.00	10.00	0	97.7	85	115				
Silver	5.26	0.200	5.000	0	105	85	115				
Thallium	2.71	0.200	2.500	0	108	85	115				
Zinc	101	1.50	100.0	0	101	85	115				

Work Order: 1612224
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Total Metals by EPA Method 200.8

Sample ID **1612240-001ADUP** SampType: **DUP** Units: **µg/L** Prep Date: **12/23/2016** RunNo: **33571**
Client ID: **BATCH** Batch ID: **15759** Analysis Date: **12/23/2016** SeqNo: **637025**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	ND	0.200						0.2035	19.4	30	
Arsenic	ND	1.00						0		30	
Beryllium	ND	0.200						0		30	
Cadmium	ND	0.200						0		30	
Chromium	0.831	0.500						0.4915	51.3	30	
Copper	283	0.500						285.6	0.768	30	
Lead	30.8	0.500						30.42	1.23	30	
Nickel	16.5	0.500						15.78	4.31	30	
Selenium	1.05	1.00						0.3835	92.7	30	
Silver	ND	0.200						0		30	
Thallium	ND	0.200						0		30	
Zinc	305	1.50						301.8	0.932	30	

Sample ID **1612240-001AMS** SampType: **MS** Units: **µg/L** Prep Date: **12/23/2016** RunNo: **33571**
Client ID: **BATCH** Batch ID: **15759** Analysis Date: **12/23/2016** SeqNo: **637026**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	25.5	0.200	25.00	0.2035	101	70	130				
Arsenic	510	1.00	500.0	0	102	70	130				
Beryllium	26.6	0.200	25.00	0.005000	106	70	130				
Cadmium	25.4	0.200	25.00	0.1025	101	70	130				
Chromium	549	0.500	500.0	0.4915	110	70	130				
Copper	814	0.500	500.0	285.6	106	70	130				
Lead	280	0.500	250.0	30.42	99.7	70	130				
Nickel	567	0.500	500.0	15.78	110	70	130				
Selenium	49.7	1.00	50.00	0.3835	98.6	70	130				
Silver	19.8	0.200	25.00	0	79.2	70	130				
Thallium	12.7	0.200	12.50	0.005500	102	70	130				
Zinc	832	1.50	500.0	301.8	106	70	130				

Work Order: 1612224
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Total Metals by EPA Method 200.8

Sample ID **1612240-001AMSD** SampType: **MSD** Units: **µg/L** Prep Date: **12/23/2016** RunNo: **33571**
Client ID: **BATCH** Batch ID: **15759** Analysis Date: **12/23/2016** SeqNo: **637027**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	25.4	0.200	25.00	0.2035	101	70	130	25.49	0.202	30	
Arsenic	512	1.00	500.0	0	102	70	130	509.6	0.531	30	
Beryllium	23.9	0.200	25.00	0.005000	95.5	70	130	26.56	10.6	30	
Cadmium	26.7	0.200	25.00	0.1025	106	70	130	25.36	5.06	30	
Chromium	555	0.500	500.0	0.4915	111	70	130	548.5	1.11	30	
Copper	813	0.500	500.0	285.6	105	70	130	813.9	0.109	30	
Lead	279	0.500	250.0	30.42	99.3	70	130	279.6	0.355	30	
Nickel	554	0.500	500.0	15.78	108	70	130	566.5	2.21	30	
Selenium	48.3	1.00	50.00	0.3835	95.9	70	130	49.69	2.77	30	
Silver	20.5	0.200	25.00	0	82.1	70	130	19.80	3.63	30	
Thallium	12.8	0.200	12.50	0.005500	102	70	130	12.72	0.717	30	
Zinc	835	1.50	500.0	301.8	107	70	130	832.4	0.332	30	

Work Order: 1612224
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Mercury by EPA Method 245.1

Sample ID	**MB-15768**	SampType:	**MBLK**			Units:	**µg/L**		Prep Date:	**12/27/2016**		RunNo:	**33581**	
Client ID:	**MBLKW**	Batch ID:	**15768**						Analysis Date:	**12/27/2016**		SeqNo:	**637511**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual		
Mercury		ND	0.100											

Sample ID	**LCS-15768**	SampType:	**LCS**			Units:	**µg/L**		Prep Date:	**12/27/2016**		RunNo:	**33581**	
Client ID:	**LCSW**	Batch ID:	**15768**						Analysis Date:	**12/27/2016**		SeqNo:	**637512**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual		
Mercury		2.46	0.100	2.500	0	98.4	85	115						

Sample ID	**1612213-001DDUP**	SampType:	**DUP**			Units:	**µg/L**		Prep Date:	**12/27/2016**		RunNo:	**33581**	
Client ID:	**BATCH**	Batch ID:	**15768**						Analysis Date:	**12/27/2016**		SeqNo:	**637514**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual		
Mercury		ND	0.100						0		20			

Sample ID	**1612213-001DMS**	SampType:	**MS**			Units:	**µg/L**		Prep Date:	**12/27/2016**		RunNo:	**33581**	
Client ID:	**BATCH**	Batch ID:	**15768**						Analysis Date:	**12/27/2016**		SeqNo:	**637515**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual		
Mercury		2.42	0.100	2.500	0	96.8	80	120						

Sample ID	**1612213-001DMSD**	SampType:	**MSD**			Units:	**µg/L**		Prep Date:	**12/27/2016**		RunNo:	**33581**	
Client ID:	**BATCH**	Batch ID:	**15768**						Analysis Date:	**12/27/2016**		SeqNo:	**637516**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual		
Mercury		2.30	0.100	2.500	0	92.0	80	120	2.420	5.08	20			

Sample Log-In Check List

Client Name:	**SW**	Work Order Number:	**1612224**
Logged by:	**Erica Silva**	Date Received:	**12/21/2016 1:53:00 PM**

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Coolers are present?	Yes ☑	No ☐	NA ☐
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐	
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Required ☑
6.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
7.	Were all items received at a temperature of >0°C to 10.0°C*	Yes ☑	No ☐	NA ☐
8.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
9.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
10.	Are samples properly preserved?	Yes ☑	No ☐	
11.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
12.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
13.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
14.	Does paperwork match bottle labels?	Yes ☑	No ☐	
15.	Are matrices correctly identified on Chain of Custody?	Yes ☐	No ☑	
16.	Is it clear what analyses were requested?	Yes ☑	No ☐	
17.	Were all holding times able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

18.	Was client notified of all discrepancies with this order?	Yes ☑	No ☐	NA ☐

Person Notified:	Dave Cline, Scott Gaulke	Date	12/21/2016
By Whom:	Erica Silva	Via:	☑ eMail ☑ Phone ☐ Fax ☐ In Person
Regarding:	Condensing of each sample to one line, Matrix, Total Persulfate Nitrogen subcontracting		
Client Instructions:	Confirmed as 7 samples, Groundwater, proceed with subcontracting to lab performing S		

19. Additional remarks:

Item Information

Item #	Temp ºC
Cooler 1	1.8
Cooler 2	2.1
Sample 1	2.0
Sample 2	0.4

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Fremont Analytical

Chain of Custody Record

3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790
Fax: 206-352-7178

Laboratory Project No (internal): _____

Date: 12/21/16

Page: 1 of: 3

Client: Shannon & Wilson
Address: 400 N. 34th ST Suite 100
City, State, Zip: Seattle, WA 98103 Tel: 206 695 6700
Reports To (PM): Dave Cline Fax: Email: DRC@shannonwilson.com

Project Name: Willow Creek
Location: Edmonds, W
Collected by: Chris Helland
Project No: 21-1-12588-032

Sample Name	Sample Date	Sample Time	Sample Type (Matrix)	VOC (EPA 8260)	GX/BTEX by EPA 8021b	BTEX by 8260	Gasoline Range Organics	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics	SEMI VOL (EPA 8270)	PAH (EPA 8270 - SIM)	PCBs (EPA 8082)	Cl Pesticides (EPA 8081)	Cl Herbicides (EPA 8151A)	Metals* (6020 / 200.8)	Total (T) | Dissolved (D)	Anions (IC)**	Fecal Coliform	TSS	Hardness	Total Phosphorus	Total Persulfate Nitrogen by SM4500-N C-97	Comments/Depth
1 WC-01-DEC16-FC	12/21/16	09:32	GW												X	T	X	X	X	X	X	X	
2 WC-01-DEC16-PHO	"	"																			X		
3 WC-01-DEC16-H-M	"	"													X	T				X			
4 WC-01-DEC16-SS-FN-CL	"	"															X		X			X	
5 WC-02-DEC16-FC	"	10:08	GW												X	T	X	X	X	X	X	X	
6 WC-02-DEC16-PHO	"	"																			X		
7 WC-02-DEC16-H-M	"	"													X	T				X			
8 WC-02-DEC16-SS-FN-CL	"	"															X		X			X	
9 WC-02-DEC16-FC	"	10:50	GW												X	T	X	X	X	X	X	X	
10 WC-03-DEC16-PHO	"	"																			X		

*Metals Analysis (Circle): MTCA-5 RCRA-8 (Priority Pollutants) TAL Individual: Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl U V Zn

**Anions (Circle): Nitrate Nitrite (Chloride) Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Sample Disposal: ☐ Return to Client ☑ Disposal by Lab (A fee may be assessed if samples are retained after 30 days.)

Special Remarks:

Relinquished	Date/Time	Received	Date/Time
x [signature]	12/21/16 13:51	x Brian Ludy	12/21/16 13:53
x		x	

TAT --> Next Day 2 Day 3 Day (STD)

Distribution: White - Lab, Yellow - File, Pink - Originator

Fremont Analytical

Chain of Custody Record

3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790
Fax: 206-352-7178

Laboratory Project No (internal): _____

Date: 12/21/16 Page: 2 of: 3

Client: SHANNON & WILSON
Address: 400 N. 34th ST
City, State, Zip: SEATTLE, WA 98103 Tel: 206 695 6706
Reports To (PM): DAVE KLINE Fax: Email: DRC@SHANWIL.COM

Project Name: WILLOW CREEK
Location: EDMONDS, WA
Collected by: CHRIS HELLAND
Project No: 21-1-12588-032

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)	VOC (EPA 8260)	GX/BTEX by EPA 8021b	BTEX by 8260	Gasoline Range Organics	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics	SEMI VOL (EPA 8270)	PAH (EPA 8270 - SIM)	PCBs (EPA 8082)	Cl Pesticides (EPA 8081)	Cl Herbicides (EPA 8151A)	Metals* (6020 / 200.8)	Total (T) | Dissolved (D)	Anions (IC)**	FECAL COLIFORM	TSS	HARDNESS	TOTAL PHOSPHORUS	TOTAL PERSULFATE NITROGEN BY SM4500-N C-97	Comments/Depth
1	WC-03-DEC16-H-M	12/21/16	10:50													X	T			X				
2	WC-03-DEC16-SS-PN-CL	"	"															X		X		X		
3	WC-04-DEC16-FC	"	11:32	GW												X	T	X	X	X	X	X	X	FL ONLY
4	WC-04-DEC16-PHO	"	"																		X			
5	WC-04-DEC16-H-M	"	"													X	T				X			
6	WC-04-DEC16-SS-PN-CL	"	"															X		X		X		
7	WC-05-DEC16-FC	"	11:50	GW												X	T	X	X	X	X	X	X	
8	WC-05-DEC16-PHO	"	"																		X			
9	WC-05-DEC16-H-M	"	"													X	T				X			
10	WC-05-DEC16-SS-PN-CL	"	"															X		X		X		

*Metals Analysis (Circle): MTCA-5 RCRA-8 (Priority Pollutants) TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl U V Zn

**Anions (Circle): Nitrate Nitrite (Chloride) Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Sample Disposal: ☐ Return to Client ☑ Disposal by Lab (A fee may be assessed if samples are retained after 30 days.)

Special Remarks:

Relinquished	Date/Time	Received	Date/Time
x	12/21/16 13:51	x Brian Ould	12/21/16 13:53
x		x	

TAT --> Next Day 2 Day 3 Day (STD)

Distribution: White - Lab, Yellow - File, Pink - Originator

Chain of Custody Record and Laboratory Services Agreement

Fremont Analytical
3600 Fremont Ave N. Tel: 206-352-3790
Seattle, WA 98103 Fax: 206-352-7178

Date: 12/21/16 Laboratory Project No (internal): _____

Page: 3 of: 3

Client: Shannon & Wilson
Address: 400 N 34th Street Ste 100
City, State, Zip: Seattle, WA 98103
Telephone: 206 695 6706 Fax: _____

Project Name: Willow Creek
Project No: 21-1-12 588-032 Collected by: Chris Holland
Location: Edmonds, WA
Report To (PM): Dave Cline
PM Email: DRC@Shannon.com

*Matrix Codes: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	VOCs (EPA 8260 / 624)	GX/BTEX	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM / 625)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8)	Total (T) | Dissolved (D)	Anions (IC)***	EDB (8011)	FECAL COLIFORM	TSS	HARDNESS	TOTAL PHOSPHORUS	TOTAL PERSULFATE NITROGEN by SM 4500-N C-97	Comments
1	WC-06-DEC16 ~~-FC~~	12/21/16	13:20	GW										X	T	X		X	X	X	X	X	
2	~~WC-06-DEC16-PHO~~	"	"																		X		
3	~~WC-06-DEC16-H-M~~	"	"											X	T					X			
4	~~WC-06-DEC16-SS-PN-CL~~	"	"													X		X				X	
5	WC-07-DEC16 ~~-FC~~	"	12:41	GW										X	T	X		X	X	X	X	X	
6	~~WC-07-DEC16-PHO~~	"	"																		X		
7	~~WC-07-DEC16-H-M~~	"	"											X	T					X			
8	~~WC-07-DEC16-SS-PN-CL~~	"	"													X		X				X	
9																							
10																							

**Metals Analysis (Circle): MTCA-5 RCRA-8 (Priority Pollutants) TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl U V Zn

***Anions (Circle): Nitrate Nitrite (Chloride) Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Sample Disposal: ☐ Return to Client ☑ Disposal by Lab (Samples will be held for 30 days unless otherwise noted. A fee may be assessed if samples are retained after 30 days.)

Turn-around times for samples received after 4:00pm will begin on the following business day.

Special Remarks:

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished	Date/Time	Received	Date/Time
x [signature]	12/21/16 13:51	x Brian Rich	12/21/16 13:53
Relinquished	Date/Time	Received	Date/Time
x		x	

TAT → SameDay^ NextDay^ 2 Day 3 Day (STD)

^Please coordinate with the lab in advance

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Shannon & Wilson
Dave Cline
400 N. 34th Street, Suite 100
Seattle, WA 98103

RE: Willow Creek
Work Order Number: 1703343

April 06, 2017

Attention Dave Cline:

Fremont Analytical, Inc. received 7 sample(s) on 3/30/2017 for the analyses presented in the following report.

Fecal Coliform by SM 9222D
Ion Chromatography by EPA Method 300.0
Mercury by EPA Method 245.1
Total Metals by EPA Method 200.8
Total Hardness by EPA Method 200.8/SM 2340B
Total Phosphorous by EPA Method 365.3
Total Suspended Solids (TSS) by SM 2540D

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Mike Ridgeway
Laboratory Director

Date: *04/06/2017*

CLIENT: Shannon & Wilson
Project: Willow Creek
Work Order: 1703343

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1703343-001	WC-01-MAR17	03/30/2017 10:30 AM	03/30/2017 2:22 PM
1703343-002	WC-02-MAR17	03/30/2017 11:00 AM	03/30/2017 2:22 PM
1703343-003	WC-03-MAR17	03/30/2017 11:30 AM	03/30/2017 2:22 PM
1703343-004	WC-04-MAR17	03/30/2017 12:00 PM	03/30/2017 2:22 PM
1703343-005	WC-05-MAR17	03/30/2017 12:20 PM	03/30/2017 2:22 PM
1703343-006	WC-06-MAR17	03/30/2017 12:40 PM	03/30/2017 2:22 PM
1703343-007	WC-07-MAR17	03/30/2017 1:00 PM	03/30/2017 2:22 PM

Case Narrative

WO#: **1703343**
Date: **4/6/2017**

CLIENT: Shannon & Wilson
Project: Willow Creek

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.
1703343-001E
TEST_SUB has been Sub Contracted.
1703343-002E
TEST_SUB has been Sub Contracted.
1703343-003E
TEST_SUB has been Sub Contracted.
1703343-004E
TEST_SUB has been Sub Contracted.
1703343-005E
TEST_SUB has been Sub Contracted.
1703343-006E
TEST_SUB has been Sub Contracted.
1703343-007E
TEST_SUB has been Sub Contracted.

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Analytical Report

Work Order: **1703343**
Date Reported: **4/6/2017**

Client: Shannon & Wilson
Project: Willow Creek
Lab ID: 1703343-001
Client Sample ID: **WC-01-MAR17**

Collection Date: 3/30/2017 10:30:00 AM
Matrix: Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R35261		Analyst: MW
Coliform, Fecal	2.00	1.00		CFU/100ml	1	3/30/2017 3:26:59 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R35279		Analyst: KT
Chloride	16,900	1,000	D	mg/L	10000	3/31/2017 1:11:00 PM
Mercury by EPA Method 245.1				Batch ID: 16716		Analyst: WF
Mercury	ND	0.100		µg/L	1	4/6/2017 2:53:55 PM
Total Hardness by EPA Method 200.8/SM 2340B				Batch ID: 16702		Analyst: TN
Total Hardness (as CaCO3)	5,060	4.00	D	mg/L CaCO3	5	4/5/2017 3:04:55 PM
Total Metals by EPA Method 200.8				Batch ID: 16702		Analyst: TN
Antimony	ND	1.00	D	µg/L	5	4/5/2017 3:04:55 PM
Arsenic	3.36	5.00	JD	µg/L	5	4/5/2017 3:04:55 PM
Beryllium	ND	1.00	D	µg/L	5	4/5/2017 3:04:55 PM
Cadmium	ND	1.00	D	µg/L	5	4/5/2017 3:04:55 PM
Chromium	1.84	2.50	JD	µg/L	5	4/5/2017 3:04:55 PM
Copper	2.94	2.50	D	µg/L	5	4/5/2017 3:04:55 PM
Lead	0.598	2.50	JD	µg/L	5	4/5/2017 3:04:55 PM
Nickel	1.69	2.50	JD	µg/L	5	4/5/2017 3:04:55 PM
Selenium	6.87	5.00	D	µg/L	5	4/5/2017 3:04:55 PM
Silver	ND	1.00	D	µg/L	5	4/5/2017 3:04:55 PM
Thallium	ND	1.00	D	µg/L	5	4/5/2017 3:04:55 PM
Zinc	12.7	7.50	D	µg/L	5	4/5/2017 3:04:55 PM
NOTES: Diluted due to matrix.						
Total Phosphorous by EPA Method 365.3				Batch ID: 16713		Analyst: KT
Phosphorus, Total (As P)	ND	0.200		mg/L	1	4/6/2017 12:59:00 PM
Total Suspended Solids (TSS) by SM 2540D				Batch ID: R35290		Analyst: KT
Total Suspended Solids	14.0	5.00		mg/L	1	4/3/2017 12:04:00 PM

Analytical Report

Work Order: **1703343**
Date Reported: **4/6/2017**

Client: Shannon & Wilson
Project: Willow Creek
Lab ID: 1703343-002
Client Sample ID: **WC-02-MAR17**

Collection Date: 3/30/2017 11:00:00 AM
Matrix: Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R35261		Analyst: MW
Coliform, Fecal	101	1.00		CFU/100ml	1	3/30/2017 3:26:59 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R35279		Analyst: KT
Chloride	7,320	500	D	mg/L	5000	3/31/2017 1:20:00 PM
Mercury by EPA Method 245.1				Batch ID: 16716		Analyst: WF
Mercury	ND	0.100		µg/L	1	4/6/2017 2:55:38 PM
Total Hardness by EPA Method 200.8/SM 2340B				Batch ID: 16702		Analyst: TN
Total Hardness (as CaCO3)	2,320	4.00	D	mg/L CaCO3	5	4/5/2017 3:33:06 PM
Total Metals by EPA Method 200.8				Batch ID: 16702		Analyst: TN
Antimony	ND	1.00	D	µg/L	5	4/5/2017 3:33:06 PM
Arsenic	2.18	5.00	JD	µg/L	5	4/5/2017 3:33:06 PM
Beryllium	ND	1.00	D	µg/L	5	4/5/2017 3:33:06 PM
Cadmium	ND	1.00	D	µg/L	5	4/5/2017 3:33:06 PM
Chromium	0.943	2.50	JD	µg/L	5	4/5/2017 3:33:06 PM
Copper	1.90	2.50	JD	µg/L	5	4/5/2017 3:33:06 PM
Lead	0.570	2.50	JD	µg/L	5	4/5/2017 3:33:06 PM
Nickel	1.10	2.50	JD	µg/L	5	4/5/2017 3:33:06 PM
Selenium	3.03	5.00	JD	µg/L	5	4/5/2017 3:33:06 PM
Silver	ND	1.00	D	µg/L	5	4/5/2017 3:33:06 PM
Thallium	ND	1.00	D	µg/L	5	4/5/2017 3:33:06 PM
Zinc	6.53	7.50	JD	µg/L	5	4/5/2017 3:33:06 PM
NOTES: Diluted due to matrix.						
Total Phosphorous by EPA Method 365.3				Batch ID: 16713		Analyst: KT
Phosphorus, Total (As P)	ND	0.200		mg/L	1	4/6/2017 1:07:00 PM
Total Suspended Solids (TSS) by SM 2540D				Batch ID: R35290		Analyst: KT
Total Suspended Solids	5.00	5.00		mg/L	1	4/3/2017 12:08:00 PM

Analytical Report

Work Order: **1703343**
Date Reported: **4/6/2017**

Client: Shannon & Wilson
Project: Willow Creek
Lab ID: 1703343-003
Client Sample ID: **WC-03-MAR17**

Collection Date: 3/30/2017 11:30:00 AM
Matrix: Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R35261		Analyst: MW
Coliform, Fecal	6.00	1.00		CFU/100ml	1	3/30/2017 3:26:59 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R35279		Analyst: KT
Chloride	7.48	0.200	D	mg/L	2	3/31/2017 12:56:00 PM
Mercury by EPA Method 245.1				Batch ID: 16716		Analyst: WF
Mercury	ND	0.100		µg/L	1	4/6/2017 2:57:21 PM
Total Hardness by EPA Method 200.8/SM 2340B				Batch ID: 16702		Analyst: TN
Total Hardness (as CaCO3)	20.9	0.800		mg/L CaCO3	1	4/5/2017 3:12:58 PM
Total Metals by EPA Method 200.8				Batch ID: 16702		Analyst: TN
Antimony	0.341	0.200		µg/L	1	4/5/2017 3:12:58 PM
Arsenic	ND	1.00		µg/L	1	4/5/2017 3:12:58 PM
Beryllium	ND	0.200		µg/L	1	4/5/2017 3:12:58 PM
Cadmium	ND	0.200		µg/L	1	4/5/2017 3:12:58 PM
Chromium	2.06	0.500		µg/L	1	4/5/2017 3:12:58 PM
Copper	2.60	0.500		µg/L	1	4/5/2017 3:12:58 PM
Lead	0.751	0.500		µg/L	1	4/5/2017 3:12:58 PM
Nickel	1.33	0.500		µg/L	1	4/5/2017 3:12:58 PM
Selenium	ND	1.00		µg/L	1	4/5/2017 3:12:58 PM
Silver	ND	0.200		µg/L	1	4/5/2017 3:12:58 PM
Thallium	ND	0.200		µg/L	1	4/5/2017 3:12:58 PM
Zinc	15.3	1.50		µg/L	1	4/5/2017 3:12:58 PM
Total Phosphorous by EPA Method 365.3				Batch ID: 16713		Analyst: KT
Phosphorus, Total (As P)	ND	0.200		mg/L	1	4/6/2017 1:10:00 PM
Total Suspended Solids (TSS) by SM 2540D				Batch ID: R35290		Analyst: KT
Total Suspended Solids	7.00	5.00		mg/L	1	4/3/2017 12:10:00 PM

Analytical Report

Work Order: **1703343**
Date Reported: **4/6/2017**

Client: Shannon & Wilson
Project: Willow Creek
Lab ID: 1703343-004
Client Sample ID: **WC-04-MAR17**

Collection Date: 3/30/2017 12:00:00 PM
Matrix: Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R35261		Analyst: MW
Coliform, Fecal	95.0	1.00		CFU/100ml	1	3/30/2017 3:26:59 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R35279		Analyst: KT
Chloride	5.39	0.100		mg/L	1	3/31/2017 11:05:00 AM
Mercury by EPA Method 245.1				Batch ID: 16716		Analyst: WF
Mercury	ND	0.100		µg/L	1	4/6/2017 2:59:04 PM
Total Hardness by EPA Method 200.8/SM 2340B				Batch ID: 16702		Analyst: TN
Total Hardness (as CaCO3)	91.0	0.800		mg/L CaCO3	1	4/5/2017 3:16:59 PM
Total Metals by EPA Method 200.8				Batch ID: 16702		Analyst: TN
Antimony	ND	0.200		µg/L	1	4/5/2017 3:16:59 PM
Arsenic	2.12	1.00		µg/L	1	4/5/2017 3:16:59 PM
Beryllium	ND	0.200		µg/L	1	4/5/2017 3:16:59 PM
Cadmium	ND	0.200		µg/L	1	4/5/2017 3:16:59 PM
Chromium	1.65	0.500		µg/L	1	4/5/2017 3:16:59 PM
Copper	2.44	0.500		µg/L	1	4/5/2017 3:16:59 PM
Lead	0.617	0.500		µg/L	1	4/5/2017 3:16:59 PM
Nickel	1.38	0.500		µg/L	1	4/5/2017 3:16:59 PM
Selenium	ND	1.00		µg/L	1	4/5/2017 3:16:59 PM
Silver	ND	0.200		µg/L	1	4/5/2017 3:16:59 PM
Thallium	ND	0.200		µg/L	1	4/5/2017 3:16:59 PM
Zinc	13.5	1.50		µg/L	1	4/5/2017 3:16:59 PM
Total Phosphorous by EPA Method 365.3				Batch ID: 16713		Analyst: KT
Phosphorus, Total (As P)	ND	0.200		mg/L	1	4/6/2017 1:13:00 PM
Total Suspended Solids (TSS) by SM 2540D				Batch ID: R35290		Analyst: KT
Total Suspended Solids	ND	5.00		mg/L	1	4/3/2017 12:12:00 PM

Analytical Report

Work Order: **1703343**
Date Reported: **4/6/2017**

Client: Shannon & Wilson
Project: Willow Creek
Lab ID: 1703343-005
Client Sample ID: **WC-05-MAR17**

Collection Date: 3/30/2017 12:20:00 PM
Matrix: Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R35261		Analyst: MW
Coliform, Fecal	36.0	1.00		CFU/100ml	1	3/30/2017 3:26:59 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R35279		Analyst: KT
Chloride	7.48	0.200	D	mg/L	2	3/31/2017 12:08:00 PM
Mercury by EPA Method 245.1				Batch ID: 16716		Analyst: WF
Mercury	ND	0.100		µg/L	1	4/6/2017 3:00:44 PM
Total Hardness by EPA Method 200.8/SM 2340B				Batch ID: 16702		Analyst: TN
Total Hardness (as CaCO3)	83.5	0.800		mg/L CaCO3	1	4/5/2017 3:21:01 PM
Total Metals by EPA Method 200.8				Batch ID: 16702		Analyst: TN
Antimony	ND	0.200		µg/L	1	4/5/2017 3:21:01 PM
Arsenic	1.66	1.00		µg/L	1	4/5/2017 3:21:01 PM
Beryllium	ND	0.200		µg/L	1	4/5/2017 3:21:01 PM
Cadmium	ND	0.200		µg/L	1	4/5/2017 3:21:01 PM
Chromium	2.08	0.500		µg/L	1	4/5/2017 3:21:01 PM
Copper	2.81	0.500		µg/L	1	4/5/2017 3:21:01 PM
Lead	ND	0.500		µg/L	1	4/5/2017 3:21:01 PM
Nickel	2.41	0.500		µg/L	1	4/5/2017 3:21:01 PM
Selenium	ND	1.00		µg/L	1	4/5/2017 3:21:01 PM
Silver	ND	0.200		µg/L	1	4/5/2017 3:21:01 PM
Thallium	ND	0.200		µg/L	1	4/5/2017 3:21:01 PM
Zinc	6.44	1.50		µg/L	1	4/5/2017 3:21:01 PM
Total Phosphorous by EPA Method 365.3				Batch ID: 16713		Analyst: KT
Phosphorus, Total (As P)	ND	0.200		mg/L	1	4/6/2017 1:15:00 PM
Total Suspended Solids (TSS) by SM 2540D				Batch ID: R35290		Analyst: KT
Total Suspended Solids	9.00	5.00		mg/L	1	4/3/2017 12:14:00 PM

Client: Shannon & Wilson
Project: Willow Creek
Lab ID: 1703343-006
Client Sample ID: **WC-06-MAR17**

Collection Date: 3/30/2017 12:40:00 PM
Matrix: Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R35261		Analyst: MW
Coliform, Fecal	32.0	1.00		CFU/100ml	1	3/30/2017 3:26:59 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R35279		Analyst: KT
Chloride	7.55	0.200	D	mg/L	2	3/31/2017 12:18:00 PM
Mercury by EPA Method 245.1				Batch ID: 16716		Analyst: WF
Mercury	ND	0.100		µg/L	1	4/6/2017 3:02:25 PM
Total Hardness by EPA Method 200.8/SM 2340B				Batch ID: 16702		Analyst: TN
Total Hardness (as CaCO3)	92.2	0.800		mg/L CaCO3	1	4/5/2017 3:25:02 PM
Total Metals by EPA Method 200.8				Batch ID: 16702		Analyst: TN
Antimony	0.202	0.200		µg/L	1	4/5/2017 3:25:02 PM
Arsenic	2.52	1.00		µg/L	1	4/5/2017 3:25:02 PM
Beryllium	ND	0.200		µg/L	1	4/5/2017 3:25:02 PM
Cadmium	ND	0.200		µg/L	1	4/5/2017 3:25:02 PM
Chromium	2.67	0.500		µg/L	1	4/5/2017 3:25:02 PM
Copper	2.09	0.500		µg/L	1	4/5/2017 3:25:02 PM
Lead	ND	0.500		µg/L	1	4/5/2017 3:25:02 PM
Nickel	1.50	0.500		µg/L	1	4/5/2017 3:25:02 PM
Selenium	ND	1.00		µg/L	1	4/5/2017 3:25:02 PM
Silver	ND	0.200		µg/L	1	4/5/2017 3:25:02 PM
Thallium	ND	0.200		µg/L	1	4/5/2017 3:25:02 PM
Zinc	8.18	1.50		µg/L	1	4/5/2017 3:25:02 PM
Total Phosphorous by EPA Method 365.3				Batch ID: 16713		Analyst: KT
Phosphorus, Total (As P)	ND	0.200		mg/L	1	4/6/2017 1:23:00 PM
Total Suspended Solids (TSS) by SM 2540D				Batch ID: R35290		Analyst: KT
Total Suspended Solids	5.00	5.00		mg/L	1	4/3/2017 12:16:00 PM

Analytical Report

Work Order: **1703343**
Date Reported: **4/6/2017**

Client: Shannon & Wilson
Project: Willow Creek
Lab ID: 1703343-007
Client Sample ID: **WC-07-MAR17**

Collection Date: 3/30/2017 1:00:00 PM
Matrix: Groundwater

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Fecal Coliform by SM 9222D				Batch ID: R35261		Analyst: MW
Coliform, Fecal	62.0	1.00		CFU/100ml	1	3/30/2017 3:26:59 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R35279		Analyst: KT
Chloride	5.47	0.100		mg/L	1	3/31/2017 11:34:00 AM
Mercury by EPA Method 245.1				Batch ID: 16716		Analyst: WF
Mercury	ND	0.100		µg/L	1	4/6/2017 3:04:07 PM
Total Hardness by EPA Method 200.8/SM 2340B				Batch ID: 16702		Analyst: TN
Total Hardness (as CaCO3)	91.4	0.800		mg/L CaCO3	1	4/5/2017 3:29:03 PM
Total Metals by EPA Method 200.8				Batch ID: 16702		Analyst: TN
Antimony	ND	0.200		µg/L	1	4/5/2017 3:29:03 PM
Arsenic	2.82	1.00		µg/L	1	4/5/2017 3:29:03 PM
Beryllium	ND	0.200		µg/L	1	4/5/2017 3:29:03 PM
Cadmium	ND	0.200		µg/L	1	4/5/2017 3:29:03 PM
Chromium	1.47	0.500		µg/L	1	4/5/2017 3:29:03 PM
Copper	1.92	0.500		µg/L	1	4/5/2017 3:29:03 PM
Lead	ND	0.500		µg/L	1	4/5/2017 3:29:03 PM
Nickel	1.55	0.500		µg/L	1	4/5/2017 3:29:03 PM
Selenium	ND	1.00		µg/L	1	4/5/2017 3:29:03 PM
Silver	ND	0.200		µg/L	1	4/5/2017 3:29:03 PM
Thallium	ND	0.200		µg/L	1	4/5/2017 3:29:03 PM
Zinc	8.04	1.50		µg/L	1	4/5/2017 3:29:03 PM
Total Phosphorous by EPA Method 365.3				Batch ID: 16713		Analyst: KT
Phosphorus, Total (As P)	ND	0.200		mg/L	1	4/6/2017 1:25:00 PM
Total Suspended Solids (TSS) by SM 2540D				Batch ID: R35290		Analyst: KT
Total Suspended Solids	ND	5.00		mg/L	1	4/3/2017 12:18:00 PM

Work Order: 1703343
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Fecal Coliform by SM 9222D

Sample ID	**MB-R35261**	SampType:	**MBLK**	Units:	**CFU/100ml**	Prep Date:	**3/30/2017**	RunNo:	**35261**
Client ID:	**MBLKW**	Batch ID:	**R35261**			Analysis Date:	**3/30/2017**	SeqNo:	**674631**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Coliform, Fecal	ND	1.00									

Work Order: 1703343
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Total Hardness by EPA Method 200.8/SM 2340B

Sample ID **MB-16702** SampType: **MBLK** Units: **mg/L** Prep Date: **4/5/2017** RunNo: **35364**
Client ID: **MBLKW** Batch ID: **16702** Analysis Date: **4/5/2017** SeqNo: **677121**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium	ND	0.100									
Magnesium	ND	0.100									

Sample ID **LCS-16702** SampType: **LCS** Units: **mg/L** Prep Date: **4/5/2017** RunNo: **35364**
Client ID: **LCSW** Batch ID: **16702** Analysis Date: **4/5/2017** SeqNo: **677122**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium	1.11	0.100	1.000	0	111	50	150				
Magnesium	1.01	0.100	1.000	0	101	50	150				

Sample ID **1703353-001ADUP** SampType: **DUP** Units: **mg/L CaCO3** Prep Date: **4/5/2017** RunNo: **35364**
Client ID: **BATCH** Batch ID: **16702** Analysis Date: **4/5/2017** SeqNo: **677124**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Hardness (as CaCO3)	105	0.800						104.7	0.216	20	

Sample ID **1703353-001AMS** SampType: **MS** Units: **mg/L** Prep Date: **4/5/2017** RunNo: **35364**
Client ID: **BATCH** Batch ID: **16702** Analysis Date: **4/5/2017** SeqNo: **677125**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium	33.4	0.100	5.000	27.33	121	50	150				
Magnesium	13.5	0.100	5.000	8.862	93.7	50	150				

Sample ID **1703353-001AMSD** SampType: **MSD** Units: **mg/L** Prep Date: **4/5/2017** RunNo: **35364**
Client ID: **BATCH** Batch ID: **16702** Analysis Date: **4/5/2017** SeqNo: **677126**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium	32.9	0.100	5.000	27.33	111	50	150	33.36	1.44	20	
Magnesium	14.0	0.100	5.000	8.862	102	50	150	13.55	3.13	20	

Date: *4/6/2017*

Work Order: 1703343
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Total Hardness by EPA Method 200.8/SM 2340B

Sample ID **1703353-001AMSD** SampType: **MSD** Units: **mg/L** Prep Date: **4/5/2017** RunNo: **35364**
Client ID: **BATCH** Batch ID: **16702** Analysis Date: **4/5/2017** SeqNo: **677126**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Work Order: 1703343
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID	**MB-R35279**	SampType:	**MBLK**			Units:	**mg/L**	Prep Date:	**3/31/2017**	RunNo:	**35279**	
Client ID:	**MBLKW**	Batch ID:	**R35279**					Analysis Date:	**3/31/2017**	SeqNo:	**675065**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride		ND	0.100									

Sample ID	**LCS-R35279**	SampType:	**LCS**			Units:	**mg/L**	Prep Date:	**3/31/2017**	RunNo:	**35279**	
Client ID:	**LCSW**	Batch ID:	**R35279**					Analysis Date:	**3/31/2017**	SeqNo:	**675066**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride		2.93	0.100	3.000	0	97.7	90	110				

Sample ID	**1703343-007CDUP**	SampType:	**DUP**			Units:	**mg/L**	Prep Date:	**3/31/2017**	RunNo:	**35279**	
Client ID:	**WC-07-MAR17**	Batch ID:	**R35279**					Analysis Date:	**3/31/2017**	SeqNo:	**675080**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride		5.48	0.100						5.472	0.223	20	

Sample ID	**1703343-007CMS**	SampType:	**MS**			Units:	**mg/L**	Prep Date:	**3/31/2017**	RunNo:	**35279**	
Client ID:	**WC-07-MAR17**	Batch ID:	**R35279**					Analysis Date:	**3/31/2017**	SeqNo:	**675081**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride		8.58	0.100	3.000	5.472	104	80	120				E

NOTES:
E - Estimated value. The amount exceeds the linear working range of the instrument.

Sample ID	**1703343-007CMSD**	SampType:	**MSD**			Units:	**mg/L**	Prep Date:	**3/31/2017**	RunNo:	**35279**	
Client ID:	**WC-07-MAR17**	Batch ID:	**R35279**					Analysis Date:	**3/31/2017**	SeqNo:	**675082**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride		8.57	0.100	3.000	5.472	103	80	120	8.585	0.125	20	E

NOTES:
E - Estimated value. The amount exceeds the linear working range of the instrument.

Work Order: 1703343
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Total Phosphorous by EPA Method 365.3

Sample ID	**MB-16713**	SampType:	**MBLK**			Units:	**mg/L**	Prep Date:	**4/6/2017**	RunNo:	**35396**	
Client ID:	**MBLKW**	Batch ID:	**16713**					Analysis Date:	**4/6/2017**	SeqNo:	**677574**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)		ND	0.200									

Sample ID	**LCS-16713**	SampType:	**LCS**			Units:	**mg/L**	Prep Date:	**4/6/2017**	RunNo:	**35396**	
Client ID:	**LCSW**	Batch ID:	**16713**					Analysis Date:	**4/6/2017**	SeqNo:	**677575**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)		2.17	0.200	2.000	0	109	65	135				

Sample ID	**1703343-001BDUP**	SampType:	**DUP**			Units:	**mg/L**	Prep Date:	**4/6/2017**	RunNo:	**35396**	
Client ID:	**WC-01-MAR17**	Batch ID:	**16713**					Analysis Date:	**4/6/2017**	SeqNo:	**677577**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)		ND	0.200						0		30	

Sample ID	**1703343-001BMS**	SampType:	**MS**			Units:	**mg/L**	Prep Date:	**4/6/2017**	RunNo:	**35396**	
Client ID:	**WC-01-MAR17**	Batch ID:	**16713**					Analysis Date:	**4/6/2017**	SeqNo:	**677578**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)		2.13	0.200	2.000	0.08480	102	65	135				

Sample ID	**1703343-001BMSD**	SampType:	**MSD**			Units:	**mg/L**	Prep Date:	**4/6/2017**	RunNo:	**35396**	
Client ID:	**WC-01-MAR17**	Batch ID:	**16713**					Analysis Date:	**4/6/2017**	SeqNo:	**677579**	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)		2.14	0.200	2.000	0.08480	103	65	135	2.127	0.843	30	

Work Order: 1703343
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Total Suspended Solids (TSS) by SM 2540D

Sample ID **MB-R35290**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **4/3/2017**	RunNo: **35290**
Client ID: **MBLKW**	Batch ID: **R35290**		Analysis Date: **4/3/2017**	SeqNo: **675247**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Suspended Solids	ND	5.00									

Sample ID **LCS-R35290**	SampType: **LCS**	Units: **mg/L**	Prep Date: **4/3/2017**	RunNo: **35290**
Client ID: **LCSW**	Batch ID: **R35290**		Analysis Date: **4/3/2017**	SeqNo: **675248**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Suspended Solids	270	10.0	300.0	0	90.0	65	135				

Sample ID **1703343-001CDUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **4/3/2017**	RunNo: **35290**
Client ID: **WC-01-MAR17**	Batch ID: **R35290**		Analysis Date: **4/3/2017**	SeqNo: **675250**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Suspended Solids	15.0	5.00						14.00	6.90	30	

Sample ID **1703364-001CDUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **4/3/2017**	RunNo: **35290**
Client ID: **BATCH**	Batch ID: **R35290**		Analysis Date: **4/3/2017**	SeqNo: **675262**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Suspended Solids	92.0	5.00						92.00	0	30	

Work Order: 1703343
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Total Metals by EPA Method 200.8

Sample ID **MB-16702** SampType: **MBLK** Units: **µg/L** Prep Date: **4/5/2017** RunNo: **35363**
Client ID: **MBLKW** Batch ID: **16702** Analysis Date: **4/5/2017** SeqNo: **677073**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	ND	0.200									
Arsenic	ND	1.00									
Beryllium	ND	0.200									
Cadmium	ND	0.200									
Chromium	ND	0.500									
Copper	ND	0.500									
Lead	ND	0.500									
Nickel	ND	0.500									
Selenium	ND	1.00									
Silver	ND	0.200									
Thallium	ND	0.200									
Zinc	ND	1.50									

Sample ID **LCS-16702** SampType: **LCS** Units: **µg/L** Prep Date: **4/5/2017** RunNo: **35363**
Client ID: **LCSW** Batch ID: **16702** Analysis Date: **4/5/2017** SeqNo: **677074**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	4.71	0.200	5.000	0	94.2	85	115				
Arsenic	97.7	1.00	100.0	0	97.7	85	115				
Beryllium	4.92	0.200	5.000	0	98.3	85	115				
Cadmium	4.70	0.200	5.000	0	94.0	85	115				
Chromium	95.3	0.500	100.0	0	95.3	85	115				
Copper	97.1	0.500	100.0	0	97.1	85	115				
Lead	47.7	0.500	50.00	0	95.4	85	115				
Nickel	97.3	0.500	100.0	0	97.3	85	115				
Selenium	9.83	1.00	10.00	0	98.3	85	115				
Silver	4.63	0.200	5.000	0	92.7	85	115				
Thallium	2.45	0.200	2.500	0	97.8	85	115				
Zinc	100	1.50	100.0	0	100	85	115				

Work Order: 1703343
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Total Metals by EPA Method 200.8

Sample ID **1703353-001ADUP** SampType: **DUP** Units: **µg/L** Prep Date: **4/5/2017** RunNo: **35363**
Client ID: **BATCH** Batch ID: **16702** Analysis Date: **4/5/2017** SeqNo: **677076**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	1.24	0.200						1.462	16.3	30	
Arsenic	1.70	1.00						1.782	4.86	30	
Beryllium	ND	0.200						0		30	
Cadmium	ND	0.200						0		30	
Chromium	2.23	0.500						1.602	32.6	30	R
Copper	2.36	0.500						2.546	7.73	30	
Lead	ND	0.500						0.5985	61.2	30	
Nickel	1.65	0.500						1.959	17.0	30	
Selenium	ND	1.00						0		30	
Silver	ND	0.200						0		30	
Thallium	ND	0.200						0		30	
Zinc	12.9	1.50						13.63	5.88	30	

NOTES:
R - High RPD observed. The method is in control as indicated by the LCS.

Sample ID **1703353-001AMS** SampType: **MS** Units: **µg/L** Prep Date: **4/5/2017** RunNo: **35363**
Client ID: **BATCH** Batch ID: **16702** Analysis Date: **4/5/2017** SeqNo: **677077**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	26.3	0.200	25.00	1.462	99.2	70	130				
Arsenic	508	1.00	500.0	1.782	101	70	130				
Beryllium	24.1	0.200	25.00	0	96.6	70	130				
Cadmium	23.5	0.200	25.00	0.08750	93.7	70	130				
Chromium	504	0.500	500.0	1.602	100	70	130				
Copper	501	0.500	500.0	2.546	99.7	70	130				
Lead	241	0.500	250.0	0.5985	96.3	70	130				
Nickel	516	0.500	500.0	1.959	103	70	130				
Selenium	52.4	1.00	50.00	0.2040	104	70	130				
Silver	15.1	0.200	25.00	0	60.5	70	130				S
Thallium	12.5	0.200	12.50	0	100	70	130				
Zinc	526	1.50	500.0	13.63	102	70	130				

Work Order: 1703343
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Total Metals by EPA Method 200.8

Sample ID **1703353-001AMS** SampType: **MS** Units: **µg/L** Prep Date: **4/5/2017** RunNo: **35363**
Client ID: **BATCH** Batch ID: **16702** Analysis Date: **4/5/2017** SeqNo: **677077**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

NOTES:
S - Outlying spike recovery(ies) observed. A duplicate analysis was performed with similar results indicating a possible matrix effect.

Sample ID **1703353-001AMSD** SampType: **MSD** Units: **µg/L** Prep Date: **4/5/2017** RunNo: **35363**
Client ID: **BATCH** Batch ID: **16702** Analysis Date: **4/5/2017** SeqNo: **677078**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Antimony	26.1	0.200	25.00	1.462	98.6	70	130	26.26	0.611	30	
Arsenic	513	1.00	500.0	1.782	102	70	130	508.4	0.820	30	
Beryllium	24.0	0.200	25.00	0	96.0	70	130	24.14	0.600	30	
Cadmium	23.5	0.200	25.00	0.08750	93.5	70	130	23.50	0.115	30	
Chromium	503	0.500	500.0	1.602	100	70	130	503.7	0.0868	30	
Copper	503	0.500	500.0	2.546	100	70	130	501.2	0.411	30	
Lead	238	0.500	250.0	0.5985	94.9	70	130	241.4	1.49	30	
Nickel	502	0.500	500.0	1.959	100	70	130	515.6	2.65	30	
Selenium	49.5	1.00	50.00	0.2040	98.6	70	130	52.38	5.68	30	
Silver	14.9	0.200	25.00	0	59.5	70	130	15.12	1.68	30	S
Thallium	12.1	0.200	12.50	0	97.1	70	130	12.51	3.04	30	
Zinc	515	1.50	500.0	13.63	100	70	130	525.8	2.06	30	

NOTES:
S - Outlying spike recovery(ies) observed. A duplicate analysis was performed with similar results indicating a possible matrix effect.

Work Order: 1703343
CLIENT: Shannon & Wilson
Project: Willow Creek

QC SUMMARY REPORT

Mercury by EPA Method 245.1

Sample ID	**MB-16716**	SampType:	**MBLK**			Units:	**µg/L**	Prep Date:	**4/6/2017**	RunNo:	**35392**
Client ID:	**MBLKW**	Batch ID:	**16716**					Analysis Date:	**4/6/2017**	SeqNo:	**677710**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	ND	0.100									

Sample ID	**LCS-16716**	SampType:	**LCS**			Units:	**µg/L**	Prep Date:	**4/6/2017**	RunNo:	**35392**
Client ID:	**LCSW**	Batch ID:	**16716**					Analysis Date:	**4/6/2017**	SeqNo:	**677712**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	2.67	0.100	2.500	0	107	85	115				

Sample ID	**1703336-002ADUP**	SampType:	**DUP**			Units:	**µg/L**	Prep Date:	**4/6/2017**	RunNo:	**35392**
Client ID:	**BATCH**	Batch ID:	**16716**					Analysis Date:	**4/6/2017**	SeqNo:	**677714**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	ND	0.100						0		20	

Sample ID	**1703336-002AMS**	SampType:	**MS**			Units:	**µg/L**	Prep Date:	**4/6/2017**	RunNo:	**35392**
Client ID:	**BATCH**	Batch ID:	**16716**					Analysis Date:	**4/6/2017**	SeqNo:	**677715**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	2.49	0.100	2.500	0.03200	98.3	80	120				

Sample ID	**1703336-002AMSD**	SampType:	**MSD**			Units:	**µg/L**	Prep Date:	**4/6/2017**	RunNo:	**35392**
Client ID:	**BATCH**	Batch ID:	**16716**					Analysis Date:	**4/6/2017**	SeqNo:	**677716**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	2.47	0.100	2.500	0.03200	97.5	80	120	2.490	0.806	20	

Sample Log-In Check List

Client Name:	**SW**	Work Order Number:	**1703343**
Logged by:	**Clare Griggs**	Date Received:	**3/30/2017 2:22:00 PM**

Chain of Custody

1.	Is Chain of Custody complete?	Yes	☑	No ☐	Not Present	☐
2.	How was the sample delivered?	Client				

Log In

3.	Coolers are present?	Yes	☑	No ☐	NA	☐
4.	Shipping container/cooler in good condition?	Yes	☑	No ☐		
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes	☐	No ☐	Not Required	☑
6.	Was an attempt made to cool the samples?	Yes	☑	No ☐	NA	☐
7.	Were all items received at a temperature of >0°C to 10.0°C*	Yes	☑	No ☐	NA	☐
8.	Sample(s) in proper container(s)?	Yes	☑	No ☐		
9.	Sufficient sample volume for indicated test(s)?	Yes	☑	No ☐		
10.	Are samples properly preserved?	Yes	☑	No ☐		
11.	Was preservative added to bottles?	Yes	☐	No ☑	NA	☐
12.	Is there headspace in the VOA vials?	Yes	☐	No ☐	NA	☑
13.	Did all samples containers arrive in good condition(unbroken)?	Yes	☑	No ☐		
14.	Does paperwork match bottle labels?	Yes	☑	No ☐		
15.	Are matrices correctly identified on Chain of Custody?	Yes	☐	No ☑		
16.	Is it clear what analyses were requested?	Yes	☑	No ☐		
17.	Were all holding times able to be met?	Yes	☑	No ☐		

Special Handling (if applicable)

18.	Was client notified of all discrepancies with this order?	Yes	☐	No ☐	NA	☑

Person Notified: _____ Date _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Cooler	1.2
Sample	1.2
Temp Blank	1.9

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Fremont Analytical
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790
Fax: 206-352-7178

Chain of Custody Record & Laboratory Services Agreement

Date: 3/30/17 Page: of:

Laboratory Project No (internal): 1703343

Special Remarks:

Client: Shannon & Wilson

Address: 400 N 34th St #100

City, State, Zip: Seattle, WA 98103

Telephone: 206 695 6706

Fax:

Project Name: Willow Creek

Project No: 21-1-12588-032

Collected by: Chris Holland

Location: Edmonds, WA

Report To (PM): Dave Cline

PM Email: DRC@shanwil.com

Sample Disposal: ☐ Return to client ☐ Disposal by lab (after 30 days)

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	VOCs (EPA 8260 / 624)	GX/BTEX	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8)	Total (T)	Dissolved (D)	Anions (IC)***	EDB (8011)	Fecal Coliform	TSS	Hardness	Total Phosphorus	Total Persulfate Nitrogen	Comments
1	WC-01-MAR17	3/30/17	10:30											X	T		X		X	X	X	X	X	
2	WC-02-MAR17	3/30/17	11:00											X	T		X		X	X	X	X	X	
3	WC-03-MAR17	3/30/17	11:30											X	T		X		X	X	X	X	X	
4	WC-04-MAR17	3/30/17	12:00											X	T		X		X	X	X	X	X	
5	WC-05-MAR17	3/30/17	12:20											X	T		X		X	X	X	X	X	
6	WC-06-MAR17	3/30/17	12:40											X	T		X		X	X	X	X	X	
7	WC-07-MAR17	3/30/17	13:00											X	T		X		X	X	X	X	X	
8																								
9																								
10																								

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 (Priority Pollutants) TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl U V Zn

***Anions (Circle): Nitrate Nitrite (Chloride) Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above and that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished	Date/Time	Received	Date/Time
x	3/30/17 14:22	x	3/30/17 1422
Relinquished	Date/Time	Received	Date/Time
x		x	

Turn-around Time:
- ☒ Standard
- ☐ 3 Day
- ☐ 2 Day
- ☐ Next Day
- Same Day ____ (specify)

APPENDIX C

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to and part of Report 21-1-12588-032

Date: May 25, 2017
To: Mr. Robert Edwards, PE
City of Edmonds Public Works Department

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland