MEMORANDUM

TO: Brad Phelps, Project Manager, CH2M Hill
FROM: Brad Gamble, Henry Hunt and Sam Stowe,
Layne Ranney Collector Wells
RE: Results: Ostrander Rock Property Site - OB-3 Test Boring
Cowlitz River Alluvial Aquifer Collector Well Feasibility Study

DATE: July 19, 2016

INTRODUCTION

The City of Longview currently operates four deep (352-385 feet) water supply wells constructed in the alluvium associated with the Columbia River. These wells, constructed in the Mint Farm Industrial Park, are located in the western portion of the City. The City initiated an investigation to determine the feasibility of replacing their current water supply wells using collector well technology from the alluvium in the Cowlitz River valley, which generally forms the eastern boundary of the City. In order to determine if the hydrogeologic conditions are sufficient to develop a collector well (or wells) along the Cowlitz River, Layne was authorized to undertake a phased drilling and testing program. As reported in our memorandum dated March 3, 2016, the initial Phase 1 field activities for this investigation consisted of the drilling of three test borings, with test boring TH-1 drilled in Riverside County Park, TH-2 drilled along Solomon Road, and TH-3 drilled adjacent to the (inactive) Fishers Lane Water Treatment Plant (FLWTP) (Figure 1). Hydraulic interval pumping tests were conducted at the TH-1 and TH-3 locations. Based on the results of the first three borings, it was recommended the City also consider investigating the hydrogeologic conditions at the Ostrander Rock property, which is located to the northeast of the TH-2 location (Figures 1 and 2).

Based on this recommendation, the City arranged for access to the Ostrander Rock property, and additional Phase 1 drilling and testing was conducted. A boring designated OB-3 was drilled on the Ostrander Rock property and a hydraulic interval test was conducted. The results of this recently completed work, the capacity estimates and water quality analyses are presented in this memorandum. As with the initial Phase 1 borings, the data collected from OB-3 were evaluated primarily to determine if additional detailed aquifer testing is warranted, which constitutes the second phase of this investigation.

FIELD ACTIVITIES

In order to evaluate the hydraulic character of the alluvial deposits, test boring OB-3 was drilled on the Ostrander Rock property by Cascade Drilling, L.P. using rotasonic drilling technology, under the supervision of an experienced Layne hydrogeologist. The boring was advanced until it was confirmed that the base of coarse-grained alluvial deposits was encountered. Lithologic samples were retained from every five (5) feet of depth and at each change in formation materials. Selected samples from the boring were retained by Layne for grain size analysis. Lithologic samples not retained by Layne were submitted to the City at the end of the field activities.

A hydraulic interval pumping test was conducted in OB-3. The vertical interval (depth) to be tested was selected by the hydrogeologist on the basis of the drilling and material sampling results. Upon reaching the total completion depth of the test boring, the casing was pulled back to the bottom of the interval to be tested, and a 15-foot length of well screen (6-inch diameter, wire-wrapped continuous slot) was installed in the selected interval using the pullback method. The screen slot size was 0.020-inch.

An electric submersible pump capable of pumping up to 125 gallons per minute (gpm) was used to develop the test well and conduct the test pumping. Development of the well was accomplished by surging, airlifting and pumping for about two hours until the water produced was visibly clear and contained little or no sediment. For the tests, the selected interval was pumped for two (2) hours, with the pumping period divided into four (4) steps of thirty (30) minutes duration. During each step, the pumping was maintained at a constant rate.

During the hydraulic interval test pumping period, depths to water in the test well were measured to the nearest 0.01 foot. The elapsed time of pumping to the nearest minute and the pumping rate associated with the water level measurements were also recorded. The approximate elevation of the Cowlitz River in this area was also monitored during this testing using a stage gage at the existing intake near the FLWTP and a nearby U.S. Army Corps of Engineers gaging station. An in-line electronic flowmeter (Great Plains Industries, Inc. Model TM200-N) was used to measure the pumping rates.

During each step of the pumping period, water level measurements in the test boring were made on at approximately the following schedule:

- Every 1 minute for 0 to 6 minutes from the start of the step;
- Every 2 minutes for 6 to 12 minutes from the start of the step;
- Every 5 minutes after 15 minutes from the start of the step.

During the hydraulic interval testing, water samples were field screened for pH, conductivity, iron and temperature by Layne. Additionally, water samples were collected by CH2M Hill during the pumping period and submitted to the ALS Environmental Kelso Laboratory for laboratory analysis of water quality parameters selected by CH2M Hill.

Following completion of the interval test, the OB-3 boring was converted to a 2-inch diameter PVC observation well. The observation well was installed with 10 feet of machine slotted PVC well screen. The top of the observation well was completed with a flush-grade cover. A water-tight plug was installed in the top of the PVC casing.

TEST DRILLING RESULTS

A detailed log of the materials encountered in the borehole is presented in Attachment 1, and a summary of information on the borehole and observation well is presented in Table 1. The sieve analysis results are presented in Attachment 2 and summarized in Table 2.

OB-3 was drilled to a total depth of 66 feet. The boring was advanced until six (6) feet of low permeability materials were encountered. Unconsolidated alluvial deposits of relatively coarse-grained sand and gravel were present from a depth of 19 feet to 60 feet. From 60 feet to the completion depth of the boring at 66 feet, the materials encountered were comprised mainly of sand to silty sand. These materials would have lower permeability than the overlying sand and gravel, and would tend to impede recharge to any more permeable deposits that might be present at greater depths. The grain size distribution of the coarse-grained alluvial deposits encountered in the borings varied from nearly all sand to more than 70% gravel (based on the Wentworth grain size classification).

The measured depth to water in the boring was about 19 feet below ground and the water table elevation was estimated to be about 15 feet above sea level at the time of the drilling activities. The saturated thickness above the base of the coarse-grained sand and gravel deposits was about 41 feet.

HYDRAULIC INTERVAL TEST RESULTS

The OB-3 hydraulic interval pumping test data are presented in Attachment 3 and a summary of the pumping test results is presented in Table 3. A time drawdown plot for the pumping test is presented in Figure 3.
The observed drawdown value (the difference between the static and the pumping water levels in the well) at the end of the step at the maximum pumping rate of 118 gpm was 2.4 feet. The observed specific capacity (the ratio of the pumping rate to the drawdown) for this step is 48 gallons per minute per foot of drawdown (gpm/ft).

Estimates of the aquifer transmissivity and hydraulic conductivity were made based on the observed specific capacity values. These transmissivity and hydraulic conductivity values should be considered as very approximate estimates given factors such as the short-term length of the pumping tests, potential boundary effects, possible recirculation of the discharge water, and pumping well efficiency. Transmissivity of an unconfined aquifer can be estimated from specific capacity using the following equation (Driscoll, 1986):

$$T = 1500 * Q/s$$

Where: T = transmissivity, gpd/ft
Q/s = specific capacity, gpm/ft
Q = pumping rate, gpm
s = drawdown, feet

Hydraulic conductivity is related to transmissivity by the following equation:

$$K = T/b$$

Where: K = hydraulic conductivity, gpd/ft^2
b = aquifer thickness, feet

The specific capacity data from the tests were adjusted for well efficiency and partial penetration effects using an equation by Kozeny (Driscoll, 1986), such that:

$$T = \frac{1500 \cdot Q/s}{X \cdot E}$$

$$X = L \cdot \left[1 + 7 \cdot \sqrt{\frac{r}{2 \cdot b \cdot L}} \cdot \cos\left(\frac{\pi \cdot L}{2} \right) \right]$$

Where:
T = aquifer transmissivity, gpd/ft
Q = pumping rate, gpm
s = drawdown, feet
r = well radius, in feet
b = saturated aquifer thickness, feet
L = well screen length as a fraction of aquifer thickness
r = well radius, feet
X = partial penetration adjustment
E = well efficiency

For the analysis, the well efficiency was estimated using the methods presented by Bruin and Hudson (1955).

The estimated transmissivity value from the hydraulic interval test is included in Table 3. The results for the OB-3 test are approximately 200,000 gallons per day per foot (gpd/ft) for the transmissivity and approximately 5,000 gallons per day per square foot (gpd/ft^2) for the hydraulic conductivity. Hydraulic conductivity values between 3,000 and 5,000 gpd/ft^2 are in the expected range for an aquifer comprised mainly of sand and gravel of a character similar to that observed during the drilling.

WATER QUALITY

The results of the field water quality testing conducted during the hydraulic interval test are presented in Table 4, and the laboratory results from the OB-3 samples are summarized in Table 5. The laboratory reports are included as Attachment 4. The field water quality measurements indicated that the ground water temperature averaged between 56 ^{o} F (13 ^{o} C). The specific conductance values averaged 370 micro-Siemens per centimeter (µS/cm). Field sampling and testing for iron concentrations exceeded the limits of the field testing equipment, indicating the iron concentrations were above the testing limit of 5 milligrams per liter (mg/l).

The laboratory iron concentration for the sample from OB-3 was 28.8 mg/l, which is considerably above the secondary drinking water standard for iron of 0.30 mg/l. The manganese result for OB-3 of 1.03 mg/l exceeds the secondary drinking water standard for manganese of 0.050 mg/l. The

aluminum result of 0.12 mg/l is below the secondary drinking water standard for aluminum of 0.20 mg/l. Secondary drinking water standards are generally established for aesthetic reasons to control issues of color, odor or the potential for staining, rather than for health effects.

A water sample from the Cowlitz River was collected by Layne at Riverside County Park in January 2016 for general background screening and comparison to the ground water quality. The results for the river water sample are summarized in Table 6. The laboratory report for this sample is included as Attachment 5 of our March 3rd Memorandum. The aluminum, iron and manganese concentrations in this river water sample also exceed the secondary drinking water standards, but the iron concentration in the river water at 0.43 mg/l is substantially lower than the iron concentrations in the sample from OB-3. Silica levels in the Cowlitz River were reported at 18 mg/L, notably lower than the total silica level of 68 mg/l reported in OB-3 ground water sample.

AQUIFER CHARACTERIZATION

The unconsolidated sand and gravel deposits encountered in OB-3 are part of the Cowlitz River Valley alluvial aquifer system. The permeable sand and gravel deposits present at the test boring location are a source of ground water supply. Based on their fine-grained nature, the deposits observed just below the sand and gravel aquifer deposits (below a depth of 60 feet) likely have lower permeability and would yield much lower quantities of water to wells.

Some of the uppermost sediments encountered at the Ostrander Rock property could be the result of dredging operations in the area following the 1980 eruption of Mt. St. Helens and subsequent surge flows down the Cowlitz and Toutle Rivers. A test boring (T.H.2) was drilled on the Ostrander Rock property by Ranney Method Western Corporation (RMWC) during a 1977 investigation for the City of Kelso. The approximate location of T.H.2 is shown on Figures 1 and 2, and it is believed that the T.H.2 location was about 500 feet from the OB-3 location. This previous boring showed a saturated sand and gravel aquifer thickness of approximately 32 feet. The previous boring was completed before the eruption of Mt. St. Helens, and the information in the 1977 report does not reflect the possible accumulation of dredge spoils or river surge flows that may have been deposited post-1980. These deposits could have raised the ground surface elevation from what was observed in 1977. The aquifer at the location of

the test boring T.H.2 also appears potentially favorable due to the well log description and the reported saturated thickness.

Based on the field work conducted in January, the aquifer hydraulic conductivity at the TH-1 (Riverside County Park) has a value in the range of 3,600 and 6,400 gpd/ft^2. Because of the similarities between the coarse-grained aquifer materials observed in TH-1 and those observed in OB-3, the hydraulic conductivity of the aquifer materials is likely similar at the two locations. Given that at the TH-1 location a thickness of 23 feet of coarse-grained sand and gravel was encountered, whereas at OB-3 a thickness of 35 feet of coarse-grained sand and gravel was present, it is possible that the aquifer transmissivity at OB-3 is higher than at TH-1, and consequently the potential collector well yield at OB-3 could be higher than at TH-1. The yield estimated for a collector well installed at TH-1, is up to 9 million gallons per day (MGD) under conditions observed in January. This is above the yield reported for the Kelso collector well on an average pumping basis, which is constructed in the alluvial deposits along the Cowlitz River. It appears that the aquifer conditions and the potential productivity at the Ostrander Rock property and at the Riverside County Park site may be similar or more favorable than those for the existing collector well operated by the City of Kelso.

The information from drilling and testing of TH-1 and OB-3, and from the existing Kelso radial collector well, suggests that the areas from the Ostrander Rock Property to Riverside County Park along the Cowlitz River appear favorable for development of a horizontal collector well water supply. At both Riverside County Park and the Ostrander Rock property, there is a flood control levee that runs the length of each property following the Cowlitz River. It is understood that subsurface construction in either area will require discussions and compliance with levee-related regulations for locating and operating wells.

HORIZONTAL COLLECTOR WELL YIELD ESTIMATE

Using the recent testing results, estimates for the yield of horizontal collector well can be calculated. The theoretical drawdown under steady-state pumping conditions in a collector well can be calculated using the following equation developed by Hantush and Papadopulos (1962):

$$s_{cs} \geq \left(\frac{Q}{2\pi Kb}\right) \text{Ln}\left(\frac{\Gamma^{\Gamma}}{\varepsilon^{\varepsilon}}\left(\frac{\left(\frac{b}{\pi r_w}\right)^2}{2\left(1 - \cos\frac{\pi}{b}\left(2z_i + r_w\right)\right)}\right)^{\frac{b}{4l}}\right)$$

where:

s_{cs}	=	Drawdown in collector well, ft
Q	=	Yield of collector, gpd
K	=	Hydraulic Conductivity, gpd/ft^2
b	=	Saturated thickness of aquifer, ft
Γ	=	$(2\ (a - r_c))/l$
a	=	Effective distance to a line of recharge, ft
l	=	Average length of laterals, ft
r_c	=	Radius of collector caisson, ft
ε	=	$(2a - r_c - l)/l$
r_w	=	Effective radius of each lateral, ft
z_i	=	Depth of lateral below top of the aquifer, ft

Using a variation of the above equation, the potential collector well yield was estimated using values determined by the test results and the hydrogeologic setting of the OB-3 location. To estimate yield, the design level of the centerline of the laterals is assumed at an elevation of approximately -17.0 feet. This places the laterals about 3 feet above the base of the coarse-grained sand and gravel deposits. The minimum pumping level is assumed to be ten (10) feet above the centerline of the laterals. The effective distance to recharge was assumed to equal the distance from the test boring location to the middle of the Cowlitz River (approximately 450 feet). The assumed collector well design utilized five (5) laterals with an average lateral length of 200 feet. For comparability, the same number and length of laterals were used for the OB-3 yield calculations as were used for the previous yield estimates for the TH-1 and TH-3a sites. The collector well yield estimates assume no pumping interference from any adjacent wells.

For the OB-3 site, the collector well yields were calculated with a low and high estimate of the hydraulic conductivity. The low value used was 5,000 gpm/ft^2, which was the value from the interval test results. For the high hydraulic conductivity value, the high value from the TH-1 site (6,400 gpd/ft^2) was used.

Based on the equation and the assumptions presented above, the yield of a collector well installed near the OB-3 location under the conditions present during testing is estimated to be in the range of 6,100 to 7,800 gpm or 8.8 to 11.2 MGD. This indicates that the OB-3 site could have a collector well yield that is good as or better than the TH-1 site. The actual collector well yields will depend on how well the actual conditions match the assumed conditions and will vary with changes in recharge conditions, river and ground water levels and river and ground water temperatures. It is estimated that during the interval testing the Cowlitz River levels were about 3 feet above normal low river levels. Reducing the static water levels to adjust for normal river conditions could reduce the estimated yields by 20% or more from the values presented above.

Depending upon property line and levee set-backs/easements, it may be possible to locate two collector wells on the Ostrander Rock property, although there would likely be hydraulic interference between the wells, possibly reducing their individual yields. Considering the estimated yield for a single collector well at the Ostrander Rock property, and assuming that a similar yield could also be developed at a second site within the property boundaries, it appears that two collector wells could be installed on this property to produce a combined capacity of up to 18 MGD, assuming minimal pumping interference between the wells. However, if the caisson and laterals of a collector well cannot be within the 200 foot shoreline jurisdiction, the Ostrander property may only be able to accommodate a single collector well.

SUMMARY/RECOMMENDATIONS

The City of Longview is considering the feasibility of installing collector wells along the Cowlitz River to supplement and/or replace some or all of the capacity produced from the existing vertical wells at the Mint Farm Regional Water Treatment Plant. In order to determine if the existing hydrogeologic conditions are sufficient to develop a collector well in one or more areas along the Cowlitz River, Layne has recommended a phased drilling and testing program. The initial activities for the first phase were completed in January of this year and involved drilling of test borings at Riverside County Park, along Solomon Road and the Fishers Lane Water Treatment Plant. Based on these results, drilling and testing was recently conducted at the Ostrander Rock property. Results of a test boring (T.H.2) made in 1977 on the Ostrander Rock property suggested favorable aquifer deposits may also exist at this location. During the recent activities, boring

OB-3 was drilled on this property and a hydraulic interval pumping test was conducted.

In OB-3 coarse-grained sand and gravel aquifer materials were present from depths of 19 to 60 feet. These coarse-grained alluvial deposits were underlain by layers comprised primarily sand and varying amounts of silt, with the silt content increasing with depth. These lower deposits likely have lower permeability than the overlying sand and gravel. The saturated thickness of the coarse-grained sand and gravel deposits at OB-3 was 41 feet. The transmissivity result from the OB-3 site is about 200,000 gpd/ft, and the estimated hydraulic conductivity is about 5,000 gpd/ft^2.

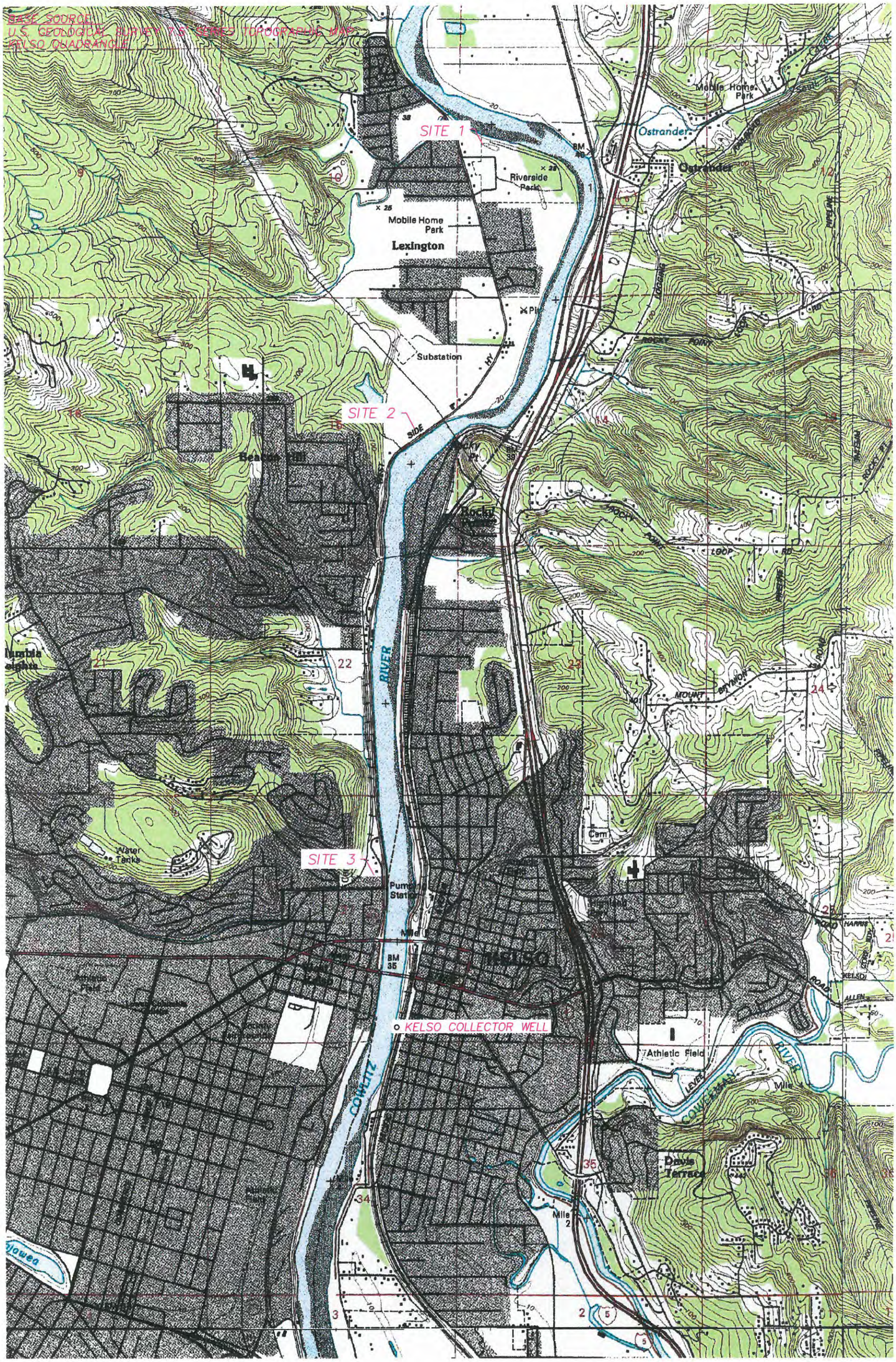
The estimated yield of a collector well installed at the Ostrander Rock property under the conditions present during the initial testing phase is approximately 9 to 11 MGD.

If the City wishes to continue to investigate the feasibility of developing a water supply using collector well technology along the Cowlitz River, Layne recommends continuing with the phased testing approach, which would involve additional detailed aquifer testing. The transmissivity and hydraulic conductivity values from the short-term pumping tests conducted at OB-3 boring and previously at the TH-1 and TH-3 locations should be considered as approximate values. Because the collector well yield estimates for OB-3 utilize the transmissivity and hydraulic conductivity values, they must also be considered approximate. A longer term pumping test conducted with a higher pumping rate and with multiple observation wells is necessary to accurately determine the aquifer characteristics and allow for accurate estimates of collector well yields. Also, additional borings are required to evaluate the potential for variability in the aquifer properties. Layne recommends installing a larger temporary production test well to be used for the detailed aquifer testing. To accurately determine the aquifer characteristics, we recommend installing up to three additional observation wells adjacent to the production test well and using the initial well OB-3 as an additional observation well. The detailed aquifer testing would then be conducted.

It is also recommended that if the City wishes to continue to investigate the feasibility of installing a collector well or wells at either the Riverside County Park or the Ostrander Rock property, consideration should be given to conducting a long-term pumping test at one of these locations to evaluate the potential effect of inducing infiltration from the river on the

quality of water produced from a well on the site. It is unlikely that any noticeable change in water quality would occur during the duration (2 to 3 days) of a typical aquifer pumping test. In order to observe changes in the ground water quality due to induced infiltration of river water, it is likely that a period of continuous pumping lasting 90 days or more would be needed. A long-term pumping test would give an indication of whether induced infiltration of river water could potentially result in a more acceptable water quality from a ground water source and assist in determining potential water treatment requirements and costs.

FIGURES



NORTH

SCALE IN FEET

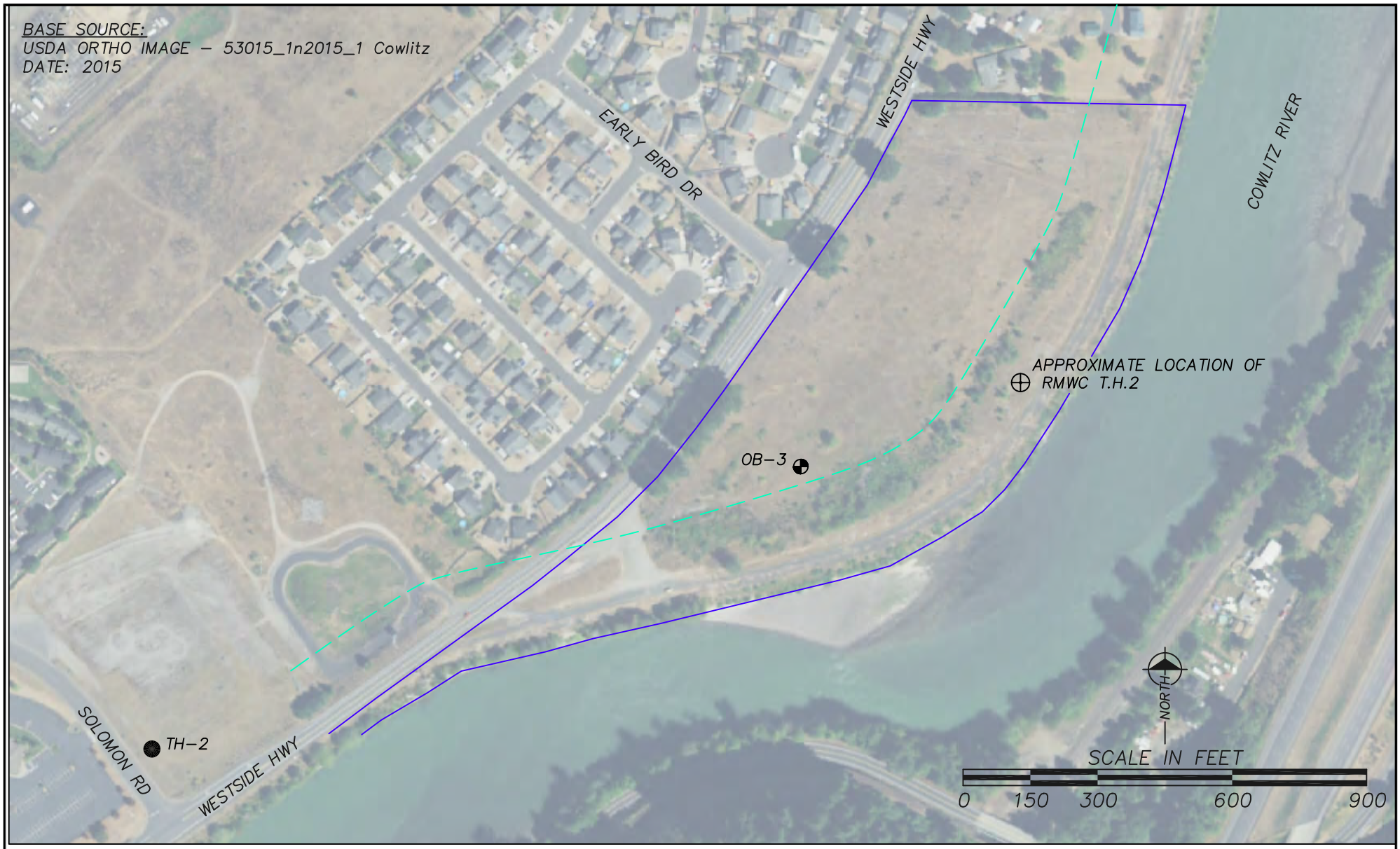
0 1000 2000 4000 6000

Layne
Ranney Collector Wells
6360 HUNTLEY ROAD
COLUMBUS, OHIO 43229
(614) 888-6263 / FAX (614) 888-9208

GENERAL LOCATION MAP

CITY OF LONGVIEW, WASHINGTON
COLLECTOR WELL FEASIBILITY INVESTIGATION

FILE NAME: 38941-01	DATE: 02/11/2016	FIGURE
PROJECT #: 38941	SCALE: 1" = 2000'	1



LEGEND:

TH–2 TEST BORING (CURRENT PROJECT)

OB–3 TEST BORING AND OBSERVATION WELL (CURRENT PROJECT)

APPROXIMATE LOCATION OF PROPERTY BOUNDARY

APPROXIMATE LOCATION DRAIN DISTRICT 200' SHORELINE JURISDICTION

Layne
Ranney Collector Wells
6360 HUNTLEY RD
COLUMBUS, OHIO 43229
(614) 888-6263 / FAX (614) 888-9208

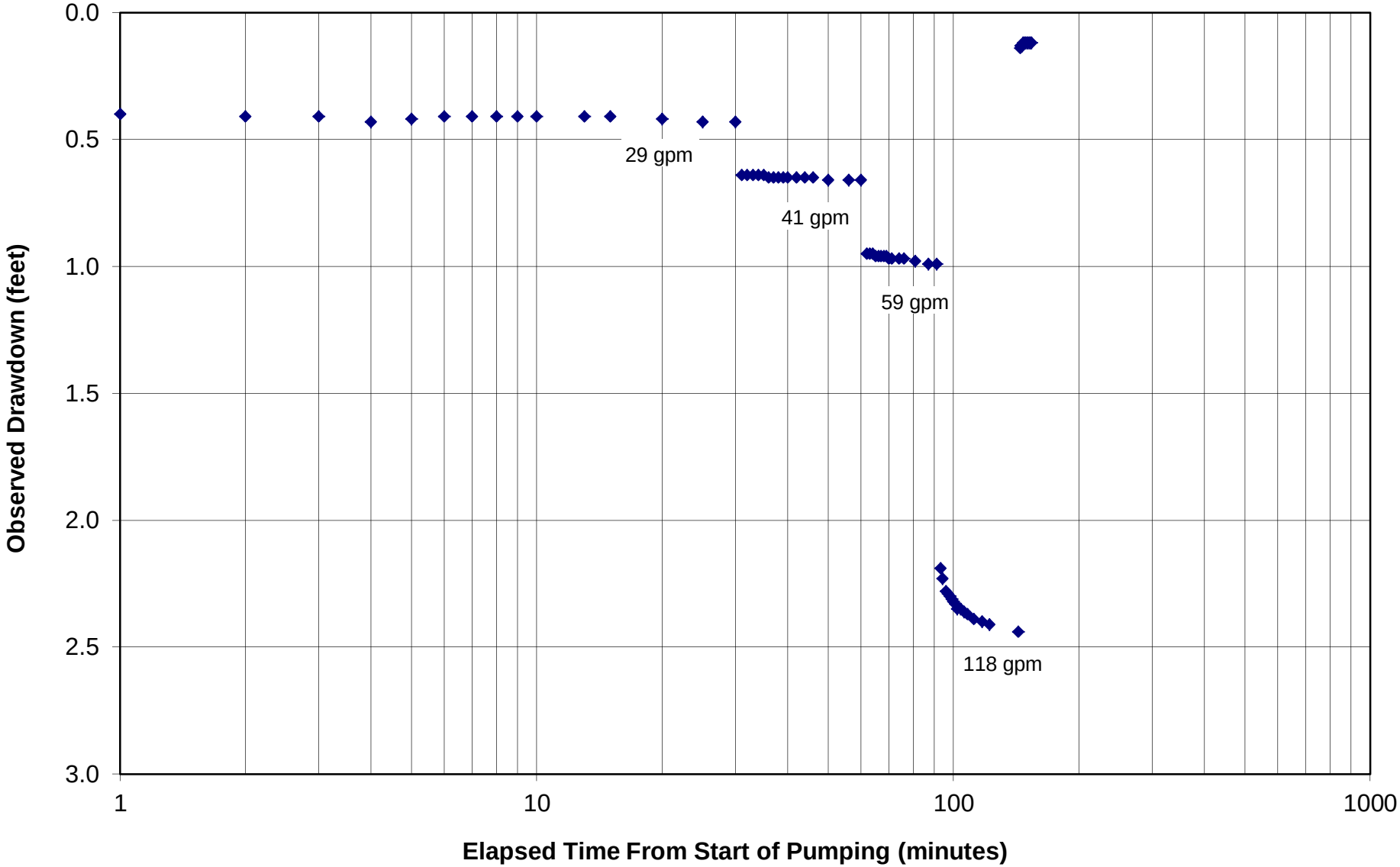
BORING LOCATION MAP

OSTRANDER ROCK PROPERTY LOCATION
CITY OF LONGVIEW, WASHINGTON – COLLECTOR WELL FEASIBILITY INVESTIGATION

PROJECT NUMBER	DATE	FILE NAME	SCALE
38491	07/19/2016	38941–09	1" = 300'

FIGURE 2

FIGURE 3
Boring OB-3 Hydraulic Interval Test Time Versus Drawdown Plot
CH2M - City of Longview, Washington



File: 38941 OB-3 Interval Test Analysis.xlsx Print Date: 7/6/2016

TABLES

TABLE 1

Boring and Well Information Summary

CH2M Hill - City of Longview, Washington

Boring ID	Location	Date Drilled	Total Depth Drilled (feet)	Depth to Base of Sand and Gravel (feet)	Approximate Location Coordinates [1] UTM Zone 10 - NAD83 Easting (meters)	Northing (meters)	Ground Surface Elevation [2] (feet)	Approximate Base of Aquifer Elevation (feet)	Interval Pumping Test Screened Depths (feet)	Monitoring Well Screened Interval Depths (feet)	Depth to Water from Ground Surface (feet date/time)		Approximate Water Elevation (feet)
OB-3	Ostrander Rock Propery	6/7/2016	66	60	507226	5113920	34	-26	37 - 52	41 - 51	19.0	6/9/16 10:18 AM	15.0
TH-1	Riverside County Park	1/11/2016	60	50	507234	5115561	32.6	-17	35 - 50	40.0 - 50.0	12.4	1/12/16 8:56 AM	20.2
TH-2	Solomon Road	1/9/2016	66	58	506785	5113728	42	-16	n/a	n/a	18.6	1/9/16 10:18 AM	23.4
TH-3	FLWTP	12/14/2015	80	48	506514	5110847	28.3	-20	30 - 45 [3]	35 - 45	13.1	1/11/16 12:07 PM	15.2

1) Location coordinates not surveyed. Estimated from handheld GPS receiver.

2) Ground surface elevations were surveyed at TH-1 and TH-3 and estimated from Google Earth at TH-2.

3) Interval pumping test conducted in the adjacent boring TH-3a.

TABLE 2
Grain Size Analysis Results
CH2M Hill - City of Longview, Washington

Test Hole ID	Depth Interval (feet)	Coefficient of Uniformity [2] (C_u)	Effective Grain Size [1]					Wentworth Size Fraction [3]		
			D_{10} (inch)	D_{40} (inch)	D_{50} (inch)	D_{60} (inch)	D_{90} (inch)	Gravel (percent)	Sand (percent)	Silt/Clay (percent)
OB-3	26 to 32	2.4	0.010	0.019	0.022	0.024	0.039	2.5%	96.4%	1.1%
	32 to 36	4.1	0.010	0.025	0.031	0.041	> 0.7	27.5%	69.4%	3.0%
	40 to 45	57 Est.	0.017	0.156	0.4 Est.	0.9 Est.	> 1	66.7%	31.4%	1.9%
	46 to 49	3.7	0.008	0.022	0.026	0.031	0.139	16.7%	79.8%	3.5%
	49 to 54	77 Est.	0.012	0.228	0.5 Est.	1.0 Est.	> 1	66.5%	32.2%	1.3%
	56 to 60	2.6	0.007	0.014	0.016	0.019	0.031	0.3%	97.1%	2.7%

1) Effective grain size values represent diameter at percent passing fraction, e.g. D_{10} = grain diameter at 10% passing size.
Est. - effective grain size estimated when the percent passing the 3/8-inch sieve is less than the percent passing value
2) Coefficient of Uniformity = D_{60}/D_{40}. Estimated when percent passing the 3/8-inch sieve is <60%

3) Wentworth Grain Size Classification

Classification		(millimeters)	(approx. inches)
Fines	Clay	< 1/256	< 0.0002
	Silt	1/256 - 1/16	0.0002 - 0.002
Sand	Very Fine Sand	1/16 - 1/8	0.002 - 0.005
	Fine Sand	1/8 - 1/4	0.005 - 0.01
	Medium Sand	1/4 - 1/2	0.01 - 0.02
	Coarse Sand	1/2 - 1	0.02 - 0.04
	Very Coarse Sand	1 - 2	0.04 - 1/16
Gravel	Granules	2 - 4	1/16 - 3/16
	Fine Pebbles	4 - 8	3/16 - 5/16
	Medium Pebbles	8 - 16	5/16 - 5/8
	Coarse Pebbles	16 - 32	5/8 - 1-1/4
	Very Coarse Pebbles	32 - 64	1-1/4 - 2-1/2
	Cobbles	64 - 256	2-1/2 - 10
	Boulders	> 256	> 10

TABLE 3

Hydraulic Interval Pumping Test Results

CH2M Hill - City of Longview, Washington

Boring	Screen Diameter	Screen Slot Size	Screen Setting Depth	Step	Observed Drawdown at End of Pumping Step	Pumping Rate at End of Step	Observed Specific Capacity at End of Step	Screen Length as Fraction of Aquifer Thickness	Partial Penetration Correction (1)	Estimated Well Efficiency (2)	Saturated Aquifer Thickness	Estimated Hydraulic Conductivity (3)	Estimated Transmissivity (4)
	(inches)	(inches)	(feet)		(feet)	(gpm)	(gpm/ft)			(%)	(feet)	(gpd/ft^2)	(gpd/ft)
OB-3	6	0.020	37 - 52	1	0.43	29	67.4	0.37	0.53	89.2%	41.0	5,260	215,300
				2	0.66	41	62.1	0.37	0.53	85.4%	41.0	5,060	207,100
				3	0.99	59	59.6	0.37	0.53	80.3%	41.0	5,160	211,400
				4	2.44	118	48.4	0.37	0.53	67.0%	41.0	5,020	205,400

1) Partial penetration correction:

$$X = L \cdot \left[1 + 7 \cdot \sqrt{\frac{r}{2 \cdot b \cdot L}} \cdot \cos\left(\frac{\pi \cdot L}{2} \right) \right]$$ (from Driscoll, 1986 based on Kozeny, 1933)

X = partial penetration correction; L = well screen length as a fraction of aquifer thickness; r = well radius; b = saturated aquifer thickness.

2) Well Efficiency estimated based on analysis using the methods of Bruin and Hudson, 1955

3) Hydraulic Conductivity = transmissivity divided by the saturated aquifer thickness, K=T/b

4) Transmissivity given by:

$$T = \frac{1500 \cdot Q/s}{X \cdot E}$$ for an unconfined aquifer

$$T = \frac{2000 \cdot Q/s}{X \cdot E}$$ for a confined aquifer

(Driscoll, 1986)

T = aquifer transmissivity; Q = well pumping rate; s = observed drawdown; X = partial penetration correction; E = well efficiency

TABLE 4
Field Water Quality Summary
CH2M Hill - City of Longview, Washington

Sample Source	Date	Time	Temperature (degees F)	Temperature (degees C)	Specific Conductance (uS/cm)	pH (S.U.)	Iron (mg/l)	Comments
OB-3	06/08/16	9:16 AM	56.6	13.7	340	6.8	> 5	During development
		11:46 AM	56.3	13.5	370	6.6	> 5	Step 1
		12:19 PM	56.1	13.4	380	6.6	> 5	Step 2
		12:50 PM	55.2	12.9	370	6.3	> 5	Step 3
		1:22 PM	54.8	12.7	370	6.3	> 5	Step 4

TABLE 5
OB-3 (Ostrander Rock Property) Sample Laboratory Water Quality Analysis Results
CH2M Hill - City of Longview, Washington

Analyte	Analysis Method	Method Reporting Limit	Sample Result	Duplicate Result	Average of Sample and Duplicate Results	Unit
Ammonia as Nitrogen	SM 4500-NH3 G	0.05	0.263		NC	mg/L
Nitrate as Nitrogen	300.0	0.10	ND	ND	NC	mg/L
Nitrite as Nitrogen	300.0	0.10	ND	ND	NC	mg/L
Hardness as $CaCO_3$	200.7/SM 2340B	0.07	125		NC	mg/L
Chloride	300.0	0.2	5.05	4.99	5.02	mg/L
Fluoride	SM 4500-F- C Modified	0.2	0.28	0.26	0.266	mg/L
Sulfate	300.0	0.2	0.26	0.29	0.273	mg/L
Cyanide, Total	335.4	0.01	ND		NC	mg/L
Turbidity	180.1	1.0	91.0	93.5	92.3	NTU
Carbon, Total Organic	SM 5310 C	0.5	2.47	2.36	2.42	mg/L
UV254	SM 5910 B		0.078	0.079	0.0785	cm-1
Color	SM 2120 B	5	ND	ND	NC	Color Units
Solids, Total Dissolved	SM 2540 C	10	216		NC	mg/L
Conductivity at 25 Degrees Celsius	SM 2510 B	2	404		NC	uMHOS/cm
Oxidation-Reduction Potential (ORP)	ASTM D1498-00		-54.6	-54.6	-54.6	mV
Oxygen, Dissolved	SM 4500-O G	1.0	ND			mg/L
pH	SM 4500-H+ B		6.62	6.67	6.65	pH Units
Aluminum, Total	200.7	10	116	124	120	ug/L (ppb)
Antimony, Total	200.8	0.05	ND	ND	NC	ug/L (ppb)
Arsenic, Total	200.8	0.5	0.8	0.7	0.7	ug/L (ppb)
Barium, Total	200.7	4	10.8	10.8	10.8	ug/L (ppb)
Beryllium, Total	200.8	0.02	ND	ND	NC	ug/L (ppb)
Cadmium, Total	200.8	0.02	ND	ND	NC	ug/L (ppb)
Calcium, Total	200.7	20	29200	29300	29300	ug/L (ppb)
Chromium, Total	200.8	0.2	0.4	0.4	0.4	ug/L (ppb)
Copper, Total	200.7	4	ND	ND	NC	ug/L (ppb)
Iron, Total	200.7	20	28800	28800	28800	ug/L (ppb)
Lead, Total	200.8	0.02	0.12	0.12	0.12	ug/L (ppb)
Magnesium, Total	200.7	5	12700	12700	12700	ug/L (ppb)
Manganese, Total	200.7	1	1030	1030	1030	ug/L (ppb)
Nickel, Total	200.8	0.2	0.6	0.7	0.7	ug/L (ppb)
Selenium, Total	200.8	1	ND	ND	NC	ug/L (ppb)
Silicon, as SiO_2, Total	200.7	500	68000	67600	67800	ug/L (ppb)
Silicon, as SiO_2, Dissolved	200.7	500	68100		NC	ug/L (ppb)
Silver, Total	200.8	0.02	ND	ND	NC	ug/L (ppb)
Sodium, Total	200.7	200	15000	14900	15000	ug/L (ppb)
Thallium, Total	200.8	0.02	ND	ND	NC	ug/L (ppb)
Zinc, Total	200.7	4	32.6	33.7	33.2	ug/L (ppb)
Mercury, Total	1631E	0.5	ND		NC	ng/L
Orthophosphate as Phosphorus	SM 4500-P E	0.05	ND	ND	NC	mg/L

ND - The contaminant was not detected at or above the stated detection limit.
NC - Not calculated

TABLE 6
Cowlitz River Sample Laboratory Water Quality Analysis Results
CH2M Hill - City of Longview, Washington

Constituent	Units	Minimum Detection Limits	MCL or SMCL	Drinking Water Standard	River Water Sample Results 1/12/16 3:19 PM
Aluminum	mg/l	0.1	0.2	EPA Secondary	**0.3**
Arsenic	mg/l	0.005	0.01	EPA Primary	ND
Barium	mg/l	0.3	2.0	EPA Primary	ND
Cadmium	mg/l	0.002	0.005	EPA Primary	ND
Calcium	mg/l	2.0	--		7.1
Chromium	mg/l	0.01	0.1	EPA Primary	ND
Copper	mg/l	0.004	1.3	EPA Action Level	ND
Iron	mg/l	0.02	0.3	EPA Secondary	**0.434**
Lead	mg/l	0.002	0.015	EPA Action Level	ND
Lithium	mg/l	0.001	--		0.001
Magnesium	mg/l	0.10	--		1.65
Manganese	mg/l	0.004	0.05	EPA Secondary	**0.051**
Mercury	mg/l	0.001	0.002	EPA Primary	ND
Nickel	mg/l	0.02	--		ND
Potassium	mg/l	1.0	--		ND
Selenium	mg/l	0.02	0.05	EPA Primary	ND
Silica	mg/l	0.1	--		18.0
Silver	mg/l	0.002	0.1	EPA Secondary	ND
Sodium	mg/l	1	--		4
Strontium		0.001	--		0.029
Uranium		0.001	0.03	EPA Primary	ND
Zinc	mg/l	0.004	5	EPA Secondary	ND
Alkalinity (Total as $CaCO_3$)	mg/l	20	--		28
Hardness	mg/l	10			24
pH	S.U.		6.5 to 8.5	EPA Secondary	7.4
Total Dissolved Solids	mg/l	20	500	EPA Secondary	53
Bromide		0.5	--		ND
Chloride	mg/l	5	250	EPA Secondary	ND
Fluoride	mg/l	0.5	4	EPA Primary	ND
Nitrate as N	mg/l	0.5	10	EPA Primary	ND
Nitrite as N	mg/l	0.5	1	EPA Primary	ND
Ortho Phosphate	mg/l	2.0	--		ND
Sulfate	mg/l	5	250	EPA Secondary	5.1
Trihalomethanes, VOCs and Other Organic Compounds See Laboratory Reports for list of parameters analyzed.					All ND

ND - The contaminant was not detected at or above the stated detection limit.
MCL - Maximum contaminant level, SMCL - Secondary maximum contaminant level

ATTACHMENT 1
BORING LOG

RANNEY COLLECTOR WELLS
6360 HUNTLEY ROAD
COLUMBUS, OHIO 43229
614-888-6263

FIELD BOREHOLE LOG

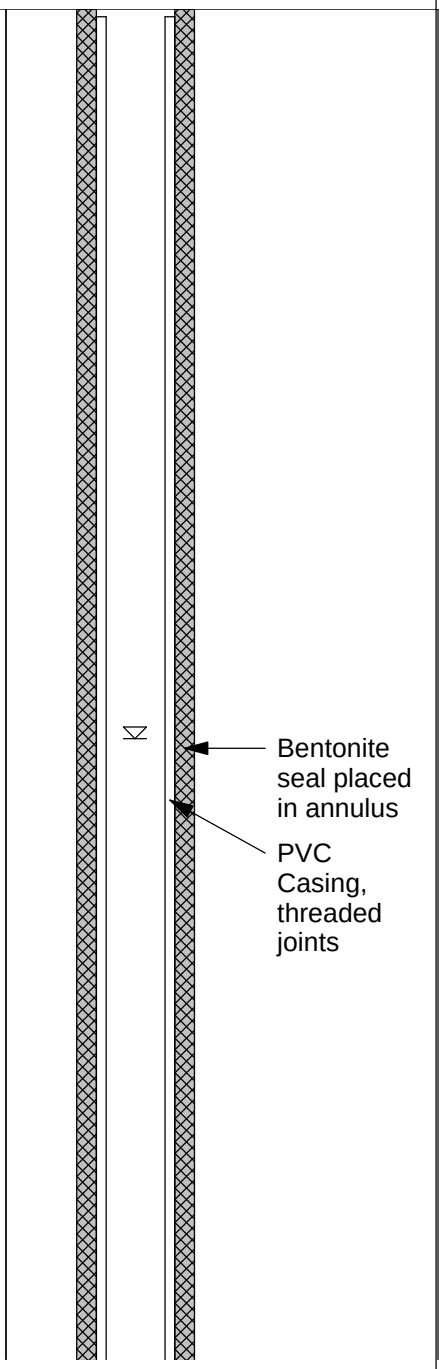
BOREHOLE NO.: **OB-3**
TOTAL DEPTH: **66 feet**

CLIENT: City of Longview, Washington - CH2M Hill
SITE LOCATION: Ostrander Property
About 250 feet SE of the Westside Hwy
COORDINATES: N 5113920 m E 507226 m UTM Zone 10 NAD83
TOP OF CASING ELEVATION: 33.8 Feet, estimated
GRADE ELEVATION: 34 Feet, estimated

JOB NO.: 38941
DATE DRILLED: 6/7/2016
GEOLOGIST: Brad Gamble, Layne
DRILLER: Dave Donnely, Cascade
BORING DIAMETER: 8 inches
DRILLING METHOD: Rotasonic

NOTES: Coordinates and Elevations Not Surveyed, approximately determined with handheld GPS receiver.
A flush-grade well cover was installed over the top of the PVC well casing.
Water level 19.0 feet below ground surface at 10:18 on 06/09/16.

DEPTH (feet)	ELEVATION (feet)	LITHOLOGY	RECOVERY
0	30	Silty Sand, brown, mostly very fine to coarse sand, trace to 10% silt, trace clay, loose, dry to moist.	0 to 6 feet, 4 feet recovery
5	25	Sand, brownish gray, very fine to very coarse sand, mostly medium, occasional granules, pebbles and cobbles, loose, dry.	
10	20	Sand, gray, very fine to very coarse, mostly coarse, trace granules and pebbles, loose, dry, clayey zone with wood fragments at about 10 feet.	6 to 16 feet, 10 feet recovery
15	15	Clayey Silt, brown mottled gray, mostly silt, trace clay, trace fine sand, slightly cohesive, moist.	
20	10	Silty Sand, brown, very fine to medium sand, mostly fine, trace to 10% silt, slightly cohesive, moist.	
25	5	Sand, brown, very fine to coarse, mostly medium, loose, dry to moist	16 to 26 feet, 9 feet recovery
30	0	Silty Sand, brown to reddish brown, some gray layering, very fine to medium sand, mostly fine, trace to 10% silt, slightly cohesive, moist to wet.	
35		Sand and Gravel, gray grading to reddish brown at about 21 feet, 50-70% very fine to very coarse sand, mostly coarse, 30-50% granules and pebbles up to 2-1/2 inches, rounded to subrounded, loose, wet.	
		Sand and Gravel, reddish brown, 70-90% very fine to very coarse sand, mostly coarse, 10-30% granules and pebbles up to 2 inches, rounded to subrounded, loose, wet.	26 to 36 feet, 10 feet recovery
		Sand and Gravel, dark gray, 50-70% very fine to very coarse sand, 30-50% granules and pebbles up to 1 inch, rounded to subrounded, loose, wet, numerous light gray pumice granules	



RANNEY COLLECTOR WELLS
6360 HUNTLEY ROAD
COLUMBUS, OHIO 43229
614-888-6263

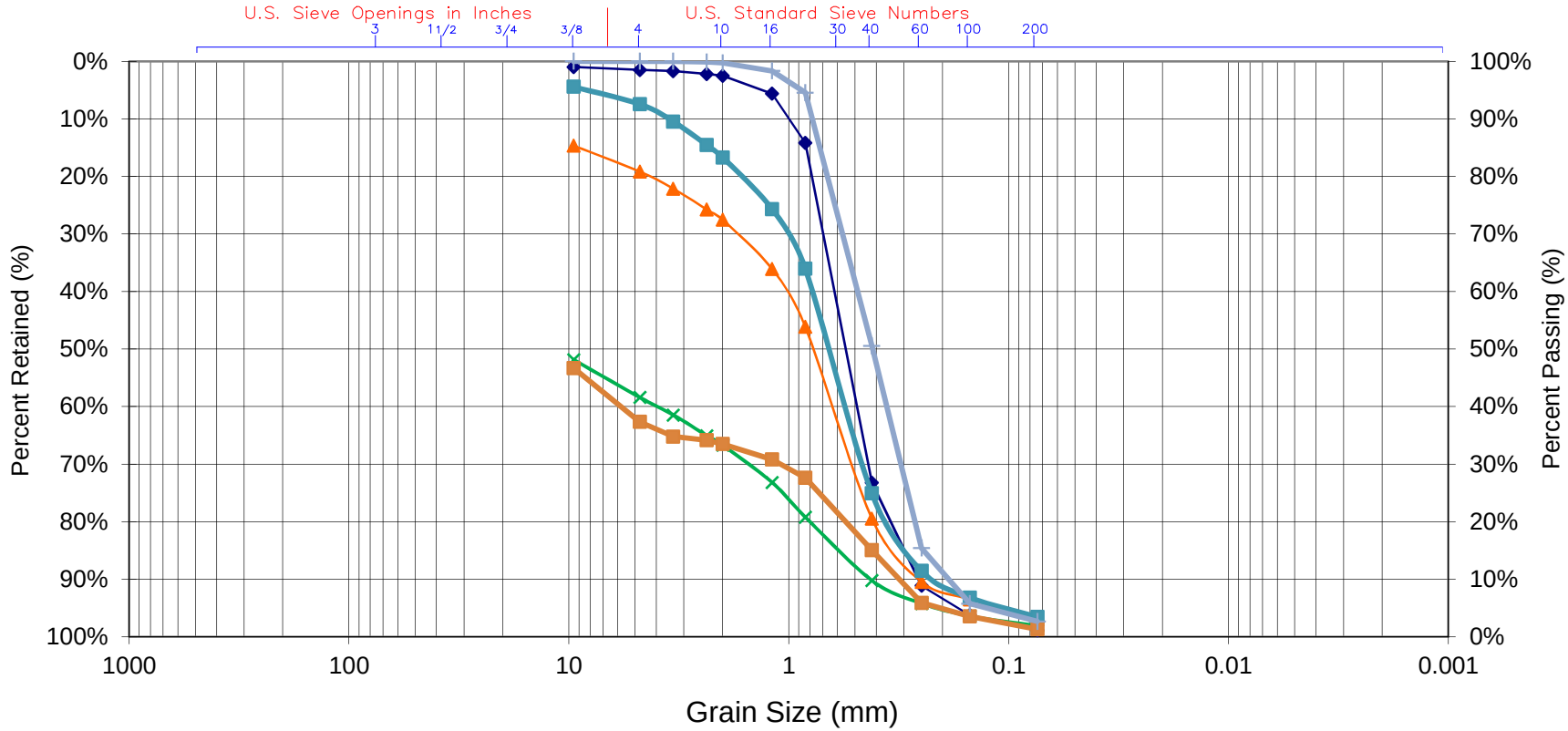
FIELD BOREHOLE LOG

BOREHOLE NO.: **OB-3**

TOTAL DEPTH: **66 feet**

DEPTH (feet)	ELEVATION (feet)	LITHOLOGY	RECOVERY	WELL CONSTRUCTION
35		and small pebbles.		
	-5	Sand and Gravel, dark gray, 60-80% very fine to very coarse sand, mostly coarse, 20-40% granules and pebbles up to 1 inch, rounded to subrounded, loose, wet, several pieces of charred wood and pumice pebbles at 36 feet.	36 to 46 feet, 9 feet recovery	
40		Sand and Gravel, dark gray, 40-60% very fine to very coarse sand, mostly coarse, 40-60% granules, pebbles and numerous cobbles up to 4 inches, rounded to subrounded, trace silt, loose, wet.		
	-10			
45			46 to 56 feet, 8 feet recovery	PVC screen, 0.010-inch slot set at 41-51 feet
	-15			
50				Sand pack set at 38-66 feet
	-20	Partially decayed wood, dark brown, friable, wet.		
55		Sand, dark gray, very fine to very coarse, mostly coarse, trace granules and occasional pebbles, trace silt, loose, wet.	56 to 66 feet, 10 feet recovery	
	-25			PVC Casing, threaded joints
60		Sand to Silty Sand, dark gray, very fine to very coarse sand, mostly medium, trace to 10% silt, loose, wet, layers with more silt at the bottom.		
	-30			
65				

ATTACHMENT 2
SIEVE ANALYSIS RESULTS



Wentworth Classification	Boulders	Cobbles	Very Coarse Pebbles	Coarse Pebbles	Medium Pebbles	Fine Pebbles	Granules	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay
	Boulders	Cobbles	Pebbles and Gravel					Sand					Silt	Clay

USCS Classification	Boulders	Cobbles	Coarse Gravel	Fine Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt or Clay
		Cobbles	Gravel		Sand			Silt or Clay

Layne
Ranney Collector Wells

- OB-3 26 to 32 feet
- OB-3 32 to 36 feet
- OB-3 40 to 45 feet
- OB-3 46 to 49 feet
- OB-3 49 to 54 feet
- OB-3 50 to 60 feet

GRAIN SIZE ANALYSIS

Layne - Ranney Collector Wells

Project: City of Longview, Washington
Test Boring: OB-3

Job Number: 38941

SIEVE ANALYSIS RESULTS

Client: City of Longview, Washington
Job No. 38941

Boring ID: OB-3
Depth Interval: 26 to 32 feet

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	10	10	1.0%	99.0%
4	4.760	0.187	5	15	1.5%	98.5%
6	3.353	0.132	2	17	1.7%	98.3%
8	2.360	0.094	5	22	2.2%	97.8%
10	1.999	0.079	3	25	2.5%	97.5%
16	1.191	0.047	31	56	5.6%	94.4%
20	0.841	0.033	85	141	14.2%	85.8%
40	0.419	0.017	586	727	73.2%	26.8%
60	0.249	0.010	178	905	91.1%	8.9%
100	0.150	0.006	51	956	96.3%	3.7%
200	0.074	0.003	26	982	98.9%	1.1%
Pan			11	993	100.0%	0.0%
		Total	993			
		Initial Weight	999	Gravel	Sand	Silt or Clay
		Difference	0.6%	2.5%	96.4%	1.1%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.26	0.49	0.55	0.62	1.00	2.41
(inches)	0.010	0.019	0.022	0.024	0.039	

Boring ID: OB-3
Depth Interval: 32 to 36 feet

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	149	149	14.7%	85.3%
4	4.760	0.187	46	195	19.2%	80.8%
6	3.353	0.132	30	225	22.1%	77.9%
8	2.360	0.094	37	262	25.8%	74.2%
10	1.999	0.079	18	280	27.5%	72.5%
16	1.191	0.047	87	367	36.1%	63.9%
20	0.841	0.033	102	469	46.1%	53.9%
40	0.419	0.017	339	808	79.4%	20.6%
60	0.249	0.010	112	920	90.5%	9.5%
100	0.150	0.006	31	951	93.5%	6.5%
200	0.074	0.003	35	986	97.0%	3.0%
Pan			31	1017	100.0%	0.0%
		Total	1017			
		Initial Weight	1024	Gravel	Sand	Silt or Clay
		Difference	0.7%	27.5%	69.4%	3.0%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.25	0.63	0.78	1.04	> 2	4.09
(inches)	0.010	0.025	0.031	0.041	> 0.05	

SIEVE ANALYSIS RESULTS

Client: City of Longview, Washington
Job No. 38941

Boring ID: OB-3
Depth Interval: 40 to 45 feet

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	663	663	51.8%	48.2%
4	4.760	0.187	84	747	58.4%	41.6%
6	3.353	0.132	39	786	61.5%	38.5%
8	2.360	0.094	46	832	65.1%	34.9%
10	1.999	0.079	21	853	66.7%	33.3%
16	1.191	0.047	83	936	73.2%	26.8%
20	0.841	0.033	77	1013	79.2%	20.8%
40	0.419	0.017	141	1154	90.2%	9.8%
60	0.249	0.010	51	1205	94.2%	5.8%
100	0.150	0.006	28	1233	96.4%	3.6%
200	0.074	0.003	22	1255	98.1%	1.9%
Pan			24	1279	100.0%	0.0%
		Total	1279			
		Initial Weight	1282	Gravel	Sand	Silt or Clay
		Difference	0.2%	66.7%	31.4%	1.9%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.43	3.96	> 10	> 10	> 10	> 50
(inches)	0.017	0.156	> 0.4	> 0.4	> 0.4	

Boring ID: OB-3
Depth Interval: 46 to 49 feet

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	41	41	4.4%	95.6%
4	4.760	0.187	28	69	7.4%	92.6%
6	3.353	0.132	28	97	10.5%	89.5%
8	2.360	0.094	38	135	14.6%	85.4%
10	1.999	0.079	20	155	16.7%	83.3%
16	1.191	0.047	83	238	25.7%	74.3%
20	0.841	0.033	96	334	36.0%	64.0%
40	0.419	0.017	362	696	75.1%	24.9%
60	0.249	0.010	125	821	88.6%	11.4%
100	0.150	0.006	43	864	93.2%	6.8%
200	0.074	0.003	31	895	96.5%	3.5%
Pan			32	927	100.0%	0.0%
		Total	927			
		Initial Weight	931	Gravel	Sand	Silt or Clay
		Difference	0.4%	16.7%	79.8%	3.5%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.21	0.55	0.66	0.78	3.54	3.68
(inches)	0.008	0.022	0.026	0.031	0.139	

SIEVE ANALYSIS RESULTS

Client: City of Longview, Washington
Job No. 38941

Boring ID: OB-3
Depth Interval: 49 to 54 feet

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	815	815	53.3%	46.7%
4	4.760	0.187	143	958	62.7%	37.3%
6	3.353	0.132	39	997	65.2%	34.8%
8	2.360	0.094	10	1007	65.9%	34.1%
10	1.999	0.079	10	1017	66.5%	33.5%
16	1.191	0.047	41	1058	69.2%	30.8%
20	0.841	0.033	49	1107	72.4%	27.6%
40	0.419	0.017	192	1299	85.0%	15.0%
60	0.249	0.010	140	1439	94.1%	5.9%
100	0.150	0.006	36	1475	96.5%	3.5%
200	0.074	0.003	34	1509	98.7%	1.3%
Pan			20	1529	100.0%	0.0%

Total	1529			
Initial Weight	1538	Gravel	Sand	Silt or Clay
Difference	0.6%	66.5%	32.2%	1.3%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.31	5.80	> 10	> 10	> 10	> 50
(inches)	0.012	0.228	> 0.4	> 0.4	> 0.4	

Boring ID: OB-3
Depth Interval: 50 to 60 feet

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	0	0	0.0%	100.0%
4	4.760	0.187	0	0	0.0%	100.0%
6	3.353	0.132	0	0	0.0%	100.0%
8	2.360	0.094	1	1	0.1%	99.9%
10	1.999	0.079	1	2	0.3%	99.7%
16	1.191	0.047	10	12	1.7%	98.3%
20	0.841	0.033	27	39	5.5%	94.5%
40	0.419	0.017	314	353	49.4%	50.6%
60	0.249	0.010	251	604	84.6%	15.4%
100	0.150	0.006	69	673	94.3%	5.7%
200	0.074	0.003	22	695	97.3%	2.7%
Pan			19	714	100.0%	0.0%

Total	714			
Initial Weight	931	Gravel	Sand	Silt or Clay
Difference	23.3%	0.3%	97.1%	2.7%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.19	0.36	0.42	0.49	0.78	2.59
(inches)	0.007	0.014	0.016	0.019	0.031	

ATTACHMENT 3
HYDRAULIC INTERVAL TEST DATA

Well ID: OB-3 **Job No.:** 38941

Client: CH2M Hill / City of Longview, Washington
Location: Ostander Property
Well Information: Temporary 0.020-inch slot wire-wrapped screen set from 37 to 52 feet below ground surface
Test Information: Multiple-rate Hydraulic Interval Step Test with 30 minute steps
Measuring Point: Top of temporary 6-inch casing, approximately 5.5 feet above ground surface.

Date/Time (mo/day/yr hr:min)	Elapsed Time from Start of Test (minutes)	Elapsed Time from Start of Step (minutes)	Depth to Water (feet)	Observed Drawdown (feet)	Totalizer Reading (gallons)	Meter Pumping Rate (gpm)	Comments
6/8/16 8:11			24.55				
6/8/16 11:01			24.65				
6/8/16 11:10			24.65				
6/8/16 11:23			25.15				Pump on to test operation
6/8/16 11:24							Pump off
6/8/16 11:25			24.68				
6/8/16 11:28			24.67				
6/8/16 11:30	0	0			383544	30.0	Start Step 1
6/8/16 11:31	1	1	25.07	0.40	383592	28.9	
6/8/16 11:32	2	2	25.08	0.41	383624	28.3	
6/8/16 11:33	3	3	25.08	0.41	383650	28.8	
6/8/16 11:34	4	4	25.10	0.43	383676	28.7	
6/8/16 11:35	5	5	25.09	0.42	383708	28.6	
6/8/16 11:36	6	6	25.08	0.41	383737	28.7	
6/8/16 11:37	7	7	25.08	0.41	383774	28.5	
6/8/16 11:38	8	8	25.08	0.41	383799	28.3	
6/8/16 11:39	9	9	25.08	0.41	383824	28.3	
6/8/16 11:40	10	10	25.08	0.41	383848	28.3	
6/8/16 11:43	13	13	25.08	0.41	383922	28.3	
6/8/16 11:45	15	15	25.08	0.41	383982	28.3	
6/8/16 11:50	20	20	25.09	0.42	384130	28.2	
6/8/16 11:55	25	25	25.10	0.43	384282	28.3	Pumping rate from totalizer 29 gpm
6/8/16 12:00	30	30 / 0	25.10	0.43	384396	28.3	Start Step 2
6/8/16 12:01	31	1	25.31	0.64	384450	41.0	
6/8/16 12:02	32	2	25.31	0.64	384495	40.6	
6/8/16 12:03	33	3	25.31	0.64	384541	40.5	
6/8/16 12:04	34	4	25.31	0.64	384598	40.8	
6/8/16 12:05	35	5	25.31	0.64	384631	40.8	
6/8/16 12:06	36	6	25.32	0.65	384665	40.6	
6/8/16 12:07	37	7	25.32	0.65	384701	40.5	
6/8/16 12:08	38	8	25.32	0.65	384741	40.7	
6/8/16 12:09	39	9	25.32	0.65	384777	40.5	
6/8/16 12:10	40	10	25.32	0.65	384818	40.5	
6/8/16 12:12	42	12	25.32	0.65	384908	40.5	
6/8/16 12:14	44	14	25.32	0.65	384984	40.5	
6/8/16 12:16	46	16	25.32	0.65	385068	40.5	
6/8/16 12:20	50	20	25.33	0.66	385247	40.3	
6/8/16 12:26	56	26	25.33	0.66	385469	40.1	
6/8/16 12:30	60	30	25.33	0.66	385637	40.4	Pumping rate from totalizer 41 gpm
6/8/16 12:31	61	31 / 0					Start Step 3
6/8/16 12:32	62	1	25.62	0.95	385731	59.1	
6/8/16 12:33	63	2	25.62	0.95	385808	59.3	
6/8/16 12:34	64	3	25.62	0.95	385873	59.3	
6/8/16 12:35	65	4	25.63	0.96	385937	59.3	
6/8/16 12:36	66	5	25.63	0.96	385994	59.5	
6/8/16 12:37	67	6	25.63	0.96	386052	59.5	
6/8/16 12:38	68	7	25.63	0.96	386114	59.5	
6/8/16 12:39	69	8	25.63	0.96	386171	59.5	
6/8/16 12:40	70	9	25.64	0.97	386225	59.3	
6/8/16 12:41	71	10	25.64	0.97	386281	59.4	
6/8/16 12:44	74	13	25.64	0.97	386474	59.3	

Well ID: OB-3 **Job No.:** 38941

Client: CH2M Hill / City of Longview, Washington
Location: Ostander Property
Well Information: Temporary 0.020-inch slot wire-wrapped screen set from 37 to 52 feet below ground surface
Test Information: Multiple-rate Hydraulic Interval Step Test with 30 minute steps
Measuring Point: Top of temporary 6-inch casing, approximately 5.5 feet above ground surface.

Date/Time (mo/day/yr hr:min)	Elapsed Time from Start of Test (minutes)	Elapsed Time from Start of Step (minutes)	Depth to Water (feet)	Observed Drawdown (feet)	Totalizer Reading (gallons)	Meter Pumping Rate (gpm)	Comments
6/8/16 12:46	76	15	25.64	0.97	386561	59.2	
6/8/16 12:51	81	20	25.65	0.98	386876	59.5	
6/8/16 12:57	87	26	25.66	0.99	387215	59.3	
6/8/16 13:01	91	30	25.66	0.99	387451	59.3	Pumping rate from totalizer 59 gpm
6/8/16 13:02	92	31 / 0				117.5	Start Step 4
6/8/16 13:03	93	1	26.86	2.19	387668	118.0	
6/8/16 13:04	94	2	26.90	2.23	387785	117.8	
6/8/16 13:06	96	4	26.95	2.28	388039	117.6	
6/8/16 13:07	97	5	26.96	2.29	388152	118.0	
6/8/16 13:08	98	6	26.97	2.30	388260	117.9	
6/8/16 13:09	99	7	26.98	2.31	388382	117.8	
6/8/16 13:10	100	8	26.99	2.32	388490	117.6	
6/8/16 13:11	101	9	27.00	2.33	388621	117.5	
6/8/16 13:12	102	10	27.02	2.35	388730	117.9	
6/8/16 13:14	104	12	27.02	2.35	388995	118.0	
6/8/16 13:16	106	14	27.03	2.36	389195	118.0	
6/8/16 13:18	108	16	27.04	2.37	389472	117.9	
6/8/16 13:22	112	20	27.06	2.39	389991	117.6	
6/8/16 13:27	117	25	27.07	2.40	390547	118.2	
6/8/16 13:32	122	30	27.08	2.41	391107	118.2	Pumping rate from totalizer 118 gpm
6/8/16 13:53	143	42	27.11	2.44			
6/8/16 13:54	144	43 / 0			393588		Pump off, start recovery
6/8/16 13:54	144.5	0.5	24.81	0.14			
6/8/16 13:55	145	44	24.80	0.13			
6/8/16 13:56	146	45	24.80	0.13			
6/8/16 13:57	147	46	24.79	0.12			
6/8/16 13:58	148	47	24.79	0.12			
6/8/16 13:59	149	48	24.79	0.12			
6/8/16 14:00	150	49	24.79	0.12			
6/8/16 14:01	151	50	24.79	0.12			
6/8/16 14:02	152	51	24.79	0.12			
6/8/16 14:03	153	52	24.79	0.12			
6/8/16 14:04	154	53	24.79	0.12			

ATTACHMENT 4
OB-3 SAMPLES
LABORATORY ANALYSIS RESULTS

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June 24, 2016

Analytical Report for Service Request No: K1606174

Brad Phelps
CH2M Hill
2020 SW 4th Ave.
Suite 300
Portland, OR 97201

RE: City of Longview Rocky Pt. Test Well OB-3

Dear Brad,

Enclosed are the results of the sample(s) submitted to our laboratory June 08, 2016
For your reference, these analyses have been assigned our service request number **K1606174.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3275. You may also contact me via email at Chris.Leaf@ALSGlobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Chris Leaf
Project Manager

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Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated value.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.
H	The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
J	The result is an estimated value.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.
Q	See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimated value.
J	The result is an estimated value.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEC UST	http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L14-51
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	Not available	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	03016
Maine DHS	Not available	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Montana DPHHS	http://www.dphhs.mt.gov/publichealth/	CERT0047
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/oqa/	WA005
North Carolina DWQ	http://www.dwqlab.org/	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/envserv/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wisconsin DNR	http://dnr.wi.gov/	998386840
Wyoming (EPA Region 8)	http://www.epa.gov/region8/water/dwhome/wyomingdi.html	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

Case Narrative

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

ALS ENVIRONMENTAL

Client:	CH2M Hill	**Service Request No.:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Received:**	06/08/16
Sample Matrix:	Water		

Case Narrative

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), Matrix/Duplicate Matrix Spike (MS/DMS), Laboratory Control Sample (LCS), and Laboratory/Duplicate Laboratory Control Sample (LCS/DLCS).

Sample Receipt

One water sample was received for analysis at ALS Environmental on 06/08/16. The sample was received in good condition and consistent with the accompanying chain of custody form. The sample was stored in a refrigerator at 4ºC upon receipt at the laboratory.

General Chemistry Parameters

Total Cyanide by EPA Method 335.4:
The matrix spike recoveries for sample Batch QC were outside control criteria because of suspected matrix interference. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. No further corrective action was taken.

No other anomalies associated with the analysis of this sample were observed.

Total and Dissolved Metals

No anomalies associated with the analysis of this sample were observed.

Diesel Range Organics by Method NWTPH-Dx-SGT

No anomalies associated with the analysis of this sample were observed.

Gasoline Range Organics by Method NWTPH-Gx

No anomalies associated with the analysis of this sample were observed.

Sulfur

This analysis was performed at ALS Environmental, Simi Valley, CA. The data for this analysis is included in the corresponding section of this report.

Approved by_____

Chain of Custody

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
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ALS Environmental

CHAIN OF CUSTODY

66258

001

SR# K16O 6174

COC Set 1 of 1

COC#

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www.alsglobal.com

Rocky Pt

Project Name	CITY OF LONGVIEW - [redacted]
Project Number	Test Well OB-3
Project Manager	Brad Phelps
Company	CH2M
Address	2020 SW 4th AVE, Portland, OR 97201
Phone #	503 360 7413
email	bphelps@CH2M.com
Sampler Signature	
Sampler Printed Name	Brad Phelps

CLIENT SAMPLE ID	LABID	SAMPLING Date	SAMPLING Time	Matrix	NUMBER OF CONTAINERS	0H: ASTM D1498-00 / Redox Pot	0H: SM 4500-H+ B / pH	0H: SM 4500-O G / Oxygen	48H: 180.1 / Turbidity	48H: 300.0 / NO2	48H: 300.0 / NO3	48H: SM 2120 B / Color	48H: SM 4500-P E / O Phos	48H: SM 5910 B / UV 254	7D: SM 2540 C / TDS	14D: 335.4 / CN T	14D: NWTPH-Dx / NW_TPH	14D: NWTPH-Gx / NW_GAS	14D: Sulfur Liq / Sulfur	28D: 245.1 / Hg T	28D: 300.0 / Chloride	28D: 300.0 / SO4	28D: SM 2510 B / Conductivity	28D: SM 4500-F- C Modified / F	28D: SM 4500-NH3 G / Ammonia	28D: SM 5310 C / TOC T	90D: 1631E / Hg LL T	180D: 200.7 / Metals T	Remarks
1. ~~Solomon Pot~~			1:30P																										
2. Rocky Pt OB-3		6/8/16	[redacted]			X																							
3.																													
4.																													
5.																													
6.																													
7.																													
8.																													
9.																													
10.																													

Report Requirements

___ I. Routine Report: Method Blank, Surrogate, as required

___ II. Report Dup., MS, MSD as required

___ III. CLP Like Summary (no raw data)

___ IV. Data Validation Report

___ V. EDD

Invoice Information

P.O.#

Bill To: City of Longview

c/o Amy Blair

Turnaround Requirements

___ 24 hr. ___ 48 hr.

X 5 Day

Standard

Requested Report Date

Circle which metals are to be analyzed

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Special Instructions/Comments:

Cyanide Dissolved

Silica Total & Dissolved

Flouride Dissolved

Hydrogen Sulfide H_2S

*Indicate State Hydrocarbon Procedure: AK CA WI Northwest Other_____(Circle One)

Relinquished By:	Received By:	Relinquished By:	Received By:	Relinquished By:	Received By:
Signature	Signature	Signature	Signature	Signature	Signature
Printed Name: Brad Phelps	Printed Name	Printed Name	Printed Name	Printed Name	Printed Name
Firm: CH2M	Firm: ALS	Firm	Firm	Firm	Firm
Date/Time: 6/8/16 15:25	Date/Time: 6/8/16 1525	Date/Time	Date/Time	Date/Time	Date/Time

PC CC

Cooler Receipt and Preservation Form

Client CH2M Hill Service Request K16 06174

Received: 6/8/16 Opened: 6/8/16 By: [illegible] Unloaded: 6/8/16 By: [illegible]

1. Samples were received via? *Mail* *Fed Ex* *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA Y N If yes, how many and where? _____

   If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID NA	Tracking Number NA	Filed
12.2	12.1	12.2	12.0	-0.2	351			

4. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
6. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA Y N
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA Y N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA Y N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* NA Y N
12. Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

RUSH
SHORT HOLD TIME

Notes, Discrepancies, & Resolutions: _____

Page ____ *of* ____

General Chemistry

ALS Environmental—Kelso Laboratory
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www.alsglobal.com

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	180.1	**Units:**	NTU
Prep Method:	None	**Basis:**	NA

Turbidity

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Rocky Pt OB-3	K1606174-001	**91.0**	1.0	5	06/09/16 14:15	
Method Blank	K1606174-MB1	ND U	0.20	1	06/09/16 14:15	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/09/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Rocky Pt OB-3	**Units:**	NTU
Lab Code:	K1606174-001	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1606174-001DUP Result	Average	RPD	RPD Limit
Turbidity	180.1	1.0	91.0	93.5	92.3	3	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Analyzed:**	06/09/16
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Turbidity

Analysis Method:	180.1	**Units:**	NTU
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	500453

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1606174-LCS1	4.60	4.23	109	90-110

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA

Chloride

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Rocky Pt OB-3	K1606174-001	**5.05**	0.20	2	06/08/16 23:35	6/8/16	
Method Blank	K1606174-MB1	ND U	0.10	1	06/08/16 17:56	6/8/16	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/09/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Rocky Pt OB-3	**Units:**	mg/L
Lab Code:	K1606174-001	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1606174-001DUP Result	Average	RPD	RPD Limit
Chloride	300.0	0.20	5.05	4.99	5.02	1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/9/16
		Date Extracted:	06/8/16

Duplicate Matrix Spike Summary
Chloride

Sample Name:	Rocky Pt OB-3	**Units:**	mg/L
Lab Code:	K1606174-001	**Basis:**	NA
Analysis Method:	300.0		
Prep Method:	Method		

		Matrix Spike K1606174-001MS			Duplicate Matrix Spike K1606174-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Chloride	5.05	14.4	10.0	93	14.4	10.0	93	90-110	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Analyzed:**	06/08/16
Sample Matrix:	Water	**Date Extracted:**	06/08/16

Lab Control Sample Summary
Chloride

Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA
		Analysis Lot:	500001

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1606174-LCS1	4.92	5.00	98	90-110

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA

Nitrite as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Rocky Pt OB-3	K1606174-001	ND U	0.10	2	06/08/16 23:35	6/8/16	
Method Blank	K1606174-MB1	ND U	0.050	1	06/08/16 17:56	6/8/16	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/09/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Rocky Pt OB-3	**Units:**	mg/L
Lab Code:	K1606174-001	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1606174-001DUP Result	Average	RPD	RPD Limit
Nitrite as Nitrogen	300.0	0.10	ND U	ND U	NC	NC	20

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/9/16
		Date Extracted:	06/8/16

Duplicate Matrix Spike Summary
Nitrite as Nitrogen

Sample Name:	Rocky Pt OB-3	**Units:**	mg/L
Lab Code:	K1606174-001	**Basis:**	NA
Analysis Method:	300.0		
Prep Method:	Method		

		Matrix Spike K1606174-001MS			**Duplicate Matrix Spike** K1606174-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Nitrite as Nitrogen	ND U	9.66	10.0	97	9.67	10.0	97	90-110	<1	20

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Analyzed:**	06/08/16
Sample Matrix:	Water	**Date Extracted:**	06/08/16

Lab Control Sample Summary
Nitrite as Nitrogen

Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA
		Analysis Lot:	500001

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1606174-LCS1	2.38	2.50	95	90-110

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA

Nitrate as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Rocky Pt OB-3	K1606174-001	ND U	0.10	2	06/08/16 23:35	6/8/16	
Method Blank	K1606174-MB1	ND U	0.050	1	06/08/16 17:56	6/8/16	

ALS Group USA, Corp.
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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/09/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Rocky Pt OB-3	**Units:**	mg/L
Lab Code:	K1606174-001	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1606174-001DUP Result	Average	RPD	RPD Limit
Nitrate as Nitrogen	300.0	0.10	ND U	ND U	NC	NC	20

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ALS Group USA, Corp.
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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/9/16
		Date Extracted:	06/8/16

Duplicate Matrix Spike Summary
Nitrate as Nitrogen

Sample Name:	Rocky Pt OB-3	**Units:**	mg/L
Lab Code:	K1606174-001	**Basis:**	NA
Analysis Method:	300.0		
Prep Method:	Method		

		Matrix Spike K1606174-001MS			**Duplicate Matrix Spike** K1606174-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Nitrate as Nitrogen	ND U	9.70	10.0	97	9.74	10.0	97	90-110	<1	20

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ALS Group USA, Corp.
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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Analyzed:**	06/08/16
Sample Matrix:	Water	**Date Extracted:**	06/08/16

Lab Control Sample Summary
Nitrate as Nitrogen

Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA
		Analysis Lot:	500001

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1606174-LCS1	2.45	2.50	98	90-110

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA

Sulfate

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Rocky Pt OB-3	K1606174-001	**0.26**	0.20	2	06/08/16 23:35	6/8/16	
Method Blank	K1606174-MB1	ND U	0.10	1	06/08/16 17:56	6/8/16	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/09/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Rocky Pt OB-3	**Units:**	mg/L
Lab Code:	K1606174-001	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1606174-001DUP Result	Average	RPD	RPD Limit
Sulfate	300.0	0.20	0.26	0.29	0.273	13	20

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/9/16
		Date Extracted:	06/8/16

Duplicate Matrix Spike Summary
Sulfate

Sample Name:	Rocky Pt OB-3	**Units:**	mg/L
Lab Code:	K1606174-001	**Basis:**	NA
Analysis Method:	300.0		
Prep Method:	Method		

		Matrix Spike			**Duplicate Matrix Spike**					
		K1606174-001MS			K1606174-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Sulfate	0.26	9.83	10.0	96	9.73	10.0	95	90-110	1	20

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Analyzed:**	06/08/16
Sample Matrix:	Water	**Date Extracted:**	06/08/16

Lab Control Sample Summary
Sulfate

Analysis Method:	300.0	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA
		Analysis Lot:	500001

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1606174-LCS1	4.96	5.00	99	90-110

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	335.4	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA

Cyanide, Total

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Rocky Pt OB-3	K1606174-001	ND U	0.010	1	06/14/16 11:40	6/13/16	
Method Blank	K1606174-MB1	ND U	0.010	1	06/14/16 11:40	6/13/16	

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dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
		Date Analyzed:	06/14/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Batch QC	**Units:**	mg/L
Lab Code:	KQ1606361-03	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1606361-03DUP Result	Average	RPD	RPD Limit
Cyanide, Total	335.4	0.010	ND U	ND U	NC	NC	20

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	N/A
Sample Matrix:	Water	**Date Received:**	N/A
		Date Analyzed:	06/14/16
		Date Extracted:	06/13/16

Duplicate Matrix Spike Summary
Cyanide, Total

Sample Name:	Batch QC	**Units:**	mg/L
Lab Code:	KQ1606361-03	**Basis:**	NA
Analysis Method:	335.4		
Prep Method:	Method		

		Matrix Spike KQ1606361-03MS				**Duplicate Matrix Spike** KQ1606361-03DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**		**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Cyanide, Total	ND U	0.085	0.100	85 *		0.082	0.100	82 *	90-110	3	20

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Analyzed:**	06/14/16
Sample Matrix:	Water	**Date Extracted:**	06/13/16

Lab Control Sample Summary
Cyanide, Total

Analysis Method:	335.4	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA
		Analysis Lot:	500844

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1606174-LCS1	0.144	0.150	96	90-110

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	ASTM D1498-00	**Units:**	mV
Prep Method:	None	**Basis:**	NA

Oxidation-Reduction Potential (ORP)

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Rocky Pt OB-3	K1606174-001	**-54.6**	-	1	06/09/16 11:21	H

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dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/09/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Rocky Pt OB-3	**Units:**	mV
Lab Code:	K1606174-001	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1606174-001DUP Result	Average	RPD	RPD Limit
Oxidation-Reduction Potential (ORP)	ASTM D1498-00	-	-54.6	-54.6	-54.6	<1	20

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Analyzed:**	06/09/16
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Oxidation-Reduction Potential (ORP)

Analysis Method:	ASTM D1498-00	**Units:**	mV
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	500237

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1606174-LCS1	455	480	95	85-115
Lab Control Sample	K1606174-LCS2	455	480	95	85-115

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	Calculation	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Nitrate+Nitrite as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Rocky Pt OB-3	K1606174-001	ND U	0.20	1	06/08/16 23:35	

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Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	SM 2120 B	**Units:**	ColorUnits
Prep Method:	None	**Basis:**	NA

Color

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Rocky Pt OB-3	K1606174-001	ND U	5.0	1	06/09/16 09:24	
Method Blank	K1606174-MB1	ND U	5.0	1	06/09/16 09:19	

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dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/09/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Rocky Pt OB-3	**Units:**	ColorUnits
Lab Code:	K1606174-001	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1606174-001DUP Result	Average	RPD	RPD Limit
Color	SM 2120 B	5.0	ND U	ND U	NC	NC	20

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Analyzed:**	06/09/16
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Color

Analysis Method:	SM 2120 B	**Units:**	ColorUnits
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	499956

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1606174-LCS1	35.0	35.0	100	85-115

ALS Group USA, Corp.
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Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	SM 2510 B	**Units:**	uMHOS/cm
Prep Method:	None	**Basis:**	NA

Conductivity at 25 Degrees Celsius

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Rocky Pt OB-3	K1606174-001	**404**	2.0	1	06/10/16 10:29	
Method Blank	K1606174-MB1	ND U	2.0	1	06/10/16 10:29	
Method Blank	K1606174-MB2	ND U	2.0	1	06/10/16 10:29	

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
		Date Analyzed:	06/10/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Batch QC	**Units:**	uMHOS/cm
Lab Code:	K1606060-001	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1606060-001DUP Result	Average	RPD	RPD Limit
Conductivity at 25 Degrees Celsius	SM 2510 B	2.0	1030	1030	1030	<1	20

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Analyzed:**	06/10/16
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Conductivity at 25 Degrees Celsius

Analysis Method:	SM 2510 B	**Units:**	uMHOS/cm
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	500437

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1606174-LCS1	295	289	102	86-113

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	SM 2540 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Solids, Total Dissolved

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Rocky Pt OB-3	K1606174-001	**216**	10	1	06/14/16 14:41	
Method Blank	K1606174-MB1	ND U	5.0	1	06/14/16 14:41	
Method Blank	K1606174-MB2	ND U	10	1	06/14/16 14:41	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
Analysis Method:	SM 2540 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Replicate Sample Summary
Solids, Total Dissolved

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Batch QC	K1606151-001DUP	10	491	484	488	1	10	06/14/16
Batch QC	K1606228-001DUP	10	484	481	483	<1	10	06/14/16

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ALS Group USA, Corp.
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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Analyzed:**	06/14/16
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Solids, Total Dissolved

Analysis Method:	SM 2540 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	500915

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1606174-LCS1	708	714	99	85-115

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	SM 4500-F- C Modified	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Fluoride

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Rocky Pt OB-3	K1606174-001	**0.28**	0.20	1	06/09/16 10:15	
Method Blank	K1606174-MB1	ND U	0.20	1	06/08/16 16:25	

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dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
Analysis Method:	SM 4500-F- C Modified	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Replicate Sample Summary
Fluoride

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Batch QC	K1605827-001DUP	0.20	0.89	0.88	0.886	<1	20	06/08/16
Rocky Pt OB-3	K1606174-001DUP	0.20	0.28	0.26	0.266	8	20	06/09/16

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ALS Group USA, Corp.
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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	N/A
Sample Matrix:	Water	**Date Received:**	N/A
		Date Analyzed:	06/8/16
		Date Extracted:	NA

Matrix Spike Summary
Fluoride

Sample Name:	Batch QC	**Units:**	mg/L
Lab Code:	K1605827-001	**Basis:**	NA
Analysis Method:	SM 4500-F- C Modified		
Prep Method:	None		

Matrix Spike
K1605827-001MS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Fluoride	0.89	28.8	25.0	112	74-128

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/9/16
		Date Extracted:	NA

Matrix Spike Summary
Fluoride

Sample Name:	Rocky Pt OB-3	**Units:**	mg/L
Lab Code:	K1606174-001	**Basis:**	NA
Analysis Method:	SM 4500-F- C Modified		
Prep Method:	None		

Matrix Spike
K1606174-001MS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Fluoride	0.28	30.6	25.0	121	74-128

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Analyzed:**	06/08/16
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Fluoride

Analysis Method:	SM 4500-F- C Modified	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	499996

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1606174-LCS1	9.18	8.52	108	87-117

ALS Group USA, Corp.
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Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	SM 4500-H+ B	**Units:**	pH Units
Prep Method:	None	**Basis:**	NA

pH

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Rocky Pt OB-3	K1606174-001	**6.62**	-	1	06/08/16 18:43	H

ALS Group USA, Corp.
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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
Analysis Method:	SM 4500-H+ B	**Units:**	pH Units
Prep Method:	None	**Basis:**	NA

Replicate Sample Summary
pH

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Batch QC	K1606139-002DUP	-	6.91	6.93	6.92	<1	20	06/08/16
Batch QC	K1606162-001DUP	-	6.64	6.66	6.65	<1	20	06/08/16
Rocky Pt OB-3	K1606174-001DUP	-	6.62	6.67	6.65	<1	20	06/08/16

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Analyzed:**	06/08/16
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
pH

Analysis Method:	SM 4500-H+ B	**Units:**	pH Units
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	500129

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1606174-LCS1	8.29	8.32	100	85-115

ALS Group USA, Corp.
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Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	SM 4500-NH3 G	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA

Ammonia as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Rocky Pt OB-3	K1606174-001	**0.263**	0.050	1	06/13/16 12:38	6/13/16	
Method Blank	K1606174-MB1	ND U	0.050	1	06/13/16 12:38	6/13/16	

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
Analysis Method:	SM 4500-NH3 G	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA

Replicate Sample Summary
Ammonia as Nitrogen

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Batch QC	K1606061-001DUP	0.050	2.12	2.10	2.11	<1	20	06/13/16
Batch QC	K1606400-001DUP	0.050	ND U	ND U	NC	NC	20	06/13/16

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	N/A
Sample Matrix:	Water	**Date Received:**	N/A
		Date Analyzed:	06/13/16
		Date Extracted:	06/13/16

Duplicate Matrix Spike Summary
Ammonia as Nitrogen

Sample Name:	Batch QC	**Units:**	mg/L
Lab Code:	K1606061-001	**Basis:**	NA
Analysis Method:	SM 4500-NH3 G		
Prep Method:	Method		

		Matrix Spike K1606061-001MS			**Duplicate Matrix Spike** K1606061-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Ammonia as Nitrogen	2.12	4.12	2.00	100	4.07	2.00	98	90-110	2	20

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	N/A
Sample Matrix:	Water	**Date Received:**	N/A
		Date Analyzed:	06/13/16
		Date Extracted:	06/13/16

Duplicate Matrix Spike Summary
Ammonia as Nitrogen

Sample Name:	Batch QC	**Units:**	mg/L
Lab Code:	K1606400-001	**Basis:**	NA
Analysis Method:	SM 4500-NH3 G		
Prep Method:	Method		

		Matrix Spike K1606400-001MS			**Duplicate Matrix Spike** K1606400-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Ammonia as Nitrogen	ND U	2.02	2.00	101	1.99	2.00	100	90-110	<1	20

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Analyzed:**	06/13/16
Sample Matrix:	Water	**Date Extracted:**	06/13/16

Lab Control Sample Summary
Ammonia as Nitrogen

Analysis Method:	SM 4500-NH3 G	**Units:**	mg/L
Prep Method:	Method	**Basis:**	NA
		Analysis Lot:	500806

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1606174-LCS1	15.8	16.2	98	90-110

ALS Group USA, Corp.
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Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	SM 4500-O G	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Oxygen, Dissolved

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Rocky Pt OB-3	K1606174-001	ND U	1.0	1	06/08/16 16:40	H

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Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	SM 4500-P E	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Orthophosphate as Phosphorus

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Rocky Pt OB-3	K1606174-001	ND U	0.050	1	06/09/16 12:47	
Method Blank	K1606174-MB1	ND U	0.050	1	06/09/16 12:47	

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/09/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Rocky Pt OB-3	**Units:**	mg/L
Lab Code:	K1606174-001	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1606174-001DUP Result	Average	RPD	RPD Limit
Orthophosphate as Phosphorus	SM 4500-P E	0.050	ND U	ND U	NC	NC	20

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/9/16
		Date Extracted:	NA

Duplicate Matrix Spike Summary
Orthophosphate as Phosphorus

Sample Name:	Rocky Pt OB-3	**Units:**	mg/L
Lab Code:	K1606174-001	**Basis:**	NA
Analysis Method:	SM 4500-P E		
Prep Method:	None		

		Matrix Spike K1606174-001MS			**Duplicate Matrix Spike** K1606174-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Orthophosphate as Phosphorus	ND U	0.399	0.400	100	0.390	0.400	97	75-125	3	20

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Analyzed:**	06/09/16
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Orthophosphate as Phosphorus

Analysis Method:	SM 4500-P E	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	500244

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1606174-LCS1	4.36	4.53	96	85-115

ALS Group USA, Corp.
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Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Carbon, Total Organic

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Rocky Pt OB-3	K1606174-001	**2.47**	0.50	1	06/13/16 16:00	
Method Blank	K1606174-MB1	ND U	0.50	1	06/13/16 16:00	

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Replicate Sample Summary
Carbon, Total Organic

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Rocky Pt OB-3	K1606174-001DUP	0.50	2.47	2.36	2.42	4	10	06/13/16

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ALS Group USA, Corp.
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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/13/16
		Date Extracted:	NA

Matrix Spike Summary
Carbon, Total Organic

Sample Name:	Rocky Pt OB-3	**Units:**	mg/L
Lab Code:	K1606174-001	**Basis:**	NA
Analysis Method:	SM 5310 C		
Prep Method:	None		

Matrix Spike
K1606174-001MS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Carbon, Total Organic	2.47	27.4	25.0	100	83-117

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Analyzed:**	06/13/16
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Carbon, Total Organic

Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	500687

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1606174-LCS1	24.2	24.0	101	83-117

ALS Group USA, Corp.
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Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/8/16
Sample Matrix:	Water	**Date Received:**	06/8/16
Analysis Method:	SM 5910 B	**Units:**	cm-1
Prep Method:	None	**Basis:**	NA

UV254

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Rocky Pt OB-3	K1606174-001	**0.078**	-	1	06/06/16 19:51	
Method Blank	K1606174-MB1	**0.001**	-	1	06/06/16 19:51	
Method Blank	K1606174-MB2	**0.001**	-	1	06/06/16 19:51	

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Analyzed:	06/06/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Rocky Pt OB-3	**Units:**	cm-1
Lab Code:	K1606174-001	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1606174-001DUP Result	Average	RPD	RPD Limit
UV254	SM 5910 B	-	0.078	0.079	0.0785	1	20

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Metals

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Extracted:	06/10/16
		Date Analyzed:	06/13/16

Hardness, as CaCO3
EPA Method 6010C / SM Method 2340B
Units: mg/L (ppm)

Sample Name	**Lab Code**	**MRL**	**Result**
Rocky Pt OB-3	K1606174-001	0.100	125
Method Blank	K1606174-MB	0.100	ND

ALS Group USA, Corp.
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Analytical Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16

Mercury, Total

Prep Method:	METHOD	Units:	ng/L
Analysis Method:	1631E	Basis:	NA
Test Notes:			

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Rocky Pt OB-3	K1606174-001	0.5	1	06/12/16	06/14/16	ND	
Method Blank 1	K1606174-MB1	0.5	1	06/12/16	06/14/16	ND	
Method Blank 2	K1606174-MB2	0.5	1	06/12/16	06/14/16	ND	
Method Blank 3	K1606174-MB3	0.5	1	06/12/16	06/14/16	ND	

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/16
Sample Matrix:	Water	**Date Received:**	06/08/16
		Date Extracted:	06/12/16
		Date Analyzed:	06/14/16

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name:	Rocky Pt OB-3	Units:	ng/L
Lab Code:	K1606174-001MS, K1606174-001MSD	Basis:	NA
Test Notes:			

									Percent Recovery				
				Spike Level		Sample	Spike Result				ALS	Relative	
	Prep	Analysis									Acceptance	Percent	Result
Analyte	**Method**	**Method**	**MRL**	**MS**	**DMS**	**Result**	**MS**	**DMS**	**MS**	**DMS**	**Limits**	**Difference**	**Notes**
Mercury	METHOD	1631E	0.5	50	50	ND	49.1	48.6	98	97	71-125	1	

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	06/14/16

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Initial)

Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	5.05	101	77-123	

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	06/14/16

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final)

Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	5.01	100	77-123	

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QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	06/14/16

Quality Control Sample (QCS) Summary
Total Metals

Sample Name: Quality Control Sample

Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	4.94	99	77-123	

ALS Group USA, Corp.
dba ALS Enviromental

Analytical Report

Client :	CH2M Hill	**Service Request :**	K1606174
Project Name :	City of Longview Rocky Pt. Test Well OB-3	**Date Collected :**	06/08/16
Project No. :	NA	**Date Received :**	06/08/16
Matrix :	Water	**Date Extracted :**	06/10/16

Total Metals

Sample Name :	Rocky Pt OB-3	**Units :**	ug/L (ppb)
Lab Code :	K1606174-001	**Basis :**	NA

Analyte	Analysis Method	MRL	Date Analyzed	Sample Result	Result Notes
Aluminum	200.7	10	06/13/16	116	
Antimony	200.8	0.05	06/14/16	ND	
Arsenic	200.8	0.5	06/14/16	0.8	
Barium	200.7	4.0	06/13/16	10.8	
Beryllium	200.8	0.02	06/14/16	ND	
Cadmium	200.8	0.02	06/14/16	ND	
Calcium	200.7	20	06/13/16	29200	
Chromium	200.8	0.2	06/14/16	0.4	
Copper	200.7	4.0	06/13/16	ND	
Iron	200.7	20	06/13/16	28800	
Lead	200.8	0.02	06/14/16	0.12	
Magnesium	200.7	5.0	06/13/16	12700	
Manganese	200.7	1.0	06/13/16	1030	
Nickel	200.8	0.2	06/14/16	0.6	
Selenium	200.8	1.0	06/14/16	ND	
Silicon, as SiO2	200.7	500	06/13/16	68000	
Silver	200.8	0.02	06/14/16	ND	
Sodium	200.7	200	06/13/16	15000	
Thallium	200.8	0.02	06/14/16	ND	
Zinc	200.7	4.0	06/13/16	32.6	

Comments:

ALS Group USA, Corp.
dba ALS Enviromental

Analytical Report

Client :	CH2M Hill	**Service Request :**	K1606174
Project Name :	City of Longview Rocky Pt. Test Well OB-3	**Date Collected :**	06/08/16
Project No. :	NA	**Date Received :**	06/08/16
Matrix :	Water	**Date Extracted :**	06/10/16

Dissolved Metals

Sample Name :	Rocky Pt OB-3	**Units :**	ug/L (ppb)
Lab Code :	K1606174-001	**Basis :**	NA

Analyte	Analysis Method	MRL	Date Analyzed	Sample Result	Result Notes
Silicon, as SiO2	200.7	500	06/13/16	68100	

Comments:

ALS Group USA, Corp.
dba ALS Enviromental

Analytical Report

Client :	CH2M Hill	**Service Request :**	K1606174
Project Name :	City of Longview Rocky Pt. Test Well OB-3	**Date Collected :**	NA
Project No. :	NA	**Date Received :**	NA
Matrix :	Water	**Date Extracted :**	06/10/16

Total Metals

Sample Name :	Method Blank	**Units :**	ug/L (ppb)
Lab Code :	K1606174-MB	**Basis :**	NA

Analyte	Analysis Method	MRL	Date Analyzed	Sample Result	Result Notes
Aluminum	200.7	10	06/13/16	ND	
Antimony	200.8	0.05	06/14/16	ND	
Arsenic	200.8	0.5	06/14/16	ND	
Barium	200.7	4.0	06/13/16	ND	
Beryllium	200.8	0.02	06/14/16	ND	
Cadmium	200.8	0.02	06/14/16	ND	
Calcium	200.7	20	06/13/16	ND	
Chromium	200.8	0.2	06/14/16	ND	
Copper	200.7	4.0	06/13/16	ND	
Iron	200.7	20	06/13/16	ND	
Lead	200.8	0.02	06/14/16	ND	
Magnesium	200.7	5.0	06/13/16	ND	
Manganese	200.7	1.0	06/13/16	ND	
Nickel	200.8	0.2	06/14/16	ND	
Selenium	200.8	1.0	06/14/16	ND	
Silicon, as SiO2	200.7	500	06/13/16	ND	
Silver	200.8	0.02	06/14/16	ND	
Sodium	200.7	200	06/13/16	ND	
Thallium	200.8	0.02	06/14/16	ND	
Zinc	200.7	4.0	06/13/16	ND	

Comments:

ALS Group USA, Corp.
dba ALS Enviromental

QA/QC Report

Client :	CH2M Hill	**Service Request :**	K1606174
Project Name :	City of Longview Rocky Pt. Test Well OB-3	**Date Collected :**	06/08/16
Project No. :	NA	**Date Received :**	06/08/16
Matrix :	Water	**Date Extracted :**	06/10/16
		Date Analyzed :	06/13,14/16

Duplicate Summary
Total Metals

Sample Name :	Rocky Pt OB-3	**Units :**	ug/L (ppb)
Lab Code :	K1606174-001D	**Basis :**	NA

Analyte	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Aluminum	200.7	10	116	124	120	7	
Antimony	200.8	0.05	ND	ND	ND	-	
Arsenic	200.8	0.5	0.8	0.7	0.7	13	
Barium	200.7	4.0	10.8	10.8	10.8	<1	
Beryllium	200.8	0.02	ND	ND	ND	-	
Cadmium	200.8	0.02	ND	ND	ND	-	
Calcium	200.7	20	29200	29300	29300	<1	
Chromium	200.8	0.2	0.4	0.4	0.4	<1	
Copper	200.7	4.0	ND	ND	ND	-	
Iron	200.7	20	28800	28800	28800	<1	
Lead	200.8	0.02	0.12	0.12	0.12	<1	
Magnesium	200.7	5.0	12700	12700	12700	<1	
Manganese	200.7	1.0	1030	1030	1030	<1	
Nickel	200.8	0.2	0.6	0.7	0.7	15	
Selenium	200.8	1.0	ND	ND	ND	-	
Silicon, as SiO2	200.7	500	68000	67600	67800	<1	
Silver	200.8	0.02	ND	ND	ND	-	
Sodium	200.7	200	15000	14900	15000	<1	
Thallium	200.8	0.02	ND	ND	ND	-	
Zinc	200.7	4.0	32.6	33.7	33.2	3	

Comments:

ALS Group USA, Corp.
dba ALS Enviromental

QA/QC Report

Client :	CH2M Hill	**Service Request :**	K1606174
Project Name :	City of Longview Rocky Pt. Test Well OB-3	**Date Collected :**	06/08/16
Project No. :	NA	**Date Received :**	06/08/16
Matrix :	Water	**Date Extracted :**	06/10/16
		Date Analyzed :	06/13,14/16

Matrix Spike Summary
Total Metals

Sample Name :	Rocky Pt OB-3	**Units :**	ug/L (ppb)
Lab Code :	K1606174-001S	**Basis :**	NA

Analyte	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Aluminum	10	2000	116	1990	94	70-130	
Aluminum	10	2000	116	2060	94	70-130	
Antimony	0.05	50.0	ND	47.9	96	70-130	
Arsenic	0.5	50.0	0.8	49.3	97	70-130	
Barium	4.0	2000	10.8	1020	50	70-130	
Beryllium	0.02	2.50	ND	2.26	90	70-130	
Cadmium	0.02	25.0	ND	25.0	100	70-130	
Calcium	20	10000	29200	40000	108	70-130	
Chromium	0.2	10.0	0.4	9.1	87	70-130	
Copper	4.0	250	ND	244	98	70-130	
Iron	20	1000	28800	30300	150	70-130	
Lead	0.02	50.0	0.12	50.3	100	70-130	
Magnesium	5.0	10000	12700	22900	102	70-130	
Manganese	1.0	500	1030	1550	104	70-130	
Nickel	0.2	25.0	0.6	22.8	89	70-130	
Selenium	1.0	50.0	ND	51.5	103	70-130	
Silicon, as SiO2	500	21400	68000	90100	103	70-130	
Silver	0.02	12.5	ND	12.4	99	70-130	
Sodium	200	10000	15000	25500	105	70-130	
Thallium	0.02	50.0	ND	53.9	108	70-130	
Zinc	4.0	500	32.6	517	97	70-130	

Comments:

ALS Group USA, Corp.
dba ALS Enviromental

QA/QC Report

Client :	CH2M Hill	**Service Request :**	K1606174
Project Name :	City of Longview Rocky Pt. Test Well OB-3	**Date Collected :**	NA
Project No. :	NA	**Date Received :**	NA
Matrix :	Water	**Date Extracted :**	06/10/16
		Date Analyzed :	06/13,14/16

Laboratory Control Sample Summary
Total Metals

Sample Name :	Laboratory Control Sample	**Units :**	ug/L (ppb)
Lab Code :	K1606174-LCS	**Basis :**	NA

Analyte	Analysis Method	True Value	Result	Percent	ALS Percent Recovery Acceptance Limits	Result Notes
Aluminum	200.7	5000	5070	101	85-115	
Antimony	200.8	50.0	47.3	95	85-115	
Arsenic	200.8	50.0	48.2	96	85-115	
Barium	200.7	5000	5040	101	85-115	
Beryllium	200.8	2.50	2.3	94	85-115	
Cadmium	200.8	25.0	24.7	99	85-115	
Calcium	200.7	12500	12500	100	85-115	
Chromium	200.8	10.0	9.8	98	85-115	
Copper	200.7	625	615	98	85-115	
Iron	200.7	2500	2500	100	85-115	
Lead	200.8	50.0	50.4	101	85-115	
Magnesium	200.7	12500	12600	101	85-115	
Manganese	200.7	1250	1250	100	85-115	
Nickel	200.8	25.0	24.5	98	85-115	
Selenium	200.8	50.0	49.5	99	85-115	
Silicon, as SiO2	200.7	21400	21500	101	85-115	
Silver	200.8	12.5	12.5	100	85-115	
Sodium	200.7	12500	12800	102	85-115	
Thallium	200.8	50.0	53.7	107	85-115	
Zinc	200.7	1250	1210	97	85-115	

Comments:

Diesel and Residual Range Organics - Silica Gel Treated

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

ALS Group USA, Corp. dba ALS Environmental

Analytical Results

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/2016
Sample Matrix:	Water	**Date Received:**	06/08/2016

Diesel and Residual Range Organics - Silica Gel Treated

Sample Name:	Rocky Pt OB-3	**Units:**	ug/L
Lab Code:	K1606174-001	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	NWTPH-Dx		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Diesel Range Organics (DRO)	ND	U	250	1	06/14/16	06/17/16	KWG1604739	
Residual Range Organics (RRO)	ND	U	500	1	06/14/16	06/17/16	KWG1604739	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
o-Terphenyl	92	50-150	06/17/16	Acceptable
n-Triacontane	93	50-150	06/17/16	Acceptable

Comments:

ALS Group USA, Corp. dba ALS Environmental

Analytical Results

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

Diesel and Residual Range Organics - Silica Gel Treated

Sample Name:	Method Blank	**Units:**	ug/L
Lab Code:	KWG1604739-3	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	NWTPH-Dx		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Diesel Range Organics (DRO)	ND	U	250	1	06/14/16	06/17/16	KWG1604739	
Residual Range Organics (RRO)	ND	U	500	1	06/14/16	06/17/16	KWG1604739	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
o-Terphenyl	74	50-150	06/17/16	Acceptable
n-Triacontane	85	50-150	06/17/16	Acceptable

Comments:

Client: CH2M Hill **Service Request:** K1606174
Project: City of Longview Rocky Pt. Test Well OB-3
Sample Matrix: Water

Surrogate Recovery Summary
Diesel and Residual Range Organics - Silica Gel Treated

Extraction Method: METHOD **Units:** Percent
Analysis Method: NWTPH-Dx **Level:** Low

Sample Name	Lab Code	Sur1	Sur2
Rocky Pt OB-3	K1606174-001	92	93
Rocky Pt OB-3DUP	KWG1604739-1	85	85
Method Blank	KWG1604739-3	74	85
Lab Control Sample	KWG1604739-2	82	83

Surrogate Recovery Control Limits (%)

Sur1	=	o-Terphenyl	50-150
Sur2	=	n-Triacontane	50-150

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Extracted:**	06/14/2016
Sample Matrix:	Water	**Date Analyzed:**	06/17/2016

Duplicate Sample Summary
Diesel and Residual Range Organics - Silica Gel Treated

Sample Name:	Rocky Pt OB-3	**Units:**	ug/L
Lab Code:	K1606174-001	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	NWTPH-Dx	**Extraction Lot:**	KWG1604739

			Rocky Pt OB-3DUP KWG1604739-1 Duplicate Sample			
Analyte Name	**MRL**	**Sample Result**	**Result**	**Average**	**Relative Percent Difference**	**RPD Limit**
Diesel Range Organics (DRO)	250	ND	ND	ND	-	30
Residual Range Organics (RRO)	500	ND	ND	ND	-	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Extracted:**	06/14/2016
Sample Matrix:	Water	**Date Analyzed:**	06/17/2016

Lab Control Spike Summary
Diesel and Residual Range Organics - Silica Gel Treated

Extraction Method:	METHOD	**Units:**	ug/L
Analysis Method:	NWTPH-Dx	**Basis:**	NA
		Level:	Low
		Extraction Lot:	KWG1604739

	Lab Control Sample KWG1604739-2 Lab Control Spike			
Analyte Name	**Result**	**Spike Amount**	**%Rec**	**%Rec Limits**
Diesel Range Organics (DRO)	2090	3200	65	46-140
Residual Range Organics (RRO)	1340	1600	84	45-159

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Gasoline Range Organics

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Analytical Results

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	06/08/2016
Sample Matrix:	Water	**Date Received:**	06/08/2016

Gasoline Range Organics

Sample Name:	Rocky Pt OB-3	**Units:**	ug/L
Lab Code:	K1606174-001	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	NWTPH-Gx		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Gasoline Range Organics-NWTPH	ND	U	250	1	06/13/16	06/13/16	KWG1604947	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
1,4-Difluorobenzene	87	50-150	06/13/16	Acceptable

Comments:

ALS Group USA, Corp. dba ALS Environmental

Analytical Results

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

Gasoline Range Organics

Sample Name:	Method Blank	**Units:**	ug/L
Lab Code:	KWG1604947-4	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	NWTPH-Gx		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Gasoline Range Organics-NWTPH	ND	U	250	1	06/13/16	06/13/16	KWG1604947	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
1,4-Difluorobenzene	85	50-150	06/13/16	Acceptable

Comments:

QA/QC Report

Client: CH2M Hill
Service Request: K1606174
Project: City of Longview Rocky Pt. Test Well OB-3
Sample Matrix: Water

Surrogate Recovery Summary
Gasoline Range Organics

Extraction Method: EPA 5030B
Units: Percent
Analysis Method: NWTPH-Gx
Level: Low

Sample Name	Lab Code	Sur1
Rocky Pt OB-3	K1606174-001	87
Rocky Pt OB-3DUP	KWG1604947-1	88
Method Blank	KWG1604947-4	85
Lab Control Sample	KWG1604947-2	83
Duplicate Lab Control Sample	KWG1604947-3	87

Surrogate Recovery Control Limits (%)

Sur1 = 1,4-Difluorobenzene 50-150

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Extracted:**	06/13/2016
Sample Matrix:	Water	**Date Analyzed:**	06/13/2016

Duplicate Sample Summary
Gasoline Range Organics

Sample Name:	Rocky Pt OB-3	**Units:**	ug/L
Lab Code:	K1606174-001	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	NWTPH-Gx	**Extraction Lot:**	KWG1604947

			Rocky Pt OB-3DUP KWG1604947-1 Duplicate Sample			
Analyte Name	**MRL**	**Sample Result**	**Result**	**Average**	**Relative Percent Difference**	**RPD Limit**
Gasoline Range Organics-NWTPH	250	ND	ND	ND	-	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client:	CH2M Hill	**Service Request:**	K1606174
Project:	City of Longview Rocky Pt. Test Well OB-3	**Date Extracted:**	06/13/2016
Sample Matrix:	Water	**Date Analyzed:**	06/13/2016

Lab Control Spike/Duplicate Lab Control Spike Summary
Gasoline Range Organics

Extraction Method:	EPA 5030B	**Units:**	ug/L
Analysis Method:	NWTPH-Gx	**Basis:**	NA
		Level:	Low
		Extraction Lot:	KWG1604947

	Lab Control Sample KWG1604947-2 Lab Control Spike			Duplicate Lab Control Sample KWG1604947-3 Duplicate Lab Control Spike					
Analyte Name	**Result**	**Spike Amount**	**%Rec**	**Result**	**Spike Amount**	**%Rec**	**%Rec Limits**	**RPD**	**RPD Limit**
Gasoline Range Organics-NWTPH	426	500	85	466	500	93	80-119	9	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Subcontract Lab Results

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
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www.alsglobal.com

LABORATORY REPORT

June 15, 2016

Brad Phelps
CH2M Hill
2020 SW 4th Ave. Suite 300
Portland, OR 97201

RE: City of Longview Rocky Pt. Test Well OB-3

Dear Brad:

Enclosed are the results of the sample submitted to our laboratory on June 10, 2016. For your reference, these analyses have been assigned our service request number K1606174.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

By Sue Anderson at 12:31 pm, Jun 15, 2016

For Kate Aguilera
Project Manager

CASE NARRATIVE

The sample was received intact under chain of custody at the Simi Valley facility on June 10, 2016 and was stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the sample at the time of sample receipt.

Hydrogen Sulfide Analysis

The sample was analyzed for hydrogen sulfide using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.

ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
AIHA-LAP, LLC	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
PJLA (DoD ELAP)	http://www.pjlabs.com/search-accredited-labs	65818 (Testing)
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2014025
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	977273
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-003
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-15-6
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272015-5
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

Intra-Network Chain of Custody

1317 South 13th Avenue • Kelso, WA 98626 • 1-360-577-7222 • FAX 1-360-636-1068

ALS Contact: Chris Leaf

Project Name: City of Longview Rocky Pt. Test Well OB-3
Project Number:
Project Manager: Brad Phelps
Company: CH2M Hill
QAP: LAB QAP

Lab Code	Client Sample ID	# of Cont.	Matrix	Sample Date	Sample Time	Date Received	Send To	Sulfur Sulfur Liq
K1606174-001	Rocky Pt OB-3	3	Water	6/8/16	1330	6/8/16	SIMIVALLEY	II

Test Comments

Sulfur - Sulfur Liq	K1606174-001	H2S only. Must run DUP on this sample.

Folder Comments:
Must run QC on this sample.
1631E LL Hg required only.

Special Instructions/Comments
Please provide the electronic (PDF and EDD) report to the following e-mail address: ALKLS.Data@alsglobal.com.

CL 6/8/16

pH Checked _____

Turnaround Requirements
X **RUSH** (Surcharges Apply)
PLEASE CIRCLE WORK DAYS
1 2 3 4 5
___ **STANDARD**
Requested FAX Date: _____
Requested Report Date: 06/15/16

Report Requirements
___ I. Results Only
✓ II. Results + QC Summaries
___ III. Results + QC and Calibration Summaries
___ IV. Data Validation Report with Raw Data
PQL/MDL/J N
EDD Y

Invoice Information
PO# 51K1606174
Bill to

Relinquished By: Kyla Smith 6/9/16 1025
Received By: [illegible] 6/10/16 0930 1°gel blank
Airbill Number:

ALS Environmental
Sample Acceptance Check Form

Client: CH2M Hill Work order: K1606174
Project: City of Longview Rocky Pt. Test Well OB-3
Sample(s) received on: 6/10/16 Date opened: 6/10/16 by: KKELPE

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Did **sample containers** arrive in good condition?	☒	☐	☐
3	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
4	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
5	Was **sample volume** received adequate for analysis?	☒	☐	☐
6	Are samples within specified holding times?	☒	☐	☐
7	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☒	☐	☐
	Cooler Temperature: ° C Blank Temperature: 1° C **Gel Packs**			
8	Were **custody seals** on outside of cooler/Box/Container?	☒	☐	☐
	Location of seal(s)? SEALING COOLER Sealing Lid?	☒	☐	☐
	Were signature and date included?	☒	☐	☐
	Were seals intact?	☒	☐	☐
9	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☒	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☒	☐	☐
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☒	☐	☐
10	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
11	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
K1606174-001.19	40mL VOA NP		7	1	A	MC 6/13/2016
K1606174-001.20	40mL VOA NP		7	1	A	MC 6/13/2016
K1606174-001.21	40mL VOA NP				A	

Explain any discrepancies: (include lab sample ID numbers):
The sample was received at ALS-Kelso on 6/8/16.

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **CH2M Hill**
Client Project ID: **City of Longview Rocky Pt. Test Well OB-3** ALS Project ID: K1606174

Hydrogen Sulfide

Test Code: GC/SCD Reduced Sulfur Analysis
Instrument ID: Agilent 6890A/GC13/SCD Date(s) Collected: 6/8/16
Analyst: Mike Conejo Date Received: 6/8/16
Sample Type: Water Date Analyzed: 6/13/16
Test Notes:

Client Sample ID	ALS Sample ID	Liquid Amount: Amount ml(s)	Purge Volume Liter(s)	Injection Volume ml(s)	**Result µg/L**	MRL µg/L	Data Qualifier
Rocky Pt OB-3	K1606174-001	10.0	0.30	1.0	ND	0.84	
Method Blank	P160613-MB	10.0	0.30	1.0	ND	0.84	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE / DUPLICATE LABORATORY CONTROL SAMPLE SUMMARY

Client: **CH2M Hill**
Client Sample ID: **Duplicate Lab Control Sample**
Client Project ID: **City of Longview Rocky Pt. Test Well OB-3**

ALS Project ID: K1606174
ALS Sample ID: P160613-DLCS

Test Code: GC/SCD Reduced Sulfur Analysis
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: Water
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 6/13/16
Liquid Amount: 10.0 ml(s)
Purge Volume: 0.30 Liter(s)
Injection Volume: 0.20 ml(s)

CAS #	Compound	Spike Amount LCS / DLCS ug/L	Result LCS ug/L	Result DLCS ug/L	% Recovery LCS	% Recovery DLCS	ALS Acceptance Limits	RPD	RPD Limit	Data Qualifier
7783-06-4	Hydrogen Sulfide	418	449	465	**107**	**111**	67-142	4	10	

ALS ENVIRONMENTAL

LABORATORY DUPLICATE SUMMARY RESULTS

Client: **CH2M Hill**
Client Sample ID: **Rocky Pt OB-3**
Client Project ID: **City of Longview Rocky Pt. Test Well OB-3**

ALS Project ID: K1606174
ALS Sample ID: K1606174-001DUP

Test Code: GC/SCD Reduced Sulfur Analysis
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: Water
Test Notes:

Date Collected: 6/8/16
Date Received: 6/8/16
Date Analyzed: 6/13/16
Liquid Amount: 1.0 ml(s)
Purge Volume: 0.30 Liter(s)
Injection Volume(s): 1.0 ml(s)

CAS #	Compound	Sample Result µg/L	Duplicate Sample Result µg/L	Average	% RPD	RPD Limit	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	ND	-	-	10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.