U.S. Fish and Wildlife Service

Evaluation of Portland Harbor Superfund Area Restoration: Larval Pacific Lamprey

2014 Annual Report

Jeffrey C. Jolley, Gregory S. Silver, and Timothy A. Whitesel

U.S. Fish and Wildlife Service
Columbia River Fisheries Program Office
Vancouver, WA 98683

On the cover: *Deepwater electrofisher/dredge sampling at Alder Point Restoration Site at head of the Multnomah Channel of the Willamette River. Photo taken in September 2014 by Jeff Jolley.*

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Abstract – Pacific lamprey *Entosphenus tridentatus* are declining in the Columbia River Basin. Numerous conservation efforts, including habitat restoration, are now being implemented. Larval lamprey use of restored habitats is understudied. To understand their effectiveness, actions to restore habitats associated with the Portland Harbor Superfund area remediation (focused on juvenile Chinook salmon *Oncorhynchus tshawytscha*) necessitate evaluation of Pacific lamprey before and after project implementations. We used a unique deepwater electrofisher to explore occupancy, detection, and habitat use of larval Pacific lamprey and *Lampetra* spp. at the Alder Point restoration site and Ross Island reference site in the Willamette River. We used a generalized randomized tessellation stratified (GRTS) approach to select sampling quadrats in a random, spatially-balanced order. Lamprey larvae occupied the shoreline areas of the Alder Point restoration site and the Ross Island reference site. Reach-specific detection probabilities ranged from 0.07 to 0.19.

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Introduction

Pacific lamprey *Entosphenus tridentatus* in the Columbia River Basin (CRB) and other areas have experienced a great decline in abundance (Close et al. 2002) and have been given protected status within Oregon (Kostow 2002). Lamprey are culturally important to Native American tribes, are ecologically important within the food web, and are an indicator species whose decline provides further insight into the impact of human actions on ecological function (Close et al. 2002). Much information is lacking on the basic biology, ecology, and population dynamics that is required for effective conservation and management.

Pacific lampreys have a complex life history that includes a multiple year larval (ammocoete), migratory juvenile, and adult marine phase (Scott and Crossman 1973). Larvae and juveniles are strongly associated with stream and river sediments. Larvae live burrowed in stream and river sediments for multiple years after hatching, where they filter feed detritus and organic material (Sutton and Bowen 1994). Larvae metamorphose into juveniles from July to December (McGree et al. 2008) and major migrations are made downstream to the Pacific Ocean in the spring and fall (Beamish and Levings 1991). The sympatric western brook lamprey *Lampetra richardsoni* does not have a major migratory or marine life stage although adults may locally migrate upstream before spawning (Renaud 1997). For both species, the majority of the information on habitat preference of larvae comes from CRB tributary systems (Moser and Close 2003; Torgersen and Close 2004; Stone and Barndt 2005; Stone 2006) and coastal systems (Farlinger and Beamish 1984; Russell et al. 1987; Gunckel et al. 2009).

Larval lamprey are known to occur in sediments of low-gradient streams ($<5^{th}$ order [1:100 scale]; Torgersen and Close 2004) but their use of larger river habitats in relatively deeper areas is not well understood. Downstream movement of larvae, whether passive or active, is observed year-round (Nursall and Buchwald 1972; Gadomski and Barfoot 1998; White and Harvey 2003). Anecdotal observations exist regarding larval lamprey occurrence in large river habitats mainly at hydropower facilities (Moursund et al. 2003; CRITFC 2008), impinged on downstream screens, in juvenile bypass facilities, or through observation during dewatering events. These occurrences are thought to be associated with downstream migration and specific collections of supposedly migrating ammocoetes have been made in large river habitats (Beamish and Youson 1987; Beamish and Levings 1991). Sea lamprey *Petromyzon marinus* ammocoetes have been documented in deepwater habitats in tributaries of the Great Lakes, in proximity to river mouths (Hansen and Hayne 1962; Wagner and Stauffer 1962; Lee and Weise 1989; Bergstedt and Genovese 1994; Fodale et al. 2003), and in the large, connecting St. Marys River (Young et al. 1996). References to other species occurring in deepwater or lacustrine habitats are scarce (American brook lamprey *Lampetra appendix*; Hansen and Hayne 1962).

In 2000, the U.S. Environmental Protection Agency declared the Portland Harbor area of the Willamette River as a Superfund site. The Superfund study area (Figure 1) extends from river kilometer 3.2 to river kilometer 18.9 and has a broader focus area (Figure 1) extending from the Columbia River to Willamette Falls. To mitigate for environmental damage that has been done, these areas are subject to various restoration activities as well as assessments of the effectiveness of any restoration. Presently, restoration activities are focused on restoration of juvenile Chinook salmon *Oncorhynchus tshawytscha* habitat. However, these activities provide an opportunity to understand how juvenile lampreys are affected by habitat restoration. It is unclear whether any of the proposed aquatic restoration activities, which are primarily focused on salmonids, will improve conditions for Pacific lamprey. As such, there is interest in monitoring the effectiveness of the restoration, in part, relative to larval Pacific lamprey.

A lamprey monitoring plan (LMP) was developed based on a set of monitoring goals and

objectives that were identified by the Trustee Council and lamprey experts over two workshops held in the fall of 2011. This LMP was developed to simultaneously monitor the impact of restoration actions on juvenile lamprey populations and health in Portland Harbor, and gather information about juvenile lamprey life history, biology, and habitat requirements that may be used by the Trustee Council in the future to design and evaluate lamprey restoration projects. Since lampreys are very different from other biota, the overlap between the LMP and the general restoration monitoring and stewardship plan is not extensive. The LMP differs from the general restoration monitoring and stewardship plan, in part, because the lamprey monitoring is proposed to continue for a period of 20 years. In most cases, the metrics proposed for collection as part of the lamprey monitoring effort need to be co-located with lamprey sampling. To maximize efficiencies, the Trustee Council will use the data collected as part of the lamprey monitoring plan for the general restoration monitoring and stewardship effort as much as possible. The experts recommended monitoring lamprey for 20 years, with the goal of capturing data for 1 to 2 complete generations. Pre-implementation monitoring will be conducted to the extent practical at each restoration site. Lampreys are expected to colonize habitats rapidly. Therefore, monitoring will be conducted on a yearly basis for the first five years, and every five years thereafter.

We began to investigate and document patterns of larval lamprey occupancy and habitat use in or near restoration areas. Obtaining the information on whether lampreys use the areas in and adjacent to restoration sites is critical to understanding the effectiveness of the restoration. At present, little specific information is available on whether and how larvae will use restored areas, how quickly and which life stage colonizes these areas, and how long they use these areas. In general, the proposed work is guided by the LMP. However, due to site specific conditions and constraints, the specific metrics and timing of monitoring proposed for any given site may differ slightly from those outlined in the LMP. Our specific objectives for this phase of Superfund restoration follows:

1. Determine whether lampreys occupy restoration and reference sites.
2. Determine the types of habitat available and in which types lamprey are detected.
3. Characterize species and life history stage that occupy a site.
4. Evaluate the health of lamprey detected at each site.

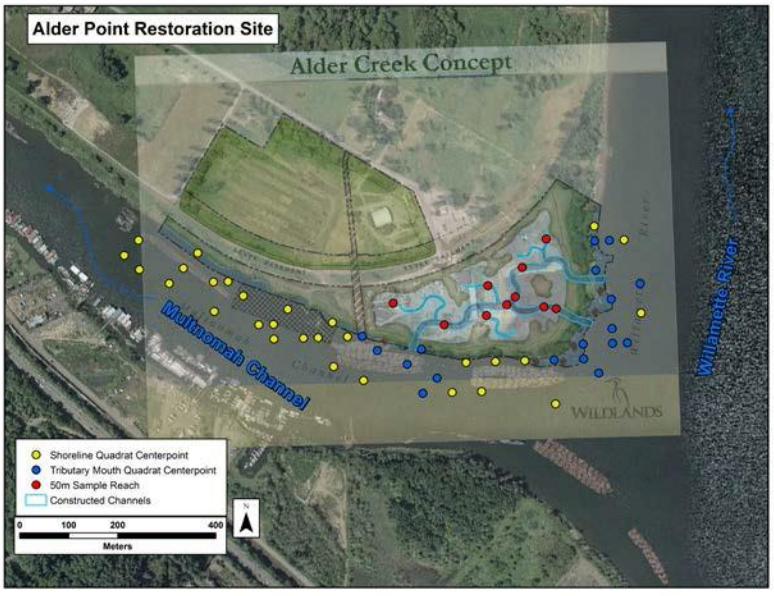

Figure 1. Proposed sample design for the restoration site, shoreline (100 m band) sample quadrats (yellow points), confluence sample quadrats (blue points) and slough sample reaches (red points).

Methods

The Alder Point restoration site is located near the mouth of the Multnomah Channel distributary of the Willamette River (Rkm 5; Figure 1). Pre-restoration monitoring consisted of sampling shoreline sites. Slough and stream habitat did not exist pre-restoration and therefore aquatic sampling in this non-existent habitat did not occur. The Ross Island

reference site is located in the Willamette River (Rkm 25; Figure 2) and shoreline sites were at the upstream tip of the island.

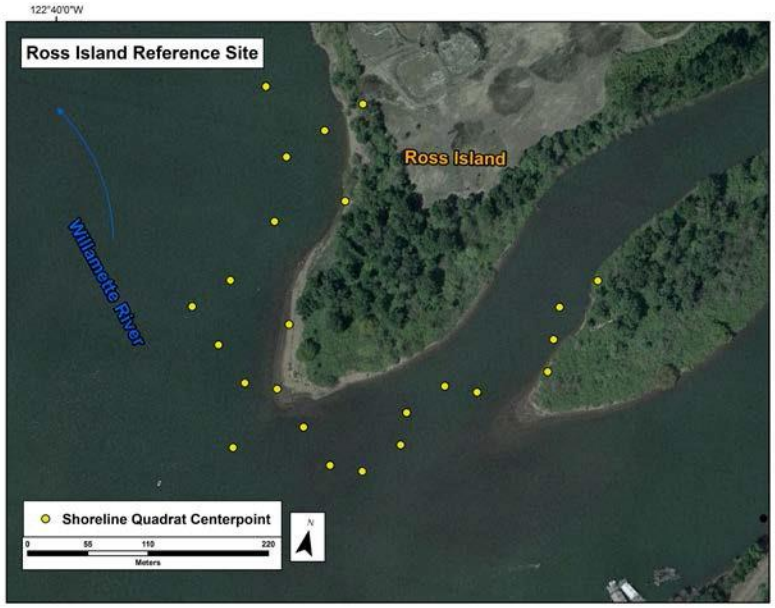

Figure 2. Proposed sample design for the reference site on the south point of Ross Island, shoreline (100 m band) sample quadrats (yellow points).

We estimated occupancy of larval lamprey in the restoration and reference sites by adapting an approach that was applied to studies of larval lamprey in the Willamette and Columbia rivers (Jolley et al. 2012, 2013a; 2013b). The approach has several requirements: 1) a site- and gear-specific detection probability (assumed or estimated); 2) the probability of presence at a predetermined acceptably low level (given no detection); and 3) random identification of spatially-balanced sample sites that allow estimation of presence and refinement of detection probabilities. A reach-specific probability of detection, d_{reach}, was calculated as the proportion of quadrats (i.e., 30 m x 30 m sampling quadrat) occupied (i.e., larvae captured) by larval lamprey in the Lower Willamette River, an area known to be occupied. The posterior probability of reach occupancy, given a larval lamprey was not detected, was estimated as:

$$(1)\ \mathrm{P}(F|C_o) = \frac{\mathrm{P}(C_o|F)\cdot\mathrm{P}(F)}{\mathrm{P}(C_o|F)\cdot\mathrm{P}(F) + \mathrm{P}(C_o|{\sim}F)\cdot\mathrm{P}({\sim}F)},$$

where P(F) is the prior probability of larval lamprey presence. Although we knew the Lower Willamette River was occupied with larval lamprey, P(F) of 0.5 (uninformed) was used for future study design (i.e., P[$F|C_o$]) in areas where larval lamprey presence is unknown. P(~F), or 1 – P(F), is the prior probability of species absence, and P($C_o|F$), or 1 – d, is the probability of not detecting a species when it occurs (C_0 = no detection; Peterson and Dunham 2003). Patterns of occupancy by site were compared using the Chi-square test for differences in probabilities (Conover 1999).

A sampling event consisted of using a deepwater electrofisher (Bergstedt and Genovese 1994) in a 30 m x 30 m quadrat. This quadrat size was selected based on our previous experience surveying for lamprey in the Willamette River (Jolley et al. 2012). A description of the complete configuration of the deepwater electrofisher is given by Bergstedt and Genovese

(1994). The bell of the deepwater electrofisher (0.61 cm^2) was lowered from a boat to the river bottom. The electrofisher delivered three pulses DC per second at 10% duty cycle, with a 2:2 pulse train (i.e., two pulses on, two pulses off). Output voltage was adjusted at each quadrat to maintain a peak voltage gradient between 0.6 and 0.8 V/cm across the electrodes. Suction was produced by directing the flow from a pump through a hydraulic eductor, prohibiting larvae from passing through the pump. Suction began approximately 5 seconds prior to shocking to purge air from the suction hose. Shocking was conducted for 60 seconds, and the suction pump remained on for an additional 60 seconds after shocking to ensure collected larvae passed through the hose and emptied into a collection basket (27 x 62 x 25 cm; 2 mm wire mesh). The sampling techniques are described in detail by Bergstedt and Genovese (1994) and were similar to those used in the Great Lakes region (Fodale et al. 2003) and the Willamette River (Jolley et al. 2012).

Results

We sampled 29 of 30 visited quadrats at the Alder Point Restoration Site and sampled 25 of 28 visited quadrats at the Ross Island Reference Site (Table 1). The feasibility of being able to sample a quadrat in each stratum was 89% to 97%. Some quadrats were not sampled because they were not feasible (dewatered conditions). Larval lampreys were detected at both the restoration site and the reference site (Table 1); no other life stages were detected. Only lamprey larger than 60 mm TL can be confidently identified and tissue samples from those less than 60 mm TL were archived for potential genetic analysis to confirm identification. Three unidentified lamprey larvae were detected at Alder Point (TL: 14, 17, and 30 mm). At Ross Island, two larger larval *Lampetra* spp. were detected (TL: 71, 83 mm) and four unidentified lamprey larvae were detected (TL: 24, 32, 34, 45 mm; Figure 3). Larvae less than 40 mm TL are likely age-0 or age 1 while larger fish are likely older, although definitive estimates of age based on size are difficult (Meeuwig and Bayer 2005). Confirmed Pacific lampreys were not detected at either site. Detection probability was highest at Ross Island (d=0.19) compared to Alder Point (d=0.07). Detection probabilities did not differ among reaches (Fisher's Exact Test multivariate permutation technique, Brown and Fears 1981, P>0.05).

Table 1. Total number of quadrats delineated, visited, sampled, and occupied and larval species present in 2014. Unidentified lampreys are noted as "Unid".

		Quadrats								
Site	Date	Total	Visited	Sampled	Occupied	*d*	Pacific lamprey	*Lampetra* spp.	Unid	Total
Alder Point	9/24	117	30	29	2	0.07	0	0	3	3
Ross Island	9/25	95	28	26	5	0.19	0	2	4	6

At Alder Point, depths sampled ranged from 0.3 to 16.8 m and larvae were detected in depths from 0.9 to 3.0 m. At Ross Island, depths sampled ranged from 0.3 to 9.8 m and larvae were detected in depths from 1.2 to 7.6 m. The total number of larvae occupying any individual quadrat ranged from 0 to 2. Sediment descriptions including grain size, grain type, and organic content are summarized in Appendix 1. Mean water temperature was 19.3°C at Alder Point and

18.5°C at Ross Island. Mean conductivity was 89.2 µS/cm at Alder Point and 82.2 µS /cm at Ross Island. Shoreline areas were in relatively deep water and visual assessments of Type I, II, and III habitat could not be conducted.

All sampled fish were in good condition as no external abnormalities were observed.

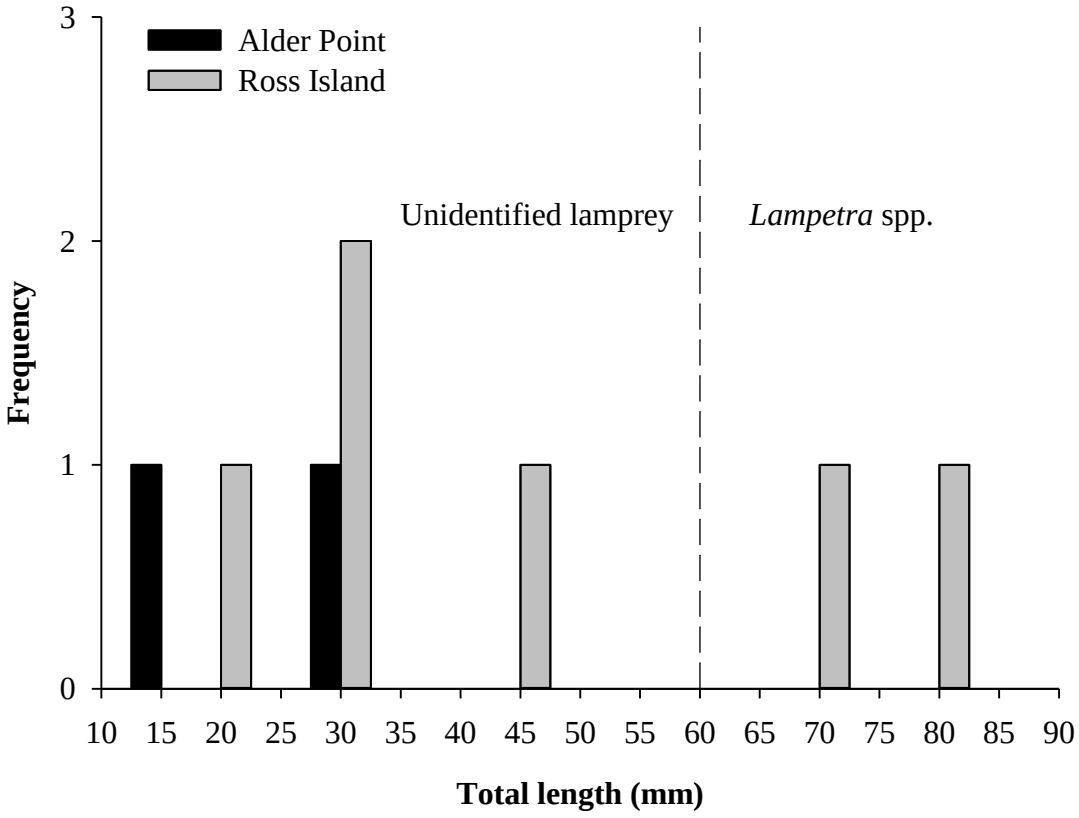

Figure 3. Length-frequency histogram of larval lamprey detected at Alder Point and Ross Island. Lamprey smaller than 60 mm were unidentified species and lamprey 60 mm or larger were Lampetra spp.

Conclusions

Larval lampreys occupied shoreline areas of both the restoration and reference sites. These larvae likely came from spawning areas located upstream, dispersed into the Willamette River, and are using these mainstem habitats for rearing. The presence of larvae in the vicinity of the Alder Point restoration site suggests a source of fish is available to colonize newly created habitats. It is unclear if Pacific lampreys occupy either site although the small, unidentified fish could be Pacific lamprey. Previous work on larval lamprey in the lower Willamette River (Jolley et al. 2012) reported that Pacific lamprey accounted for 22-42% of the larvae while *Lampetra* spp. accounted for 50-59% of the larvae. Data contained in this report will serve as the baseline

for before and after monitoring of the Alder Point restoration site paired with the Ross Island Reference site.

Acknowledgements

Funding for this project was provided by Portland Harbor Holdings II, LLC. We are grateful to all those who have been involved in developing this project. Unfortunately, it is impractical to acknowledge the large number of people and organizations by name. However, we would like to specifically thank C. Uh for field assistance; R. Haverkate, C. Wang and H. Schaller for administrative support, J. Harris for analytical guidance; J. Kassakian for project oversight and integration as well as; H. Holmes and J. Buck for assistance with sediment sampling.

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Appendix 1. Sediment descriptions from Alder Point and Ross Island.

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May 2015

ALS Environmental
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F: 1-360-636-1068
www.alsglobal.com

January 13, 2015

Analytical Report for Service Request No: K1413105

Rachel DelVecchio
Industrial Economics, Inc.
2067 Massachusetts Ave.
Cambridge, MA 02140

RE: Portland Harbor 2014/Alder

Dear Rachel:

Enclosed are the results of the sample(s) submitted to our laboratory on November 3, 2014. For your reference, these analyses have been assigned our service request number **K1413105**.

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 3364. You may also contact me via email at howard.holmes@alsglobal.com.

Respectfully submitted,

ALS Group USA Corp. dba ALS Environmental

Howard Holmes
Project Manager

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	-
Idaho DHW	http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx	-
ISO 17025	http://www.pjlabs.com/	L14-50
Louisiana DEQ	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	03016
Maine DHS	Not available	WA01276
Michigan DEQ	http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html	9949
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:	Industrial Economics, Inc.	**Service Request No.:**	K1413105
Project:	Portland Harbor 2014/ Alder	**Date Received:**	11/03/14
Sample Matrix:	Sediment		

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 IV validation deliverables including summary forms and all of the associated raw data for each of the analyses. When appropriate to the method, method blank results have been reported with each analytical test.

Sample Receipt

Twenty-eight sediment samples were received for analysis at ALS Environmental on 11/03/14. The samples were received in good condition and consistent with the accompanying chain of custody form, except where noted on the cooler receipt and preservation form included in this report. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

General Chemistry Parameters

Carbon Organic (TOC) by Method 9060:
Samples were analyzed past holding time. The analysis was performed as soon as possible after receipt by the laboratory. The data was flagged to indicate the holding time violation.

Particle Size by PSEP:
Batch QC-Percent of total weight recovered was outside ALS acceptance limits due to possible heterogeneous character of the sample. No Trip analysis for Batch QC due to limited sample.

No other anomalies associated with the analysis of these samples were observed.

Approved by____ Howard B. Holmes

Chain of Custody

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Rachel DelVecchio
Industrial Economics, Inc
Portland Harbor 2014

K1413105

Tests Requested
PSEP Particle Size
9060 TOC
Total Solids
Archive

Alder	8 oz	4 oz	PS	TOC	TS	Archive	Date
254	6oz	NA	Y	Y	Y	N	9/24
455	1	NA	N	Y	Y	N	9/24
579	4	NA	Y	Y	Y	N	9/24
958	6	NA	Y	Y	Y	N	9/24
1982	4	NA	Y	Y	Y	N	9/24
2046	4	NA	Y	Y	Y	N	9/24
2302	6	NA	Y	Y	Y	N	9/24
2563	4	NA	Y	Y	Y	N	9/24
2695	4	NA	Y	Y	Y	N	9/24
3015	6	NA	Y	Y	Y	N	9/24
3207	0*	NA	N	N	N	N	9/24
3271	2	NA	N	Y	Y	N	9/24
3395	6	NA	Y	Y	Y	N	9/24
3463	4	NA	N	N	N	N	9/24
3774	1	NA	N	Y	Y	N	9/24
3838	2	NA	N	Y	Y	N	9/24
4094	4	NA	Y	Y	Y	N	9/24
4611	6	NA	Y	Y	Y	N	9/24
5054	6	NA	Y	Y	Y	N	9/24
5118	3	NA	N	Y	Y	N	9/24
6142	1	NA	N	Y	Y	N	9/24
5635	6	NA	Y	Y	Y	N	9/24
5719	6	NA	Y	Y	Y	N	9/24
6078	2	NA	N	Y	Y	N	9/24
6279	Rocks	NA	N	N	N	N	9/24
6743	6	NA	Y	Y	Y	N	9/24
7166	2	NA	N	Y	Y	N	9/24
7367	6	NA	Y	Y	Y	N	9/24

* Jar contained a rusty metal bolt

Recd 11/3/2014

PC HH

Cooler Receipt and Preservation Form

Client / Project: Dept of Fish and Wildlife Service Request *K14* 13105

Received: 11.3.14 Opened: 11.3.14 By: bw Unloaded: 11.3.14 By: bw

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
1.0	0.9	3.7	3.6	-0.1	339			
0.4	0.5	3.1	3.2	+0.1	340			

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
ALD 3838				X						

Notes, Discrepancies, & Resolutions: ALD 3838 CONTAINED IN A 4oz JAR.

General Chemistry

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	09/24/14
Sample Matrix:	Sediment	**Date Received:**	11/3/14
Analysis Method:	160.3 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	As Received

Solids, Total

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
254	K1413105-001	**76.0**	-	1	11/21/14 12:24	
455	K1413105-002	**74.5**	-	1	11/21/14 12:24	
579	K1413105-003	**64.0**	-	1	11/21/14 12:24	
958	K1413105-004	**52.5**	-	1	11/21/14 12:24	
1982	K1413105-005	**51.7**	-	1	11/21/14 12:24	
2046	K1413105-006	**71.3**	-	1	11/21/14 12:24	
2302	K1413105-007	**73.3**	-	1	11/21/14 12:24	
2563	K1413105-008	**68.7**	-	1	11/21/14 12:24	
2695	K1413105-009	**72.2**	-	1	11/21/14 12:24	
3015	K1413105-010	**70.5**	-	1	11/21/14 12:24	
3271	K1413105-012	**62.0**	-	1	11/21/14 12:24	
3395	K1413105-013	**59.6**	-	1	11/21/14 12:24	
3774	K1413105-015	**86.0**	-	1	11/21/14 12:24	
3838	K1413105-016	**58.9**	-	1	11/21/14 12:24	
4094	K1413105-017	**51.4**	-	1	11/21/14 12:24	
4611	K1413105-018	**70.9**	-	1	11/21/14 12:24	
5054	K1413105-019	**67.1**	-	1	11/21/14 12:24	
5118	K1413105-020	**52.0**	-	1	11/21/14 12:24	
6142	K1413105-021	**72.6**	-	1	11/21/14 12:24	
5635	K1413105-022	**76.5**	-	1	11/21/14 12:24	
5719	K1413105-023	**57.2**	-	1	11/21/14 15:21	
6078	K1413105-024	**60.1**	-	1	11/21/14 15:21	
6743	K1413105-026	**74.2**	-	1	11/21/14 15:21	
7166	K1413105-027	**46.8**	-	1	11/21/14 15:21	
7367	K1413105-028	**73.9**	-	1	11/21/14 15:21	

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Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	09/24/14
Sample Matrix:	Sediment	**Date Received:**	11/3/14
Analysis Method:	9060	**Units:**	Percent
Prep Method:	Method	**Basis:**	Dry, per Method

Carbon Organic (TOC)

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
254	K1413105-001	**0.38**	0.10	1	12/18/14 11:16	12/15/14	*
455	K1413105-002	**0.18**	0.10	1	12/18/14 11:16	12/15/14	*
579	K1413105-003	**1.30**	0.10	1	12/18/14 11:16	12/15/14	*
958	K1413105-004	**3.63**	0.10	1	12/18/14 11:16	12/15/14	*
1982	K1413105-005	**2.54**	0.10	1	12/18/14 11:16	12/15/14	*
2046	K1413105-006	**0.40**	0.10	1	12/18/14 11:16	12/15/14	*
2302	K1413105-007	**0.24**	0.10	1	12/18/14 11:16	12/15/14	*
2563	K1413105-008	**0.47**	0.10	1	12/18/14 11:16	12/15/14	*
2695	K1413105-009	**0.36**	0.10	1	12/18/14 11:16	12/15/14	*
3015	K1413105-010	**0.48**	0.10	1	12/18/14 11:16	12/15/14	*
3271	K1413105-012	**2.94**	0.10	1	12/18/14 11:16	12/15/14	*
3395	K1413105-013	**1.92**	0.10	1	12/18/14 11:16	12/15/14	*
3774	K1413105-015	**0.15**	0.10	1	12/18/14 11:16	12/15/14	*
3838	K1413105-016	**4.08**	0.10	1	12/18/14 11:16	12/15/14	*
4094	K1413105-017	**4.39**	0.10	1	12/18/14 11:16	12/15/14	*
4611	K1413105-018	**0.18**	0.10	1	12/19/14 10:06	12/18/14	*
5054	K1413105-019	**0.73**	0.10	1	12/19/14 10:06	12/18/14	*
5118	K1413105-020	**2.65**	0.10	1	12/19/14 10:06	12/18/14	*
6142	K1413105-021	**0.20**	0.10	1	12/19/14 10:06	12/18/14	*
5635	K1413105-022	**0.12**	0.10	1	12/19/14 10:06	12/18/14	*
5719	K1413105-023	**1.44**	0.10	1	12/19/14 10:06	12/18/14	*
6078	K1413105-024	**3.61**	0.10	1	12/19/14 10:06	12/18/14	*
6743	K1413105-026	**0.19**	0.10	1	12/19/14 10:06	12/18/14	*
7166	K1413105-027	**14.2**	0.10	1	12/19/14 10:06	12/18/14	*
7367	K1413105-028	**0.13**	0.10	1	12/19/14 10:06	12/18/14	*
Method Blank	K1413105-MB1	ND U	0.10	1	12/18/14 11:16	12/15/14	
Method Blank	K1413105-MB2	ND U	0.10	1	12/19/14 10:06	12/18/14	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project	Portland Harbor 2014/Alder	**Date Collected:**	09/24/14
Sample Matrix:	Sediment	**Date Received:**	11/03/14
Analysis Method:	9060	**Units:**	Percent
Prep Method:	Method	**Basis:**	Dry, per Method

Replicate Sample Summary
Carbon Organic (TOC)

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
254	K1413105-001DUP	0.10	0.38	0.35	0.365	8	20	12/18/14
4611	K1413105-018DUP	0.10	0.18	0.18	0.180	<1	20	12/19/14

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:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	09/24/14
Sample Matrix:	Sediment	**Date Received:**	11/03/14
		Date Analyzed:	12/18/14
		Date Extracted:	12/15/14

Duplicate Matrix Spike Summary
Carbon Organic (TOC)

Sample Name:	254	**Units:**	Percent
Lab Code:	K1413105-001	**Basis:**	Dry, per Method
Analysis Method:	9060		
Prep Method:	Method		

		Matrix Spike			Duplicate Matrix Spike					
		K1413105-001MS			K1413105-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Carbon Organic (TOC)	0.38	2.85	2.37	104	2.80	2.37	102	70-122	2	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.

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	09/24/14
Sample Matrix:	Sediment	**Date Received:**	11/03/14
		Date Analyzed:	12/19/14
		Date Extracted:	12/18/14

Duplicate Matrix Spike Summary
Carbon Organic (TOC)

Sample Name:	4611	**Units:**	Percent
Lab Code:	K1413105-018	**Basis:**	Dry, per Method
Analysis Method:	9060		
Prep Method:	Method		

		Matrix Spike K1413105-018MS			**Duplicate Matrix Spike** K1413105-018DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Carbon Organic (TOC)	0.18	2.77	2.40	108	2.56	2.39	100	70-122	8	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.

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Analyzed:**	12/18/14
Sample Matrix:	Sediment	**Date Extracted:**	12/15/14

Lab Control Sample Summary
Carbon Organic (TOC)

Analysis Method:	9060	**Units:**	Percent
Prep Method:	Method	**Basis:**	Dry, per Method
		Analysis Lot:	426762

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1413105-LCS1	0.280	0.28	102	72-122

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Analyzed:**	12/19/14
Sample Matrix:	Sediment	**Date Extracted:**	12/18/14

Lab Control Sample Summary
Carbon Organic (TOC)

Analysis Method:	9060	**Units:**	Percent
Prep Method:	Method	**Basis:**	Dry, per Method
		Analysis Lot:	426764

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1413105-LCS2	0.240	0.28	87	72-122

Client: Industrial Economics, Inc. **Service Request:** K1413105
Project: Portland Harbor 2014/Alder

Continuing Calibration Verification (CCV) Summary

Carbon Organic (TOC)

Analysis Method: 9060 **Units:** Percent

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	426762	KQ1416755-01	12/18/14 11:16	12.0	12.7	106	85-115
CCV2	426762	KQ1416755-02	12/18/14 11:16	12.0	12.4	103	85-115
CCV3	426762	KQ1416755-03	12/18/14 11:16	12.0	12.3	103	85-115
CCV4	426764	KQ1416757-01	12/19/14 10:06	12.0	12.9	107	85-115
CCV5	426764	KQ1416757-02	12/19/14 10:06	12.0	13.0	109	85-115
CCV6	426764	KQ1416757-03	12/19/14 10:06	12.0	12.8	106	85-115

Client: Industrial Economics, Inc. **Service Request:**K1413105
Project: Portland Harbor 2014/Alder

Continuing Calibration Blank (CCB) Summary
Carbon Organic (TOC)

Analysis Method: 9060 **Units:**Percent

	Analysis Lot	Lab Code	Date Analyzed	MRL	Result	Q
CCB1	426762	KQ1416755-04	12/18/14 11:16	0.10	ND	U
CCB2	426762	KQ1416755-05	12/18/14 11:16	0.10	ND	U
CCB3	426762	KQ1416755-06	12/18/14 11:16	0.10	ND	U
CCB4	426764	KQ1416757-04	12/19/14 10:06	0.10	ND	U
CCB5	426764	KQ1416757-05	12/19/14 10:06	0.10	ND	U
CCB6	426764	KQ1416757-06	12/19/14 10:06	0.10	ND	U

ALS Group USA, Corp.
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Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 254
Lab Code: K1413105-001

Sand Fraction:	Dry Weight (Grams)	75.5810
Sand Fraction:	Weight Recovered (Grams)	75.1870
Sand Fraction:	Percent Recovery	99.48

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	4.6810	6.12
Very Coarse Sand	-1 to 0 Ø	6.8433	8.94
Coarse Sand	0 to 1 Ø	24.5842	32.13
Medium Sand	1 to 2 Ø	33.1548	43.34
Fine Sand	2 to 3 Ø	4.3851	5.73
Very Fine Sand	3 to 4 Ø	1.4134	1.85
62.5 µm	4 to 5 Ø	0.4550	0.59
31.3 µm	5 to 6 Ø	0.5100	0.67
15.6 µm	6 to 7 Ø	0.0050	0.01
7.8 µm	7 to 8 Ø	0.1650	0.22
3.9 µm	8 to 9 Ø	0.2500	0.33
1.95 µm	9 to 10 Ø	-0.0250	0.00
0.98 µm	> 10 Ø	0.1650	0.22
		76.5868	100.14

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 579
Lab Code: K1413105-003

Sand Fraction:	Dry Weight (Grams)	35.4671
Sand Fraction:	Weight Recovered (Grams)	35.2773
Sand Fraction:	Percent Recovery	99.46

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Very Coarse Sand	-1 to 0 Ø	0.0234	0.05
Coarse Sand	0 to 1 Ø	0.0938	0.21
Medium Sand	1 to 2 Ø	6.3644	14.59
Fine Sand	2 to 3 Ø	17.5704	40.27
Very Fine Sand	3 to 4 Ø	9.6327	22.08
62.5 µm	4 to 5 Ø	4.0550	9.29
31.3 µm	5 to 6 Ø	2.1850	5.01
15.6 µm	6 to 7 Ø	1.9700	4.52
7.8 µm	7 to 8 Ø	1.0200	2.34
3.9 µm	8 to 9 Ø	0.7850	1.80
1.95 µm	9 to 10 Ø	0.6950	1.59
0.98 µm	> 10 Ø	0.7450	1.71
		45.1397	103.46

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 958
Lab Code: K1413105-004

Sand Fraction:	Dry Weight (Grams)	24.7356
Sand Fraction:	Weight Recovered (Grams)	24.6978
Sand Fraction:	Percent Recovery	99.85

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.4500	1.39
Very Coarse Sand	-1 to 0 Ø	0.1576	0.49
Coarse Sand	0 to 1 Ø	0.1391	0.43
Medium Sand	1 to 2 Ø	1.0093	3.11
Fine Sand	2 to 3 Ø	5.6392	17.40
Very Fine Sand	3 to 4 Ø	15.0840	46.55
62.5 µm	4 to 5 Ø	4.8600	15.00
31.3 µm	5 to 6 Ø	1.6800	5.18
15.6 µm	6 to 7 Ø	0.6650	2.05
7.8 µm	7 to 8 Ø	0.6200	1.91
3.9 µm	8 to 9 Ø	0.5200	1.60
1.95 µm	9 to 10 Ø	0.2400	0.74
0.98 µm	> 10 Ø	0.3400	1.05
		31.4042	96.92

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	1/5/2015

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 1982
Lab Code: K1413105-005

Sand Fraction:	Dry Weight (Grams)	17.0945
Sand Fraction:	Weight Recovered (Grams)	16.8177
Sand Fraction:	Percent Recovery	98.38

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0072	0.03
Very Coarse Sand	-1 to 0 Ø	0.0060	0.03
Coarse Sand	0 to 1 Ø	0.0695	0.30
Medium Sand	1 to 2 Ø	2.5618	10.97
Fine Sand	2 to 3 Ø	3.6253	15.53
Very Fine Sand	3 to 4 Ø	7.8278	33.53
62.5 µm	4 to 5 Ø	4.0300	17.26
31.3 µm	5 to 6 Ø	1.6000	6.85
15.6 µm	6 to 7 Ø	1.0550	4.52
7.8 µm	7 to 8 Ø	0.7300	3.13
3.9 µm	8 to 9 Ø	0.6000	2.57
1.95 µm	9 to 10 Ø	0.4950	2.12
0.98 µm	> 10 Ø	0.5750	2.46
		23.1826	99.30

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 2046
Lab Code: K1413105-006

Sand Fraction:	Dry Weight (Grams)	67.0128
Sand Fraction:	Weight Recovered (Grams)	66.8366
Sand Fraction:	Percent Recovery	99.74

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.4781	0.67
Very Coarse Sand	-1 to 0 Ø	0.5095	0.71
Coarse Sand	0 to 1 Ø	16.2162	22.61
Medium Sand	1 to 2 Ø	43.1404	60.15
Fine Sand	2 to 3 Ø	5.6423	7.87
Very Fine Sand	3 to 4 Ø	0.7256	1.01
62.5 µm	4 to 5 Ø	-0.0450	0.00
31.3 µm	5 to 6 Ø	0.2350	0.33
15.6 µm	6 to 7 Ø	0.3450	0.48
7.8 µm	7 to 8 Ø	0.3750	0.52
3.9 µm	8 to 9 Ø	-0.0150	0.00
1.95 µm	9 to 10 Ø	-0.0300	0.00
0.98 µm	> 10 Ø	0.0850	0.12
		67.6621	94.47

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 2302
Lab Code: K1413105-007

Sand Fraction:	Dry Weight (Grams)	72.4746
Sand Fraction:	Weight Recovered (Grams)	72.4518
Sand Fraction:	Percent Recovery	99.97

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.9741	1.35
Very Coarse Sand	-1 to 0 Ø	1.9125	2.65
Coarse Sand	0 to 1 Ø	18.2824	25.33
Medium Sand	1 to 2 Ø	43.6502	60.48
Fine Sand	2 to 3 Ø	5.8292	8.08
Very Fine Sand	3 to 4 Ø	1.6394	2.27
62.5 µm	4 to 5 Ø	0.4100	0.57
31.3 µm	5 to 6 Ø	0.4050	0.56
15.6 µm	6 to 7 Ø	0.2800	0.39
7.8 µm	7 to 8 Ø	0.3300	0.46
3.9 µm	8 to 9 Ø	0.2750	0.38
1.95 µm	9 to 10 Ø	0.1250	0.17
0.98 µm	> 10 Ø	0.1000	0.14
		74.2128	102.82

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 2563
Lab Code: K1413105-008

Sand Fraction:	Dry Weight (Grams)	68.3103
Sand Fraction:	Weight Recovered (Grams)	68.4622
Sand Fraction:	Percent Recovery	100.22

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.1342	0.20
Very Coarse Sand	-1 to 0 Ø	0.1218	0.18
Coarse Sand	0 to 1 Ø	0.3973	0.58
Medium Sand	1 to 2 Ø	21.2996	30.95
Fine Sand	2 to 3 Ø	40.4328	58.75
Very Fine Sand	3 to 4 Ø	5.5851	8.12
62.5 µm	4 to 5 Ø	0.8700	1.26
31.3 µm	5 to 6 Ø	1.0350	1.50
15.6 µm	6 to 7 Ø	0.3900	0.57
7.8 µm	7 to 8 Ø	0.5900	0.86
3.9 µm	8 to 9 Ø	0.3400	0.49
1.95 µm	9 to 10 Ø	0.5100	0.74
0.98 µm	> 10 Ø	-0.0500	0.00
		71.6558	104.19

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 2695
Lab Code: K1413105-009

Sand Fraction:	Dry Weight (Grams)	66.2727
Sand Fraction:	Weight Recovered (Grams)	92.0988
Sand Fraction:	Percent Recovery	99.79

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	5.1857	7.80
Very Coarse Sand	-1 to 0 Ø	3.0321	4.56
Coarse Sand	0 to 1 Ø	14.2091	21.37
Medium Sand	1 to 2 Ø	33.3133	50.10
Fine Sand	2 to 3 Ø	8.7448	13.15
Very Fine Sand	3 to 4 Ø	1.5315	2.30
62.5 µm	4 to 5 Ø	0.2550	0.38
31.3 µm	5 to 6 Ø	0.1850	0.28
15.6 µm	6 to 7 Ø	0.5100	0.77
7.8 µm	7 to 8 Ø	-0.0350	0.00
3.9 µm	8 to 9 Ø	0.3100	0.47
1.95 µm	9 to 10 Ø	-0.0500	0.00
0.98 µm	> 10 Ø	0.1450	0.22
		67.3365	101.39

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 3015
Lab Code: K1413105-010

Sand Fraction:	Dry Weight (Grams)	69.5391
Sand Fraction:	Weight Recovered (Grams)	100.1737
Sand Fraction:	Percent Recovery	99.99

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.1414	0.20
Very Coarse Sand	-1 to 0 Ø	0.4129	0.58
Coarse Sand	0 to 1 Ø	5.3868	7.58
Medium Sand	1 to 2 Ø	31.5012	44.36
Fine Sand	2 to 3 Ø	22.9961	32.38
Very Fine Sand	3 to 4 Ø	8.2756	11.65
62.5 µm	4 to 5 Ø	1.4950	2.11
31.3 µm	5 to 6 Ø	0.8350	1.18
15.6 µm	6 to 7 Ø	0.8650	1.22
7.8 µm	7 to 8 Ø	0.4900	0.69
3.9 µm	8 to 9 Ø	0.1650	0.23
1.95 µm	9 to 10 Ø	0.3350	0.47
0.98 µm	> 10 Ø	0.2600	0.37
		73.1590	103.01

ALS Group USA, Corp.
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Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 3395
Lab Code: K1413105-013

Sand Fraction:	Dry Weight (Grams)	30.5222
Sand Fraction:	Weight Recovered (Grams)	30.7150
Sand Fraction:	Percent Recovery	100.63

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0965	0.26
Very Coarse Sand	-1 to 0 Ø	0.1103	0.30
Coarse Sand	0 to 1 Ø	0.2036	0.55
Medium Sand	1 to 2 Ø	4.7362	12.71
Fine Sand	2 to 3 Ø	10.5238	28.25
Very Fine Sand	3 to 4 Ø	12.8143	34.40
62.5 µm	4 to 5 Ø	4.2450	11.40
31.3 µm	5 to 6 Ø	1.2300	3.30
15.6 µm	6 to 7 Ø	0.8500	2.28
7.8 µm	7 to 8 Ø	0.6200	1.66
3.9 µm	8 to 9 Ø	0.6000	1.61
1.95 µm	9 to 10 Ø	0.4350	1.17
0.98 µm	> 10 Ø	0.3000	0.81
		36.7647	98.70

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 4094
Lab Code: K1413105-017

Sand Fraction:	Dry Weight (Grams)	20.1846
Sand Fraction:	Weight Recovered (Grams)	20.1980
Sand Fraction:	Percent Recovery	100.07

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.3648	1.30
Very Coarse Sand	-1 to 0 Ø	0.1776	0.64
Coarse Sand	0 to 1 Ø	0.1804	0.65
Medium Sand	1 to 2 Ø	0.4221	1.51
Fine Sand	2 to 3 Ø	3.5305	12.63
Very Fine Sand	3 to 4 Ø	12.2111	43.67
62.5 µm	4 to 5 Ø	5.3950	19.29
31.3 µm	5 to 6 Ø	2.0250	7.24
15.6 µm	6 to 7 Ø	0.8450	3.02
7.8 µm	7 to 8 Ø	0.4600	1.65
3.9 µm	8 to 9 Ø	0.4550	1.63
1.95 µm	9 to 10 Ø	0.2950	1.06
0.98 µm	> 10 Ø	0.1200	0.43
		26.4815	94.71

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 4611
Lab Code: K1413105-018

Sand Fraction:	Dry Weight (Grams)	67.5920
Sand Fraction:	Weight Recovered (Grams)	67.7601
Sand Fraction:	Percent Recovery	100.25

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	1.6538	2.46
Very Coarse Sand	-1 to 0 Ø	0.5657	0.84
Coarse Sand	0 to 1 Ø	17.1045	25.41
Medium Sand	1 to 2 Ø	40.4760	60.13
Fine Sand	2 to 3 Ø	6.0886	9.05
Very Fine Sand	3 to 4 Ø	1.6380	2.43
62.5 µm	4 to 5 Ø	0.1550	0.23
31.3 µm	5 to 6 Ø	0.4350	0.65
15.6 µm	6 to 7 Ø	0.0900	0.13
7.8 µm	7 to 8 Ø	0.0050	0.01
3.9 µm	8 to 9 Ø	0.0900	0.13
1.95 µm	9 to 10 Ø	-0.0450	0.00
0.98 µm	> 10 Ø	0.1350	0.20
		68.3916	101.67

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 5054
Lab Code: K1413105-019

Sand Fraction:	Dry Weight (Grams)	33.4308
Sand Fraction:	Weight Recovered (Grams)	33.1980
Sand Fraction:	Percent Recovery	99.30

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.3937	1.00
Very Coarse Sand	-1 to 0 Ø	0.0745	0.19
Coarse Sand	0 to 1 Ø	0.2766	0.70
Medium Sand	1 to 2 Ø	8.9689	22.85
Fine Sand	2 to 3 Ø	13.5875	34.62
Very Fine Sand	3 to 4 Ø	8.6871	22.14
62.5 µm	4 to 5 Ø	2.2100	5.63
31.3 µm	5 to 6 Ø	0.5100	1.30
15.6 µm	6 to 7 Ø	0.2650	0.68
7.8 µm	7 to 8 Ø	0.3550	0.90
3.9 µm	8 to 9 Ø	0.4950	1.26
1.95 µm	9 to 10 Ø	-0.0500	0.00
0.98 µm	> 10 Ø	0.1600	0.41
		35.9333	91.69

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 5635
Lab Code: K1413105-022

Sand Fraction:	Dry Weight (Grams)	75.8104
Sand Fraction:	Weight Recovered (Grams)	75.7895
Sand Fraction:	Percent Recovery	99.97

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.6292	0.83
Very Coarse Sand	-1 to 0 Ø	1.4043	1.86
Coarse Sand	0 to 1 Ø	21.6254	28.59
Medium Sand	1 to 2 Ø	44.1288	58.34
Fine Sand	2 to 3 Ø	6.5803	8.70
Very Fine Sand	3 to 4 Ø	1.2964	1.71
62.5 µm	4 to 5 Ø	-0.0700	0.00
31.3 µm	5 to 6 Ø	0.2900	0.38
15.6 µm	6 to 7 Ø	0.1000	0.13
7.8 µm	7 to 8 Ø	0.0900	0.12
3.9 µm	8 to 9 Ø	0.1050	0.14
1.95 µm	9 to 10 Ø	-0.0100	0.00
0.98 µm	> 10 Ø	0.1650	0.22
		76.3344	101.03

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 5719
Lab Code: K1413105-023

Sand Fraction:	Dry Weight (Grams)	21.4187
Sand Fraction:	Weight Recovered (Grams)	21.6253
Sand Fraction:	Percent Recovery	100.96

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.2217	0.65
Very Coarse Sand	-1 to 0 Ø	0.0713	0.21
Coarse Sand	0 to 1 Ø	0.4400	1.30
Medium Sand	1 to 2 Ø	1.5841	4.67
Fine Sand	2 to 3 Ø	5.6938	16.78
Very Fine Sand	3 to 4 Ø	11.7841	34.73
62.5 µm	4 to 5 Ø	7.0400	20.75
31.3 µm	5 to 6 Ø	4.1550	12.25
15.6 µm	6 to 7 Ø	1.1250	3.32
7.8 µm	7 to 8 Ø	0.9400	2.77
3.9 µm	8 to 9 Ø	0.2650	0.78
1.95 µm	9 to 10 Ø	0.5550	1.64
0.98 µm	> 10 Ø	0.2150	0.63
		34.0900	100.48

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 6743
Lab Code: K1413105-026

Sand Fraction:	Dry Weight (Grams)	73.1891
Sand Fraction:	Weight Recovered (Grams)	73.3616
Sand Fraction:	Percent Recovery	100.24

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	3.8364	5.16
Very Coarse Sand	-1 to 0 Ø	1.2497	1.68
Coarse Sand	0 to 1 Ø	10.9978	14.80
Medium Sand	1 to 2 Ø	43.3117	58.27
Fine Sand	2 to 3 Ø	7.5099	10.10
Very Fine Sand	3 to 4 Ø	5.7138	7.69
62.5 µm	4 to 5 Ø	1.6800	2.26
31.3 µm	5 to 6 Ø	0.4300	0.58
15.6 µm	6 to 7 Ø	0.3450	0.46
7.8 µm	7 to 8 Ø	0.4300	0.58
3.9 µm	8 to 9 Ø	0.3800	0.51
1.95 µm	9 to 10 Ø	-0.0050	0.00
0.98 µm	> 10 Ø	0.1850	0.25
		76.0643	102.34

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 7367
Lab Code: K1413105-028

Sand Fraction:	Dry Weight (Grams)	60.9902
Sand Fraction:	Weight Recovered (Grams)	61.0542
Sand Fraction:	Percent Recovery	100.10

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	1.0715	1.80
Very Coarse Sand	-1 to 0 Ø	4.5839	7.71
Coarse Sand	0 to 1 Ø	24.5149	41.24
Medium Sand	1 to 2 Ø	27.4706	46.21
Fine Sand	2 to 3 Ø	2.4571	4.13
Very Fine Sand	3 to 4 Ø	0.7974	1.34
62.5 µm	4 to 5 Ø	0.0800	0.13
31.3 µm	5 to 6 Ø	0.1400	0.24
15.6 µm	6 to 7 Ø	0.1000	0.17
7.8 µm	7 to 8 Ø	0.1850	0.31
3.9 µm	8 to 9 Ø	0.1600	0.27
1.95 µm	9 to 10 Ø	-0.1550	0.00
0.98 µm	> 10 Ø	0.1400	0.24
		61.5454	103.79

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 7367
Lab Code: K1413105-028 DUP

Sand Fraction:	Dry Weight (Grams)	62.0154
Sand Fraction:	Weight Recovered (Grams)	61.7221
Sand Fraction:	Percent Recovery	99.53

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.8171	1.37
Very Coarse Sand	-1 to 0 Ø	4.0992	6.86
Coarse Sand	0 to 1 Ø	24.5293	41.03
Medium Sand	1 to 2 Ø	28.6891	47.99
Fine Sand	2 to 3 Ø	2.8176	4.71
Very Fine Sand	3 to 4 Ø	0.6515	1.09
62.5 µm	4 to 5 Ø	0.1900	0.32
31.3 µm	5 to 6 Ø	0.1200	0.20
15.6 µm	6 to 7 Ø	0.1750	0.29
7.8 µm	7 to 8 Ø	-0.0350	0.00
3.9 µm	8 to 9 Ø	0.2900	0.49
1.95 µm	9 to 10 Ø	-0.2150	0.00
0.98 µm	> 10 Ø	0.0600	0.10
		62.1888	104.45

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413105
Project:	Portland Harbor 2014/Alder	**Date Collected:**	9/24/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 7367
Lab Code: K1413105-028 TRP

Sand Fraction:	Dry Weight (Grams)	61.1487
Sand Fraction:	Weight Recovered (Grams)	61.1409
Sand Fraction:	Percent Recovery	99.99

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.6661	1.12
Very Coarse Sand	-1 to 0 Ø	4.2802	7.20
Coarse Sand	0 to 1 Ø	24.7307	41.61
Medium Sand	1 to 2 Ø	27.8971	46.94
Fine Sand	2 to 3 Ø	2.8122	4.73
Very Fine Sand	3 to 4 Ø	0.6695	1.13
62.5 µm	4 to 5 Ø	0.1500	0.25
31.3 µm	5 to 6 Ø	0.0950	0.16
15.6 µm	6 to 7 Ø	0.1000	0.17
7.8 µm	7 to 8 Ø	0.1050	0.18
3.9 µm	8 to 9 Ø	0.0400	0.07
1.95 µm	9 to 10 Ø	0.0450	0.08
0.98 µm	> 10 Ø	0.0100	0.02
		61.6008	103.64

Raw Data

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General Chemistry

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Benchsheet

Service Request #:	K1413105, KQ1415325	Run #:	422506
Test:	TS	Balance ID:	K-Balance-16
Method:	160.3 Modified		

Pan ID:	Lab Code:	Tare (g)	Wet Wt. (g)	Tare + Dry Wt. (g)	Dry Weight (g)	% Total Solids	RPD
	K1413105-001	1.32	10.74	9.48	8.16	76.0	
	K1413105-001DUP	1.33	9.72	8.82	7.49	77.1	1
	K1413105-002	1.31	8.74	7.82	6.51	74.5	
	K1413105-003	1.32	14.24	10.44	9.12	64.0	
	K1413105-004	1.32	12.12	7.68	6.36	52.5	
	K1413105-005	1.33	10.67	6.85	5.52	51.7	
	K1413105-006	1.33	10.45	8.78	7.45	71.3	
	K1413105-007	1.33	13.32	11.10	9.77	73.3	
	K1413105-008	1.32	11.27	9.06	7.74	68.7	
	K1413105-009	1.32	14.58	11.85	10.5	72.2	
	K1413105-010	1.33	14.98	11.89	10.6	70.5	
	K1413105-012	1.32	11.48	8.44	7.12	62.0	
	K1413105-013	1.32	12.39	8.70	7.38	59.6	
	K1413105-015	1.34	10.41	10.29	8.95	86.0	
	K1413105-016	1.33	10.53	7.53	6.20	58.9	
	K1413105-017	1.32	11.12	7.04	5.72	51.4	
	K1413105-018	1.33	10.20	8.56	7.23	70.9	
	K1413105-018DUP	1.33	10.50	9.13	7.80	74.3	5
	K1413105-019	1.33	11.00	8.71	7.38	67.1	
	K1413105-020	1.33	12.89	8.03	6.70	52.0	
	K1413105-021	1.32	11.57	9.72	8.40	72.6	
	K1413105-022	1.32	11.85	10.38	9.06	76.5	

	Oven ID	Temp In	Temp Out	Date In	Time In	Date Out	Time Out	Thermometer ID
Oven1	K-OVEN 07	105	105	11/21/2014	12:24	11/24/2014	08:02	

	Cal EQID	Cal Start Value	Cal End Value	Start Date	Start Time	End Date	End Time
Calibration1	K-Balance-16	1.00, 99.99	1.00, 99.99	11/21/2014	11:58	11/21/2014	12:24
Calibration2	K-Balance-16	1.00, 99.99	1.00, 99.99	11/24/2014	08:24	11/24/2014	08:29

Comments: ZR

Analytical Results Summary

Instrument Name: K-Balance-16 **Analyst:** DMADDEN **Analysis Lot:** 422506 **Method/Testcode:** 160.3 Modified/TS

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
K1413105-001	Solids, Total	N/A		Sediment	76.00 Percent	10.74 g	76.0 Percent	1					11/21/14 12:24	N	IV
K1413105-002	Solids, Total	N/A		Sediment	74.50 Percent	8.74 g	74.5 Percent	1					11/21/14 12:24	N	IV
K1413105-003	Solids, Total	N/A		Sediment	64.00 Percent	14.24 g	64.0 Percent	1					11/21/14 12:24	N	IV
K1413105-004	Solids, Total	N/A		Sediment	52.50 Percent	12.12 g	52.5 Percent	1					11/21/14 12:24	N	IV
K1413105-005	Solids, Total	N/A		Sediment	51.70 Percent	10.67 g	51.7 Percent	1					11/21/14 12:24	N	IV
K1413105-006	Solids, Total	N/A		Sediment	71.30 Percent	10.45 g	71.3 Percent	1					11/21/14 12:24	N	IV
K1413105-007	Solids, Total	N/A		Sediment	73.30 Percent	13.32 g	73.3 Percent	1					11/21/14 12:24	N	IV
K1413105-008	Solids, Total	N/A		Sediment	68.70 Percent	11.27 g	68.7 Percent	1					11/21/14 12:24	N	IV
K1413105-009	Solids, Total	N/A		Sediment	72.20 Percent	14.58 g	72.2 Percent	1					11/21/14 12:24	N	IV
K1413105-010	Solids, Total	N/A		Sediment	70.50 Percent	14.98 g	70.5 Percent	1					11/21/14 12:24	N	IV
K1413105-012	Solids, Total	N/A		Sediment	62.00 Percent	11.48 g	62.0 Percent	1					11/21/14 12:24	N	IV
K1413105-013	Solids, Total	N/A		Sediment	59.60 Percent	12.39 g	59.6 Percent	1					11/21/14 12:24	N	IV
K1413105-015	Solids, Total	N/A		Sediment	86.00 Percent	10.41 g	86.0 Percent	1					11/21/14 12:24	N	IV
K1413105-016	Solids, Total	N/A		Sediment	58.90 Percent	10.53 g	58.9 Percent	1					11/21/14 12:24	N	IV
K1413105-017	Solids, Total	N/A		Sediment	51.40 Percent	11.12 g	51.4 Percent	1					11/21/14 12:24	N	IV
K1413105-018	Solids, Total	N/A		Sediment	70.90 Percent	10.20 g	70.9 Percent	1					11/21/14 12:24	N	IV
K1413105-019	Solids, Total	N/A		Sediment	67.10 Percent	11.00 g	67.1 Percent	1					11/21/14 12:24	N	IV
K1413105-020	Solids, Total	N/A		Sediment	52.00 Percent	12.89 g	52.0 Percent	1					11/21/14 12:24	N	IV
K1413105-021	Solids, Total	N/A		Sediment	72.60 Percent	11.57 g	72.6 Percent	1					11/21/14 12:24	N	IV
K1413105-022	Solids, Total	N/A		Sediment	76.50 Percent	11.85 g	76.5 Percent	1					11/21/14 12:24	N	IV
KQ1415325-01	Solids, Total	DUP	K1413105-001	Sediment	77.10 Percent	9.72 g	77.1 Percent	1				1	11/21/14 12:24	N	IV
KQ1415325-02	Solids, Total	DUP	K1413105-018	Sediment	74.30 Percent	10.50 g	74.3 Percent	1				5	11/21/14 12:24	N	IV

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Benchsheet

Service Request #:	K1413105, KQ1415336, K1413106, K1413085	Run #:	422563
Test:	TS	Balance ID:	K-Balance-16
Method:	160.3 Modified		

Pan ID:	Lab Code:	Tare (g)	Wet Wt. (g)	Tare + Dry Wt. (g)	Dry Weight (g)	% Total Solids	RPD
	K1413105-023	1.33	11.07	7.66	6.33	57.2	
	K1413105-023DUP	1.32	10.74	7.53	6.21	57.8	1
	K1413105-024	1.32	13.22	9.27	7.95	60.1	
	K1413105-026	1.33	10.03	8.77	7.44	74.2	
	K1413105-027	1.32	11.88	6.88	5.56	46.8	
	K1413105-028	1.33	10.67	9.22	7.89	73.9	
	K1413106-023	1.32	9.99	8.47	7.15	71.6	
	K1413106-024	1.32	11.55	9.08	7.76	67.2	
	K1413085-001	1.33	11.17	11.68	10.4	92.7	
	K1413085-001DUP	1.32	9.92	10.44	9.12	91.9	<1
	K1413085-002	1.33	10.92	11.49	10.2	93.0	
	K1413085-003	1.33	11.29	11.68	10.4	91.7	
	K1413085-004	1.33	9.55	10.06	8.73	91.4	
	K1413085-005	1.31	13.07	11.30	9.99	76.4	
	K1413085-006	1.32	10.69	10.37	9.05	84.7	
	K1413085-007	1.33	10.81	11.20	9.87	91.3	
	K1413085-008	1.33	11.39	11.54	10.2	89.6	
	K1413085-009	1.33	11.07	9.93	8.60	77.7	
	K1413085-010	1.33	10.80	11.22	9.89	91.6	
	K1413085-011	1.34	10.77	11.28	9.94	92.3	
	K1413085-012	1.32	11.58	12.08	10.8	92.9	
	K1413085-013	1.32	10.66	10.78	9.46	88.7	

	Oven ID	Temp In	Temp Out	Date In	Time In	Date Out	Time Out	Thermometer ID
Oven1	K-OVEN 07	105	105	11/21/2014	15:21	11/24/2014	08:05	

	Cal EQID	Cal Start Value	Cal End Value	Start Date	Start Time	End Date	End Time
Calibration1	K-Balance-16	1.00, 99.99	1.00, 99.99	11/21/2014	14:30	11/21/2014	15:21
Calibration2	K-Balance-16	1.00, 99.99	1.00, 99.99	11/24/2014	08:33	11/24/2014	08:36

11/24/14

Comments: ZR

Analytical Results Summary

nstrument Name: K-Balance-16 **Analyst:** DMADDEN **Analysis Lot:** 422563 **Method/Testcode:** 160.3 Modified/TS

b Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
413085-001	Solids, Total	N/A		Soil	92.70 Percent	11.17 g	92.7 Percent	1					11/21/14 15:21	N	II
413085-002	Solids, Total	N/A		Soil	93.00 Percent	10.92 g	93.0 Percent	1					11/21/14 15:21	N	II
413085-003	Solids, Total	N/A		Soil	91.70 Percent	11.29 g	91.7 Percent	1					11/21/14 15:21	N	II
413085-004	Solids, Total	N/A		Soil	91.40 Percent	9.55 g	91.4 Percent	1					11/21/14 15:21	N	II
413085-005	Solids, Total	N/A		Soil	76.40 Percent	13.07 g	76.4 Percent	1					11/21/14 15:21	N	II
413085-006	Solids, Total	N/A		Soil	84.70 Percent	10.69 g	84.7 Percent	1					11/21/14 15:21	N	II
413085-007	Solids, Total	N/A		Soil	91.30 Percent	10.81 g	91.3 Percent	1					11/21/14 15:21	N	II
413085-008	Solids, Total	N/A		Soil	89.60 Percent	11.39 g	89.6 Percent	1					11/21/14 15:21	N	II
413085-009	Solids, Total	N/A		Soil	77.70 Percent	11.07 g	77.7 Percent	1					11/21/14 15:21	N	II
413085-010	Solids, Total	N/A		Soil	91.60 Percent	10.80 g	91.6 Percent	1					11/21/14 15:21	N	II
413085-011	Solids, Total	N/A		Soil	92.30 Percent	10.77 g	92.3 Percent	1					11/21/14 15:21	N	II
413085-012	Solids, Total	N/A		Soil	92.90 Percent	11.58 g	92.9 Percent	1					11/21/14 15:21	N	II
413085-013	Solids, Total	N/A		Soil	88.70 Percent	10.66 g	88.7 Percent	1					11/21/14 15:21	N	II
413105-023	Solids, Total	N/A		Sediment	57.20 Percent	11.07 g	57.2 Percent	1					11/21/14 15:21	N	IV
413105-024	Solids, Total	N/A		Sediment	60.10 Percent	13.22 g	60.1 Percent	1					11/21/14 15:21	N	IV
413105-026	Solids, Total	N/A		Sediment	74.20 Percent	10.03 g	74.2 Percent	1					11/21/14 15:21	N	IV
413105-027	Solids, Total	N/A		Sediment	46.80 Percent	11.88 g	46.8 Percent	1					11/21/14 15:21	N	IV
413105-028	Solids, Total	N/A		Sediment	73.90 Percent	10.67 g	73.9 Percent	1					11/21/14 15:21	N	IV
413106-023	Solids, Total	N/A		Sediment	71.60 Percent	9.99 g	71.6 Percent	1					11/21/14 15:21	N	IV
413106-024	Solids, Total	N/A		Sediment	67.20 Percent	11.55 g	67.2 Percent	1					11/21/14 15:21	N	IV
)1415336-01	Solids, Total	DUP	K1413105-023	Sediment	57.80 Percent	10.74 g	57.8 Percent	1				1	11/21/14 15:21	N	IV
)1415336-02	Solids, Total	DUP	K1413085-001	Soil	91.90 Percent	9.92 g	91.9 Percent	1				<1	11/21/14 15:21	N	II

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ndicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Benchsheet

Service Request #:	K1413105, K1414241, KQ1500004	**Run #:**	427774
Test:	TS	**Balance ID:**	K-Balance-16
Method:	160.3 Modified		

Pan ID:	Lab Code:	Tare (g)	Wet Wt. (g)	Tare + Dry Wt. (g)	Dry Weight (g)	% Total Solids	RPD
	K1413105-005	1.29	18.20	10.62	9.33	51.3	
	K1414241-001	1.33	4.99	5.21	3.88	77.8	
	K1414241-001DUP	1.31	4.90	5.18	3.87	79.0	2
	K1414241-002	1.30	4.81	4.79	3.49	72.6	
	K1414241-003	1.30	4.91	4.90	3.60	73.3	
	K1414241-004	1.30	4.97	5.80	4.50	90.5	
	K1414241-005	1.30	5.05	5.82	4.52	89.5	
	K1414241-006	1.31	5.00	5.77	4.46	89.2	

	Oven ID	Temp In	Temp Out	Date In	Time In	Date Out	Time Out	Thermometer ID
Oven1	K-OVEN-07	105	105	1/2/2015	08:50	1/2/2015	13:10	

	Cal EQID	Cal Start Value	Cal End Value	Start Date	Start Time	End Date	End Time
Calibration1	K-Balance-16	0.99, 99.99	1.00, 99.99	1/2/2015	08:43	1/2/2015	08:50
Calibration2	K-Balance-16	1.00, 99.98	1.00, 99.99	1/2/2015	13:29	1/2/2015	13:31

Comments: DJM Put in oven again at 13:34 and pulled back out at 13:51 to confirm weights.

Analytical Results Summary

Instrument Name: K-Balance-16 **Analyst:** DMADDEN **Analysis Lot:** 427774 **Method/Testcode:** 160.3 Modified/TS

ab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
1413105-005	Solids, Total	N/A		Sediment	51.30 Percent	18.20 g	51.3 Percent	1					1/2/15 08:50	N	IV
1414241-001	Solids, Total	N/A		Soil	77.80 Percent	4.99 g	77.8 Percent	1					1/2/15 08:50	N	V
1414241-002	Solids, Total	N/A		Soil	72.60 Percent	4.81 g	72.6 Percent	1					1/2/15 08:50	N	V
1414241-003	Solids, Total	N/A		Soil	73.30 Percent	4.91 g	73.3 Percent	1					1/2/15 08:50	N	V
1414241-004	Solids, Total	N/A		Soil	90.50 Percent	4.97 g	90.5 Percent	1					1/2/15 08:50	N	V
1414241-005	Solids, Total	N/A		Soil	89.50 Percent	5.05 g	89.5 Percent	1					1/2/15 08:50	N	V
1414241-006	Solids, Total	N/A		Soil	89.20 Percent	5.00 g	89.2 Percent	1					1/2/15 08:50	N	V
Q1500004-01	Solids, Total	DUP	K1414241-001	Soil	79.00 Percent	4.90 g	79.0 Percent	1				2	1/2/15 08:50	N	V

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indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Benchsheet

Service Request #:	**K1413105, K1414241, KQ1500004**	**Run #:**	**427774**
Test:	**TS**	**Balance ID:**	**K-Balance-16**
Method:	**160.3 Modified**		

Pan ID:	Lab Code:	Tare (g)	Wet Wt. (g)	Tare + Dry Wt. (g)	Dry Weight (g)	% Total Solids	RPD
	K1413105-005	1.29	18.20	10.63	9.34	51.3	
	K1414241-001	1.33	4.99	5.22	3.89	78.0	
	K1414241-001DUP	1.31	4.90	5.18	3.87	79.0	1
	K1414241-002	1.30	4.81	4.80	3.50	72.8	
	K1414241-003	1.30	4.91	4.90	3.60	73.3	
	K1414241-004	1.30	4.97	5.80	4.50	90.5	
	K1414241-005	1.30	5.05	5.82	4.52	89.5	
	K1414241-006	1.31	5.00	5.76	4.45	89.0	

	Oven ID	Temp In	Temp Out	Date In	Time In	Date Out	Time Out	Thermometer ID
Oven1	K-OVEN-07	105	105	1/2/2015	08:50	1/2/2015	13:10	

	Cal EQID	Cal Start Value	Cal End Value	Start Date	Start Time	End Date	End Time
Calibration1	K-Balance-16	0.99, 99.99	1.00, 99.99	1/2/2015	08:43	1/2/2015	08:50
Calibration2	K-Balance-16	1.00, 99.98	1.00, 99.99	1/2/2015	13:29	1/2/2015	13:31

Comments: DJM

Work Request # (Original) K1413105

Tier: IV

Date Analyzed: 12/18/14

Analyst: AB

Analysis: Toc Soil / 9060

Run # 92702

DATA QUALITY REPORT
INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1.	Is the method name and number correct and appropriate?	yes/no/NA
2.	Holding times met for all analyses and for all samples?	yes/no/NA
3.	Are calculations correct?	yes/no/NA
4.	Is the reporting basis correct? (Dry Weight)	yes/no/NA
5.	All quality control criteria met?	yes/no
6.	Is the calibration curve correlation coefficient ≥ 0.995?	yes/no/NA
7.	MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?	yes/no/NA
8.	Are ICVs, CCVs, and CCBs all within acceptance limits?	yes/no/NA
9.	Are results for methods blanks all ND?	yes/no/NA
10.	Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)	yes/no/NA
11.	Are all exceptions explained?	yes/no/NA
12.	Have all applicable service requests been reviewed?	yes/no/NA
13.	Are all samples labeled correctly?	yes/no/NA
14.	Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V)	yes/no/NA
15.	Are detection limits and units reported correctly?	yes/no/NA
16.	Is the unused space on the benchsheet crossed out?	yes/no/NA
17.	Was analysis turned in by the due date? (n-2) (If not record SR#)	yes/no/NA Late

COMMENTS:

Final Approved by: _____ Date: 12/23/14

DQREPORT

Analytical Results Summary

Instrument Name: K-TOC-04 **Analyst:** DBRADBURY **Analysis Lot:** 426762 **Method/Testcode:** 9060/TOC

ab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
1413105-001	Carbon Organic (TOC)	N/A		Sediment	0.38 Percent		0.38 Percent	1	0.02	0.10			12/18/14 11:16:00	N	IV
1413105-002	Carbon Organic (TOC)	N/A		Sediment	0.18 Percent		0.18 Percent	1	0.02	0.10			12/18/14 11:16:00	N	IV
1413105-003	Carbon Organic (TOC)	N/A		Sediment	1.30 Percent		1.30 Percent	1	0.02	0.10			12/18/14 11:16:00	N	IV
1413105-004	Carbon Organic (TOC)	N/A		Sediment	3.63 Percent		3.63 Percent	1	0.02	0.10			12/18/14 11:16:00	N	IV
1413105-005	Carbon Organic (TOC)	N/A		Sediment	2.54 Percent		2.54 Percent	1	0.02	0.10			12/18/14 11:16:00	N	IV
1413105-006	Carbon Organic (TOC)	N/A		Sediment	0.40 Percent		0.40 Percent	1	0.02	0.10			12/18/14 11:16:00	N	IV
1413105-007	Carbon Organic (TOC)	N/A		Sediment	0.24 Percent		0.24 Percent	1	0.02	0.10			12/18/14 11:16:00	N	IV
1413105-008	Carbon Organic (TOC)	N/A		Sediment	0.47 Percent		0.47 Percent	1	0.02	0.10			12/18/14 11:16:00	N	IV
1413105-009	Carbon Organic (TOC)	N/A		Sediment	0.36 Percent		0.36 Percent	1	0.02	0.10			12/18/14 11:16:00	N	IV
1413105-010	Carbon Organic (TOC)	N/A		Sediment	0.48 Percent		0.48 Percent	1	0.02	0.10			12/18/14 11:16:00	N	IV
1413105-012	Carbon Organic (TOC)	N/A		Sediment	2.94 Percent		2.94 Percent	1	0.02	0.10			12/18/14 11:16:00	N	IV
1413105-013	Carbon Organic (TOC)	N/A		Sediment	1.92 Percent		1.92 Percent	1	0.02	0.10			12/18/14 11:16:00	N	IV
1413105-015	Carbon Organic (TOC)	N/A		Sediment	0.15 Percent		0.15 Percent	1	0.02	0.10			12/18/14 11:16:00	N	IV
1413105-016	Carbon Organic (TOC)	N/A		Sediment	4.08 Percent		4.08 Percent	1	0.02	0.10			12/18/14 11:16:00	N	IV
1413105-017	Carbon Organic (TOC)	N/A		Sediment	4.39 Percent		4.39 Percent	1	0.02	0.10			12/18/14 11:16:00	N	IV
Q1416754-01	Carbon Organic (TOC)	DUP	K1413105-001	Sediment	0.35 Percent		0.35 Percent	1	0.02	0.10		8	12/18/14 11:16:00	N	IV
Q1416754-02	Carbon Organic (TOC)	MS	K1413105-001	Sediment	2.85 Percent		2.85 Percent	1	0.02	0.10	104		12/18/14 11:16:00	N	IV
Q1416754-03	Carbon Organic (TOC)	DMS	K1413105-001	Sediment	2.80 Percent		2.80 Percent	1	0.02	0.10	102	2	12/18/14 11:16:00	N	IV
Q1416754-04	Carbon Organic (TOC)	LCS		Sediment	0.28 Percent		0.280 Percent	1	0.02	0.10	102		12/18/14 11:16:00	N	IV
Q1416754-05	Carbon Organic (TOC)	MB		Sediment	0.02 Percent		0.10 Percent U	1	0.02	0.10			12/18/14 11:16:00	N	IV
Q1416755-01	Carbon Organic (TOC)	CCV		Sediment	12.70 Percent		12.7 Percent	1			106		12/18/14 11:16:00	N	IV
Q1416755-02	Carbon Organic (TOC)	CCV		Sediment	12.36 Percent		12.4 Percent	1			103		12/18/14 11:16:00	N	IV
Q1416755-03	Carbon Organic (TOC)	CCV		Sediment	12.32 Percent		12.3 Percent	1			103		12/18/14 11:16:00	N	IV
Q1416755-04	Carbon Organic (TOC)	CCB		Sediment	0.01 Percent		0.10 Percent U	1	0.02	0.10			12/18/14 11:16:00	N	IV
Q1416755-05	Carbon Organic (TOC)	CCB		Sediment	0.01 Percent		0.10 Percent U	1	0.02	0.10			12/18/14 11:16:00	N	IV
Q1416755-06	Carbon Organic (TOC)	CCB		Sediment	0.01 Percent		0.10 Percent U	1	0.02	0.10			12/18/14 11:16:00	N	IV

AB 12/23/14

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indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

aj-analyzer multi EA 4000; multiWin 5.2; Serial number: N4-138/M
% TOTAL ORGANIC CARBON

AnalysisGroup

AnalysisGroup: % TOC

Remark: % Total Organic Carbon

Run # 426762

Created on: 3/16/2013 11:53:50 AM
Last modification: 12/18/2014 4:13:13 PM
State: solid

Analysis name	Result (average)	Sample quantity	Time of analysis
CCV	TC: 12.70%	25.300mg % REC = 106	12/18/2014 11:16:03 AM
CCB	TC: 0.012%	250.000mg	12/18/2014 11:29:16 AM
LCS	TC: 0.28%	251.400mg % REC = 102	12/18/2014 11:37:33 AM
MB	TC: 0.016%	250.000mg	12/18/2014 11:47:33 AM
K1413105-001	TC: 0.38%	251.500mg	12/18/2014 11:55:52 AM
K1413105-001d	TC: 0.35%	251.100mg	12/18/2014 12:06:10 PM
K1413105-001ms	TC: 2.85%	127.200mg	12/18/2014 12:16:19 PM
K1413105-001msd	TC: 2.80%	127.300mg	12/18/2014 12:31:53 PM
K1413105-002	TC: 0.18%	252.200mg	12/18/2014 12:45:31 PM
K1413105-003	TC: 1.30%	252.200mg	12/18/2014 12:55:34 PM
K1413105-004	TC: 3.63%	251.400mg	12/18/2014 1:06:58 PM
K1413105-005	TC: 2.54%	252.100mg	12/18/2014 1:21:27 PM
CCV	TC: 12.36%	25.300mg % REC = 103	12/18/2014 1:33:33 PM
CCB	TC: 0.012%	250.000mg	12/18/2014 1:46:16 PM
K1413105-006	TC: 0.40%	252.000mg	12/18/2014 1:54:29 PM
K1413105-007	TC: 0.24%	251.600mg	12/18/2014 2:04:34 PM
K1413105-008	TC: 0.47%	251.700mg	12/18/2014 2:14:36 PM
K1413105-009	TC: 0.36%	252.500mg	12/18/2014 2:25:01 PM
K1413105-010	TC: 0.48%	251.300mg	12/18/2014 2:35:09 PM
K1413105-012	TC: 2.94%	252.500mg	12/18/2014 2:45:33 PM
K1413105-013	TC: 1.92%	251.200mg	12/18/2014 2:59:32 PM
K1413105-015	TC: 0.15%	252.400mg	12/18/2014 3:11:17 PM
K1413105-016	TC: 4.08%	251.100mg	12/18/2014 3:21:28 PM
K1413105-017	TC: 4.39%	251.800mg	12/18/2014 3:38:14 PM
CCV	TC: 12.32%	25.100mg % REC = 103	12/18/2014 3:52:35 PM
CCB	TC: 0.012%	250.000mg	12/18/2014 4:05:31 PM

Prep # 220021
Run # 426762

Service Request: K1413105 **Method:** EPA 9060

Date Weighed: 12/15/14 **Analysis:** Total Organic Carbon in Soil

Analyst: AB **Reviewed By:** _____

Sample Position	Sample ID	Weight (mg)
1	Clean	NA
2	CCV	25.3
3	CCB	250.0
4	LCS	251.4
5	MB	250.0
6	K1413105-001	251.5
7	K1413105-001d	251.1
8	K1413105-001ms	127.2
9	K1413105-001msd	127.3
10	K1413105-002	252.2
11	K1413105-003	252.2
12	K1413105-004	251.4
13	K1413105-005	252.1
14	CCV	25.3
15	CCB	250.0
16	K1413105-006	252.0
17	K1413105-007	251.6
18	K1413105-008	251.7
19	K1413105-009	252.5
20	K1413105-010	251.3
21	K1413105-012	252.5
22	K1413105-013	251.2
23	K1413105-015	252.4
24	K1413105-016	251.1

Sample Position	Sample ID	Weight (mg)
25	K1413105-017	251.8
26	CCV	25.1
27	CCB	250.0
28		
29		
30		
31		
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48		

MS CaCO3 (mg)	K1413105-001ms	25.1
MSD CaCO3 (mg)	K1413105-001msd	25.1

Balance ID: K-BALANCE-38 **Oven ID:** K-OVEN-01

HCL ID: TOC/2-81-C **Thermometer ID:** K31316

CCV: CaCO3, Alfa Aesar, ID: 13-TOC-01-1C, Lot # J05X011, TV = 12.0% % REC = 106, 103, 103

LCS: Nutrients in Soil, ERA, ID: TOCS/1-17-D, Lot # D076-542, TV = 0.275% % REC = 102

MS: (mg CCV)(% TV CCV) / (mg sample) = (25.1)(12) / 127.2 = 2.37 % REC = 104

MSD: (mg CCV)(% TV CCV) / (mg sample) = (25.1)(12) / 127.3 = 2.37 % REC = 102

Work Request # Original ( ) K1413105, 13106

Tier: IV IV

Date Analyzed: 12/19/14

Analyst: AB

Analysis: Toc Soil / 9060 Run # 426764

DATA QUALITY REPORT
INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1.	Is the method name and number correct and appropriate?	yes/no/NA
2.	Holding times met for all analyses and for all samples?	yes/no/NA
3.	Are calculations correct?	yes/no/NA
4.	Is the reporting basis correct? (Dry Weight)	yes/no/NA
5.	All quality control criteria met?	yes/no
6.	Is the calibration curve correlation coefficient ≥ 0.995?	yes/no/NA
7.	MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?	yes/no/NA
8.	Are ICVs, CCVs, and CCBs all within acceptance limits?	yes/no/NA
9.	Are results for methods blanks all ND?	yes/no/NA
10.	Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)	yes/no/NA
11.	Are all exceptions explained?	yes/no/NA
12.	Have all applicable service requests been reviewed?	yes/no/NA
13.	Are all samples labeled correctly?	yes/no/NA
14.	Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V)	yes/no/NA
15.	Are detection limits and units reported correctly?	yes/no/NA
16.	Is the unused space on the benchsheet crossed out?	yes/no/NA
17.	Was analysis turned in by the due date? (n-2) (If not record SR#)	yes/no/NA Late

COMMENTS:

Final Approved by: [signature] Date: 12/23/14

DQREPORT

Analytical Results Summary

Instrument Name: K-TOC-04 **Analyst:** DBRADBURY **Analysis Lot:** 426764 **Method/Testcode:** 9060/TOC

ab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
1413105-018	Carbon Organic (TOC)	N/A		Sediment	0.18 Percent		0.18 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-019	Carbon Organic (TOC)	N/A		Sediment	0.73 Percent		0.73 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-020	Carbon Organic (TOC)	N/A		Sediment	2.65 Percent		2.65 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-021	Carbon Organic (TOC)	N/A		Sediment	0.20 Percent		0.20 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-022	Carbon Organic (TOC)	N/A		Sediment	0.12 Percent		0.12 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-023	Carbon Organic (TOC)	N/A		Sediment	1.44 Percent		1.44 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-024	Carbon Organic (TOC)	N/A		Sediment	3.61 Percent		3.61 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-026	Carbon Organic (TOC)	N/A		Sediment	0.19 Percent		0.19 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-027	Carbon Organic (TOC)	N/A		Sediment	14.23 Percent		14.2 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-028	Carbon Organic (TOC)	N/A		Sediment	0.13 Percent		0.13 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413106-001	Carbon Organic (TOC)	N/A		Sediment	2.56 Percent		2.56 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413106-002	Carbon Organic (TOC)	N/A		Sediment	0.27 Percent		0.27 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413106-003	Carbon Organic (TOC)	N/A		Sediment	0.39 Percent		0.39 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413106-004	Carbon Organic (TOC)	N/A		Sediment	0.27 Percent		0.27 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413106-007	Carbon Organic (TOC)	N/A		Sediment	2.33 Percent		2.33 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
Q1416756-01	Carbon Organic (TOC)	DUP	K1413105-018	Sediment	0.18 Percent		0.18 Percent	1	0.02	0.10		<1	12/19/14 10:06:00	N	IV
Q1416756-02	Carbon Organic (TOC)	MS	K1413105-018	Sediment	2.77 Percent		2.77 Percent	1	0.02	0.10	108		12/19/14 10:06:00	N	IV
Q1416756-03	Carbon Organic (TOC)	DMS	K1413105-018	Sediment	2.56 Percent		2.56 Percent	1	0.02	0.10	100	8	12/19/14 10:06:00	N	IV
Q1416756-04	Carbon Organic (TOC)	LCS		Sediment	0.24 Percent		0.240 Percent	1	0.02	0.10	87		12/19/14 10:06:00	N	IV
Q1416756-05	Carbon Organic (TOC)	MB		Sediment	0.01 Percent		0.10 Percent U	1	0.02	0.10			12/19/14 10:06:00	N	IV
Q1416757-01	Carbon Organic (TOC)	CCV		Sediment	12.85 Percent		12.9 Percent	1			107		12/19/14 10:06:00	N	IV
Q1416757-02	Carbon Organic (TOC)	CCV		Sediment	13.04 Percent		13.0 Percent	1			109		12/19/14 10:06:00	N	IV
Q1416757-03	Carbon Organic (TOC)	CCV		Sediment	12.77 Percent		12.8 Percent	1			106		12/19/14 10:06:00	N	IV
Q1416757-04	Carbon Organic (TOC)	CCB		Sediment	0.01 Percent		0.10 Percent U	1	0.02	0.10			12/19/14 10:06:00	N	IV
Q1416757-05	Carbon Organic (TOC)	CCB		Sediment	0.01 Percent		0.10 Percent U	1	0.02	0.10			12/19/14 10:06:00	N	IV
Q1416757-06	Carbon Organic (TOC)	CCB		Sediment	0.01 Percent		0.10 Percent U	1	0.02	0.10			12/19/14 10:06:00	N	IV

AB 12/23/14

indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

aj-analyzer multi EA 4000; multiWin 5.2; Serial number: N4-138/M
% TOTAL ORGANIC CARBON

AnalysisGroup

AnalysisGroup: % TOC

Remark: % Total Organic Carbon

Run # 426764

Created on: 3/16/2013 11:53:50 AM
Last modification: 12/19/2014 3:06:57 PM
State: solid

Analysis name	Result (average)	Sample quantity	Time of analysis
CCV	TC: 12.85%	25.200mg % REC = 107	12/19/2014 10:06:38 AM
CCB	TC: 0.012%	250.000mg	12/19/2014 10:20:20 AM
LCS	TC: 0.24%	252.100mg % REC = 87	12/19/2014 10:28:32 AM
MB	TC: 0.012%	250.000mg	12/19/2014 10:38:34 AM
K1413105-018	TC: 0.18%	250.700mg	12/19/2014 10:46:46 AM
K1413105-018d	TC: 0.18%	251.100mg	12/19/2014 10:56:54 AM
K1413105-018ms	TC: 2.77%	127.100mg	12/19/2014 11:07:04 AM
K1413105-018msd	TC: 2.56%	127.700mg	12/19/2014 11:24:11 AM
K1413105-019	TC: 0.73%	252.700mg	12/19/2014 11:38:12 AM
K1413105-020	TC: 2.65%	251.600mg	12/19/2014 11:48:42 AM
K1413105-021	TC: 0.20%	251.800mg	12/19/2014 12:02:15 PM
K1413105-022	TC: 0.12%	251.900mg	12/19/2014 12:12:21 PM
CCV	TC: 13.04%	25.100mg % REC = 107	12/19/2014 12:22:37 PM
CCB	TC: 0.012%	250.000mg	12/19/2014 12:37:31 PM
K1413105-023	TC: 1.44%	251.800mg	12/19/2014 12:45:47 PM
K1413105-024	TC: 3.61%	250.900mg	12/19/2014 12:57:32 PM
K1413105-026	TC: 0.19%	251.700mg	12/19/2014 1:13:36 PM
K1413105-027	TC: 14.23%	251.800mg	12/19/2014 1:23:42 PM
K1413105-028	TC: 0.13%	251.900mg	12/19/2014 1:40:22 PM
K1413106-001	TC: 2.56%	250.900mg	12/19/2014 1:50:40 PM
K1413106-002	TC: 0.27%	252.500mg	12/19/2014 2:01:56 PM
K1413106-003	TC: 0.39%	251.600mg	12/19/2014 2:12:01 PM
K1413106-004	TC: 0.27%	252.900mg	12/19/2014 2:22:04 PM
K1413106-007	TC: 2.33%	252.500mg	12/19/2014 2:32:07 PM
CCV	TC: 12.77%	25.100mg % REC = 106	12/19/2014 2:45:15 PM
CCB	TC: 0.012%	250.000mg	12/19/2014 2:59:11 PM

Prep # 220147
Run # 426764

Service Request: K1413105, K1413106 **Method:** EPA 9060

Date Weighed: 12/18/14 **Analysis:** Total Organic Carbon in Soil

Analyst: AB **Reviewed By:** _____

Sample Position	Sample ID	Weight (mg)
1	Clean	NA
2	CCV	25.2
3	CCB	250.0
4	LCS	252.1
5	MB	250.0
6	K1413105-018	250.7
7	K1413105-018d	251.1
8	K1413105-018ms	127.1
9	K1413105-018msd	127.7
10	K1413105-019	252.7
11	K1413105-020	251.6
12	K1413105-021	251.8
13	K1413105-022	251.9
14	CCV	25.1
15	CCB	250.0
16	K1413105-023	251.8
17	K1413105-024	250.9
18	K1413105-026	251.7
19	K1413105-027	251.8
20	K1413105-028	251.9
21	K1413106-001	250.9
22	K1413106-002	252.5
23	K1413106-003	251.6
24	K1413106-004	252.9

Sample Position	Sample ID	Weight (mg)
25	K1413106-007	252.5
26	CCV	25.1
27	CCB	250.0
28		
29		
30		
31		
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MS CaCO3 (mg)	K1413105-018ms	25.4
MSD CaCO3 (mg)	K1413105-018msd	25.4

Balance ID: K-BALANCE-38 **Oven ID:** K-OVEN-01

HCL ID: TOC/2-81-C **Thermometer ID:** K31316

CCV: CaCO3, Alfa Aesar, ID: 13-TOC-01-1C, Lot # J05X011, TV = 12.0% % REC = 107, 109, 106

LCS: Nutrients in Soil, ERA, ID: TOCS/1-17-D, Lot # D076-542, TV = 0.275% % REC = 87

MS: (mg CCV)(% TV CCV) / (mg sample) = (12)(25.4) / 127.1 = 2.40 % REC = 108

MSD: (mg CCV)(% TV CCV) / (mg sample) = (12)(25.4) / 127.7 = 2.39 % REC = 100

Work Request # Original ( ) 13105

Tier:

Date Analyzed: 11/26 - 1/5/15

Analyst: ER/cc/CS

Analysis: G.S.

423900

DATA QUALITY REPORT
INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1.	Is the method name and number correct and appropriate?	yes/no/NA
2.	Holding times met for all analyses and for all samples?	yes/no/NA
3.	Are calculations correct?	yes/no/NA
4.	Is the reporting basis correct? (Dry Weight)	yes/no/NA
5.	All quality control criteria met?	yes/no
6.	Is the calibration curve correlation coefficient ≥ 0.995?	yes/no/NA
7.	MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?	yes/no/NA
8.	Are ICVs, CCVs, and CCBs all within acceptance limits?	yes/no/NA
9.	Are results for methods blanks all ND?	yes/no/NA
10.	Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)	yes/no/NA
11.	Are all exceptions explained?	yes/no/NA
12.	Have all applicable service requests been reviewed?	yes/no/NA
13.	Are all samples labeled correctly?	yes/no/NA
14.	Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V)	yes/no/NA
15.	Are detection limits and units reported correctly?	yes/no/NA
16.	Is the unused space on the benchsheet crossed out?	yes/no/NA
17.	Was analysis turned in by the due date? (n-2) (If not record SR#)	yes/no/NA

COMMENTS:

Batch QC - % of total wt. recovered was outside ALS acceptance limits due to possible het. character of the sample. No dup. pair analyzed for batch QC due to limited sample.

Final Approved by: ER Date: 1/12/15

DQREPORT

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-001

423900

Client:	Industrial Economics, Inc.
Project:	Portland Harbor 2014/Alder
Sample Matrix:	Sediment

Sample Name:	254
Date Collected:	9/24/2014
Date Received:	11/3/2014
Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	4.6810	N/A
V.C. Sand, 1.00 mm (g)	18	6.8433	N/A
C. Sand, 0.500 mm (g)	35	24.5842	N/A
M. Sand, 0.250 mm (g)	60	33.1548	N/A
F. Sand, 0.125 mm (g)	120	4.3851	N/A
V.F. Sand, 0.0625 mm (g)	230	1.4134	N/A
S/C <0.0625 mm (g)	Pan	0.1252	N/A

Total (g) Recov'd	75.1870
Total (%) Recov'd	99.5

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	173.4152
Grams Beaker(Tare)	97.8342
GramsGravel/Sand	75.5810

I. Sample Preparation

Grams As Received Sample	100.6653
Percent (%) Solids	76.0
Grams Oven Dried Sample	76.5056

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID: C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	30.6724	39.8520	40.8967	31.6554	31.6205	34.7454	30.4555
Grams of Tare	30.6397	39.8284	40.8833	31.6421	31.6105	34.7404	30.4500
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0305	0.0214	0.0112	0.0111	0.0078	0.0028	0.0033
Total Grams Sample X 50	0.4550	0.5100	0.0050	0.1650	0.2500	-0.0250	0.1650

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-003

Client:	Industrial Economics, Inc.	Sample Name:	579
Project:	Portland Harbor 2014/Alder	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0000	N/A
V.C. Sand, 1.00 mm (g)	18	0.0234	N/A
C. Sand, 0.500 mm (g)	35	0.0938	N/A
M. Sand, 0.250 mm (g)	60	6.3644	N/A
F. Sand, 0.125 mm (g)	120	17.5704	N/A
V.F. Sand, 0.0625 mm (g)	230	9.6327	N/A
S/C <0.0625 mm (g)	Pan	1.5926	N/A

Total (g) Recov'd	35.2773
Total (%) Recov'd	99.5

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	138.5490
Grams Beaker(Tare)	103.0819
GramsGravel/Sand	35.4671

I. Sample Preparation

Grams As Received Sample	68.1743
Percent (%) Solids	64.0
Grams Oven Dried Sample	43.6316

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	32.4328	40.8084	31.5333	32.2016	31.8596	29.8487	28.1675
Grams of Tare	32.2015	40.6582	31.4268	32.1345	31.8129	29.8177	28.1504
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.2291	0.1480	0.1043	0.0649	0.0445	0.0288	0.0149
Total Grams Sample X 50	4.0550	2.1850	1.9700	1.0200	0.7850	0.6950	0.7450

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-004

Client:	Industrial Economics, Inc.	Sample Name:	958
Project:	Portland Harbor 2014/Alder	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.4500	N/A
V.C. Sand, 1.00 mm (g)	18	0.1576	N/A
C. Sand, 0.500 mm (g)	35	0.1391	N/A
M. Sand, 0.250 mm (g)	60	1.0093	N/A
F. Sand, 0.125 mm (g)	120	5.6392	N/A
V.F. Sand, 0.0625 mm (g)	230	15.0840	N/A
S/C <0.0625 mm (g)	Pan	2.2186	N/A

Total (g) Recov'd	24.6978
Total (%) Recov'd	99.8

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	152.9762
Grams Beaker(Tare)	128.2406
GramsGravel/Sand	24.7356

I. Sample Preparation

Grams As Received Sample	61.7183
Percent (%) Solids	52.5
Grams Oven Dried Sample	32.4021

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	28.8105	31.5204	28.0843	30.9418	31.1397	30.9435	34.3865
Grams of Tare	28.6298	31.4369	28.0344	30.9052	31.1155	30.9297	34.3775
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.1785	0.0813	0.0477	0.0344	0.0220	0.0116	0.0068
Total Grams Sample X 50	4.8600	1.6800	0.6650	0.6200	0.5200	0.2400	0.3400

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-005

Client:	Industrial Economics, Inc.	Sample Name:	1982
Project:	Portland Harbor 2014	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	1/5/2015

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0072	N/A
V.C. Sand, 1.00 mm (g)	18	0.0060	N/A
C. Sand, 0.500 mm (g)	35	0.0695	N/A
M. Sand, 0.250 mm (g)	60	2.5618	N/A
F. Sand, 0.125 mm (g)	120	3.6253	N/A
V.F. Sand, 0.0625 mm (g)	230	7.8278	N/A
S/C <0.0625 mm (g)	Pan	2.7201	N/A

Total (g) Recov'd	16.8177
Total (%) Recov'd	98.4

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	118.3230
Grams Beake(Tare)	101.2285
GramsGravel/Sand	17.0945

I. Sample Preparation

Grams As Received Sample	45.5086
Percent (%) Solids	51.3
Grams Oven Dried Sample	23.3459

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	42.2051	29.9183	34.1806	40.9645	41.6508	31.5414	29.5856
Grams of Tare	42.0213	29.8151	34.1094	40.9144	41.6153	31.5179	29.5720
Grams of Dispersant Correction	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021
Grams of Sample	0.1817	0.1011	0.0691	0.0480	0.0334	0.0214	0.0115
Total Grams Sample X 50	4.0300	1.6000	1.0550	0.7300	0.6000	0.4950	0.5750

Analyst: CC Date: 1/5/2015
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-005

Client:	Industrial Economics, Inc.	Sample Name:	1982
Project:	Portland Harbor 2014/Alder	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.2809	N/A
V.C. Sand, 1.00 mm (g)	18	0.1801	N/A
C. Sand, 0.500 mm (g)	35	0.1181	N/A
M. Sand, 0.250 mm (g)	60	1.7769	N/A
F. Sand, 0.125 mm (g)	120	3.2504	N/A
V.F. Sand, 0.0625 mm (g)	230	8.8724	N/A
S/C <0.0625 mm (g)	Pan	1.9112	N/A

Total (g) Recov'd	16.3900
Total (%) Recov'd	100.0

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	136.4381
Grams Beaker(Tare)	120.0403
GramsGravel/Sand	16.3978

I. Sample Preparation

Grams As Received Sample	60.7665
Percent (%) Solids	51.7
Grams Oven Dried Sample	31.4163

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	31.7562	31.2264	27.2404	34.2282	34.6039	30.4290	31.5873
Grams of Tare	31.5821	31.1283	27.1775	34.1860	34.5781	30.4138	31.5779
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.1719	0.0959	0.0607	0.0400	0.0236	0.0130	0.0072
Total Grams Sample X 50	3.8000	1.7600	1.0350	0.8200	0.5300	0.2900	0.3600

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-006

Client:	Industrial Economics, Inc.
Project:	Portland Harbor 2014/Alder
Sample Matrix:	Sediment

Sample Name:	2046
Date Collected:	9/24/2014
Date Received:	11/3/2014
Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.4781	N/A
V.C. Sand, 1.00 mm (g)	18	0.5095	N/A
C. Sand, 0.500 mm (g)	35	16.2162	N/A
M. Sand, 0.250 mm (g)	60	43.1404	N/A
F. Sand, 0.125 mm (g)	120	5.6423	N/A
V.F. Sand, 0.0625 mm (g)	230	0.7256	N/A
S/C <0.0625 mm (g)	Pan	0.1245	N/A

Total (g) Recov'd	66.8366
Total (%) Recov'd	99.7

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	160.7691
Grams Beaker(Tare)	93.7563
GramsGravel/Sand	67.0128

I. Sample Preparation

Grams As Received Sample	100.5869
Percent (%) Solids	71.3
Grams Oven Dried Sample	71.7185

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	34.4791	40.1287	35.2898	41.7746	42.2386	27.0489	31.7651
Grams of Tare	34.4579	40.1066	35.2724	41.7641	42.2356	27.0456	31.7612
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0190	0.0199	0.0152	0.0083	0.0008	0.0011	0.0017
Total Grams Sample X 50	-0.0450	0.2350	0.3450	0.3750	-0.0150	-0.0300	0.0850

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-007

Client:	Industrial Economics, Inc.	Sample Name:	2302
Project:	Portland Harbor 2014/Alder	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.9741	N/A
V.C. Sand, 1.00 mm (g)	18	1.9125	N/A
C. Sand, 0.500 mm (g)	35	18.2824	N/A
M. Sand, 0.250 mm (g)	60	43.6502	N/A
F. Sand, 0.125 mm (g)	120	5.8292	N/A
V.F. Sand, 0.0625 mm (g)	230	1.6394	N/A
S/C <0.0625 mm (g)	Pan	0.1640	N/A

Total (g) Recov'd	72.4518
Total (%) Recov'd	100.0

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	175.4196
Grams Beaker(Tare)	102.9450
GramsGravel/Sand	72.4746

I. Sample Preparation

Grams As Received Sample	98.4705
Percent (%) Solids	73.3
Grams Oven Dried Sample	72.1789

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	40.5342	34.2681	31.3280	28.7426	29.8319	30.1801	34.0423
Grams of Tare	40.4935	34.2356	31.3036	28.7238	29.8197	30.1734	34.0381
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0385	0.0303	0.0222	0.0166	0.0100	0.0045	0.0020
Total Grams Sample X 50	0.4100	0.4050	0.2800	0.3300	0.2750	0.1250	0.1000

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-008

Client:	Industrial Economics, Inc.
Project:	Portland Harbor 2014/Alder
Sample Matrix:	Sediment

Sample Name:	2563
Date Collected:	9/24/2014
Date Received:	11/3/2014
Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.1342	N/A
V.C. Sand, 1.00 mm (g)	18	0.1218	N/A
C. Sand, 0.500 mm (g)	35	0.3973	N/A
M. Sand, 0.250 mm (g)	60	21.2996	N/A
F. Sand, 0.125 mm (g)	120	40.4328	N/A
V.F. Sand, 0.0625 mm (g)	230	5.5851	N/A
S/C <0.0625 mm (g)	Pan	0.4914	N/A

Total (g) Recov'd	68.4622
Total (%) Recov'd	100.2

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	180.6601
Grams Beaker(Tare)	112.3498
GramsGravel/Sand	68.3103

I. Sample Preparation

Grams As Received Sample	100.1737
Percent (%) Solids	68.7
Grams Oven Dried Sample	68.8193

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	32.3100	31.6754	30.5642	42.3764	30.6963	32.2150	34.5553
Grams of Tare	32.2341	31.6169	30.5264	42.3464	30.6781	32.2036	34.5541
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0737	0.0563	0.0356	0.0278	0.0160	0.0092	-0.0010
Total Grams Sample X 50	0.8700	1.0350	0.3900	0.5900	0.3400	0.5100	-0.0500

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-009

Client:	Industrial Economics, Inc.	Sample Name:	2695
Project:	Portland Harbor 2014/Alder	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	5.1857	N/A
V.C. Sand, 1.00 mm (g)	18	3.0321	N/A
C. Sand, 0.500 mm (g)	35	14.2091	N/A
M. Sand, 0.250 mm (g)	60	33.3133	N/A
F. Sand, 0.125 mm (g)	120	8.7448	N/A
V.F. Sand, 0.0625 mm (g)	230	1.5315	N/A
S/C <0.0625 mm (g)	Pan	0.1152	N/A

Total (g) Recov'd	66.1317
Total (%) Recov'd	99.8

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	174.2355
Grams Beaker(Tare)	107.9628
GramsGravel/Sand	66.2727

I. Sample Preparation

Grams As Received Sample	92.0988
Percent (%) Solids	72.2
Grams Oven Dried Sample	66.4953

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	40.6411	27.0978	40.2977	40.1689	31.6667	33.3529	30.3432
Grams of Tare	40.6125	27.0743	40.2779	40.1593	31.6564	33.3488	30.3381
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0264	0.0213	0.0176	0.0074	0.0081	0.0019	0.0029
Total Grams Sample X 50	0.2550	0.1850	0.5100	-0.0350	0.3100	-0.0500	0.1450

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-010

Client:	Industrial Economics, Inc.
Project:	Portland Harbor 2014/Alder
Sample Matrix:	Sediment

Sample Name:	3015
Date Collected:	9/24/2014
Date Received:	11/3/2014
Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.1414	N/A
V.C. Sand, 1.00 mm (g)	18	0.4129	N/A
C. Sand, 0.500 mm (g)	35	5.3868	N/A
M. Sand, 0.250 mm (g)	60	31.5012	N/A
F. Sand, 0.125 mm (g)	120	22.9961	N/A
V.F. Sand, 0.0625 mm (g)	230	8.2756	N/A
S/C <0.0625 mm (g)	Pan	0.8193	N/A

Total (g) Recov'd	69.5333
Total (%) Recov'd	100.0

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	178.2709
Grams Beaker(Tare)	108.7318
GramsGravel/Sand	69.5391

I. Sample Preparation

Grams As Received Sample	100.7370
Percent (%) Solids	70.5
Grams Oven Dried Sample	71.0196

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	34.1288	31.2485	33.6281	33.3597	40.2763	29.6698	28.8886
Grams of Tare	34.0377	31.1873	33.5836	33.3325	40.2589	29.6557	28.8812
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0889	0.0590	0.0423	0.0250	0.0152	0.0119	0.0052
Total Grams Sample X 50	1.4950	0.8350	0.8650	0.4900	0.1650	0.3350	0.2600

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-013

Client:	Industrial Economics, Inc.	Sample Name:	3395
Project:	Portland Harbor 2014/Alder	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0965	N/A
V.C. Sand, 1.00 mm (g)	18	0.1103	N/A
C. Sand, 0.500 mm (g)	35	0.2036	N/A
M. Sand, 0.250 mm (g)	60	4.7362	N/A
F. Sand, 0.125 mm (g)	120	10.5238	N/A
V.F. Sand, 0.0625 mm (g)	230	12.8143	N/A
S/C <0.0625 mm (g)	Pan	2.2303	N/A

Total (g) Recov'd	30.7150
Total (%) Recov'd	100.6

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	136.7209
Grams Beaker(Tare)	106.1987
GramsGravel/Sand	30.5222

I. Sample Preparation

Grams As Received Sample	62.4992
Percent (%) Solids	59.6
Grams Oven Dried Sample	37.2495

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	30.1967	29.3371	31.2069	28.1209	40.1996	40.7453	31.4196
Grams of Tare	30.0289	29.2542	31.1486	28.0796	40.1707	40.7284	31.4114
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.1656	0.0807	0.0561	0.0391	0.0267	0.0147	0.0060
Total Grams Sample X 50	4.2450	1.2300	0.8500	0.6200	0.6000	0.4350	0.3000

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-017

Client:	Industrial Economics, Inc.	Sample Name:	4094
Project:	Portland Harbor 2014/Alder	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.3648	N/A
V.C. Sand, 1.00 mm (g)	18	0.1776	N/A
C. Sand, 0.500 mm (g)	35	0.1804	N/A
M. Sand, 0.250 mm (g)	60	0.4221	N/A
F. Sand, 0.125 mm (g)	120	3.5305	N/A
V.F. Sand, 0.0625 mm (g)	230	12.2111	N/A
S/C <0.0625 mm (g)	Pan	3.3115	N/A

Total (g) Recov'd	20.1980
Total (%) Recov'd	100.1

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	116.7341
Grams Beaker(Tare)	96.5495
GramsGravel/Sand	20.1846

I. Sample Preparation

Grams As Received Sample	54.3989
Percent (%) Solids	51.4
Grams Oven Dried Sample	27.9610

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	31.0681	41.0843	39.8308	42.4112	42.2341	30.2136	31.9764
Grams of Tare	30.8740	40.9981	39.7851	42.3824	42.2145	30.2031	31.9718
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.1919	0.0840	0.0435	0.0266	0.0174	0.0083	0.0024
Total Grams Sample X 50	5.3950	2.0250	0.8450	0.4600	0.4550	0.2950	0.1200

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-018

Client:	Industrial Economics, Inc.	Sample Name:	4611
Project:	Portland Harbor 2014/Alder	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	1.6538	N/A
V.C. Sand, 1.00 mm (g)	18	0.5657	N/A
C. Sand, 0.500 mm (g)	35	17.1045	N/A
M. Sand, 0.250 mm (g)	60	40.4760	N/A
F. Sand, 0.125 mm (g)	120	6.0886	N/A
V.F. Sand, 0.0625 mm (g)	230	1.6380	N/A
S/C <0.0625 mm (g)	Pan	0.2335	N/A

Total (g) Recov'd	67.7601
Total (%) Recov'd	100.2

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	178.3241
Grams Beaker(Tare)	110.7321
GramsGravel/Sand	67.5920

I. Sample Preparation

Grams As Received Sample	94.9365
Percent (%) Solids	70.9
Grams Oven Dried Sample	67.3100

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	34.6782	42.4851	40.3906	30.8354	29.8002	31.5953	40.9538
Grams of Tare	34.6587	42.4687	40.3829	30.8295	29.7944	31.5913	40.9489
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0173	0.0142	0.0055	0.0037	0.0036	0.0018	0.0027
Total Grams Sample X 50	0.1550	0.4350	0.0900	0.0050	0.0900	-0.0450	0.1350

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-019

Client:	Industrial Economics, Inc.	Sample Name:	5054
Project:	Portland Harbor 2014/Alder	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.3937	N/A
V.C. Sand, 1.00 mm (g)	18	0.0745	N/A
C. Sand, 0.500 mm (g)	35	0.2766	N/A
M. Sand, 0.250 mm (g)	60	8.9689	N/A
F. Sand, 0.125 mm (g)	120	13.5875	N/A
V.F. Sand, 0.0625 mm (g)	230	8.6871	N/A
S/C <0.0625 mm (g)	Pan	1.2097	N/A

Total (g) Recov'd	33.1980
Total (%) Recov'd	99.3

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	151.3583
Grams Beaker(Tare)	117.9275
GramsGravel/Sand	33.4308

I. Sample Preparation

Grams As Received Sample	58.4876
Percent (%) Solids	67.1
Grams Oven Dried Sample	39.2452

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	40.5636	42.1936	35.5807	40.6013	31.5293	29.2477	40.7589
Grams of Tare	40.4825	42.1567	35.5540	40.5799	31.5150	29.2433	40.7535
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0789	0.0347	0.0245	0.0192	0.0121	0.0022	0.0032
Total Grams Sample X 50	2.2100	0.5100	0.2650	0.3550	0.4950	-0.0500	0.1600

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-022

Client:	Industrial Economics, Inc.	Sample Name:	5635
Project:	Portland Harbor 2014/Alder	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.6292	N/A
V.C. Sand, 1.00 mm (g)	18	1.4043	N/A
C. Sand, 0.500 mm (g)	35	21.6254	N/A
M. Sand, 0.250 mm (g)	60	44.1288	N/A
F. Sand, 0.125 mm (g)	120	6.5803	N/A
V.F. Sand, 0.0625 mm (g)	230	1.2964	N/A
S/C <0.0625 mm (g)	Pan	0.1251	N/A

Total (g) Recov'd	75.7895
Total (%) Recov'd	100.0

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	180.5825
Grams Beaker(Tare)	104.7721
GramsGravel/Sand	75.8104

I. Sample Preparation

Grams As Received Sample	98.8746
Percent (%) Solids	76.5
Grams Oven Dried Sample	75.6391

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	40.0187	27.4502	30.9280	30.4701	33.7961	31.8167	33.0916
Grams of Tare	40.0031	27.4332	30.9168	30.4609	33.7887	31.8114	33.0861
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0134	0.0148	0.0090	0.0070	0.0052	0.0031	0.0033
Total Grams Sample X 50	-0.0700	0.2900	0.1000	0.0900	0.1050	-0.0100	0.1650

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-023

Client:	Industrial Economics, Inc.	Sample Name:	5719
Project:	Portland Harbor 2014/Alder	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.2217	N/A
V.C. Sand, 1.00 mm (g)	18	0.0713	N/A
C. Sand, 0.500 mm (g)	35	0.4400	N/A
M. Sand, 0.250 mm (g)	60	1.5841	N/A
F. Sand, 0.125 mm (g)	120	5.6938	N/A
V.F. Sand, 0.0625 mm (g)	230	11.7841	N/A
S/C <0.0625 mm (g)	Pan	1.8303	N/A

Total (g) Recov'd	21.6253
Total (%) Recov'd	101.0

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	118.9708
Grams Beaker(Tare)	97.5521
GramsGravel/Sand	21.4187

I. Sample Preparation

Grams As Received Sample	59.3126
Percent (%) Solids	57.2
Grams Oven Dried Sample	33.9268

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	42.3235	31.5738	42.3782	35.4146	30.4654	27.1614	40.4104
Grams of Tare	42.0354	31.4265	42.3140	35.3729	30.4425	27.1438	40.4039
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.2859	0.1451	0.0620	0.0395	0.0207	0.0154	0.0043
Total Grams Sample X 50	7.0400	4.1550	1.1250	0.9400	0.2650	0.5550	0.2150

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-026

Client:	Industrial Economics, Inc.	Sample Name:	6743
Project:	Portland Harbor 2014/Alder	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	3.8364	N/A
V.C. Sand, 1.00 mm (g)	18	1.2497	N/A
C. Sand, 0.500 mm (g)	35	10.9978	N/A
M. Sand, 0.250 mm (g)	60	43.3117	N/A
F. Sand, 0.125 mm (g)	120	7.5099	N/A
V.F. Sand, 0.0625 mm (g)	230	5.7138	N/A
S/C <0.0625 mm (g)	Pan	0.7423	N/A

Total (g) Recov'd	73.3616
Total (%) Recov'd	100.2

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	197.6775
Grams Beaker(Tare)	124.4884
GramsGravel/Sand	73.1891

I. Sample Preparation

Grams As Received Sample	100.1743
Percent (%) Solids	74.2
Grams Oven Dried Sample	74.3293

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	40.8345	34.7426	44.1116	42.0907	28.2537	32.8407	40.9620
Grams of Tare	40.7634	34.7051	44.0827	42.0687	28.2403	32.8349	40.9561
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0689	0.0353	0.0267	0.0198	0.0112	0.0036	0.0037
Total Grams Sample X 50	1.6800	0.4300	0.3450	0.4300	0.3800	-0.0050	0.1850

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-028

Client:	Industrial Economics, Inc.	Sample Name:	7367
Project:	Portland Harbor 2014/Alder	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation

	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	1.0715	N/A
V.C. Sand, 1.00 mm (g)	18	4.5839	N/A
C. Sand, 0.500 mm (g)	35	24.5149	N/A
M. Sand, 0.250 mm (g)	60	27.4706	N/A
F. Sand, 0.125 mm (g)	120	2.4571	N/A
V.F. Sand, 0.0625 mm (g)	230	0.7974	N/A
S/C <0.0625 mm (g)	Pan	0.1588	N/A

Total (g) Recov'd	61.0542
Total (%) Recov'd	100.1

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	162.8240
Grams Beaker(Tare)	101.8338
GramsGravel/Sand	60.9902

I. Sample Preparation

Grams As Received Sample	80.4416
Percent (%) Solids	73.9
Grams Oven Dried Sample	59.4463

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	31.4468	34.2472	30.5829	41.2744	31.7005	28.2150	30.3586
Grams of Tare	31.4316	34.2336	30.5721	41.2656	31.6954	28.2131	30.3536
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0130	0.0114	0.0086	0.0066	0.0029	-0.0003	0.0028
Total Grams Sample X 50	0.0800	0.1400	0.1000	0.1850	0.1600	-0.1550	0.1400

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-028 DUP

Client:	Industrial Economics, Inc.	Sample Name:	7367
Project:	Portland Harbor 2014/Alder	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation

	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.8171	N/A
V.C. Sand, 1.00 mm (g)	18	4.0992	N/A
C. Sand, 0.500 mm (g)	35	24.5293	N/A
M. Sand, 0.250 mm (g)	60	28.6891	N/A
F. Sand, 0.125 mm (g)	120	2.8176	N/A
V.F. Sand, 0.0625 mm (g)	230	0.6515	N/A
S/C <0.0625 mm (g)	Pan	0.1183	N/A

Total (g) Recov'd	61.7221
Total (%) Recov'd	99.5

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	168.8785
Grams Beaker(Tare)	106.8631
GramsGravel/Sand	62.0154

I. Sample Preparation

Grams As Received Sample	80.8923
Percent (%) Solids	73.9
Grams Oven Dried Sample	59.7794

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID: C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	30.7485	40.6322	41.5864	31.9216	35.7974	40.8665	33.4863
Grams of Tare	30.7346	40.6221	41.5787	31.9174	35.7925	40.8674	33.4829
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0117	0.0079	0.0055	0.0020	0.0027	-0.0031	0.0012
Total Grams Sample X 50	0.1900	0.1200	0.1750	-0.0350	0.2900	-0.2150	0.0600

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413105-028 TRP

Client:	Industrial Economics, Inc.	Sample Name:	7367
Project:	Portland Harbor 2014/Alder	Date Collected:	9/24/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.6661	N/A
V.C. Sand, 1.00 mm (g)	18	4.2802	N/A
C. Sand, 0.500 mm (g)	35	24.7307	N/A
M. Sand, 0.250 mm (g)	60	27.8971	N/A
F. Sand, 0.125 mm (g)	120	2.8122	N/A
V.F. Sand, 0.0625 mm (g)	230	0.6695	N/A
S/C <0.0625 mm (g)	Pan	0.0851	N/A

Total (g) Recov'd	61.1409
Total (%) Recov'd	100

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	162.1036
Grams Beaker(Tare)	100.9549
GramsGravel/Sand	61.1487

I. Sample Preparation

Grams As Received Sample	80.4283
Percent (%) Solids	73.9
Grams Oven Dried Sample	59.4365

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	33.9698	30.5231	33.5874	27.3640	40.5724	29.4341	30.7046
Grams of Tare	33.9567	30.5130	33.5792	27.3578	40.5683	29.4308	30.7022
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0109	0.0079	0.0060	0.0040	0.0019	0.0011	0.0002
Total Grams Sample X 50	0.1500	0.0950	0.1000	0.1050	0.0400	0.0450	0.0100

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 12/31/2014

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413106-014

Client:	Industrial Economics, Inc.	Sample Name:	Batch QC
Project:	Portland Harbor 2014	Date Collected:	NA
Sample Matrix:	Sediment	Date Received:	NA
		Date Analyzed:	1/5/2015

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.2871	N/A
V.C. Sand, 1.00 mm (g)	18	0.0252	N/A
C. Sand, 0.500 mm (g)	35	0.1367	N/A
M. Sand, 0.250 mm (g)	60	10.0132	N/A
F. Sand, 0.125 mm (g)	120	22.2367	N/A
V.F. Sand, 0.0625 mm (g)	230	8.7247	N/A
S/C <0.0625 mm (g)	Pan	2.8655	N/A

Total (g) Recov'd	44.2891
Total (%) Recov'd	99.7

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	150.0059
Grams Beake(Tare)	105.5919
GramsGravel/Sand	44.4140

I. Sample Preparation

Grams As Received Sample	93.8945
Percent (%) Solids	49.1
Grams Oven Dried Sample	46.1022

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	29.7911	31.9162	31.4044	31.1490	28.0432	30.7517	31.3358
Grams of Tare	29.5268	31.7915	31.3389	31.1065	28.0169	30.7354	31.3244
Grams of Dispersant Correction	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021
Grams of Sample	0.2622	0.1226	0.0634	0.0404	0.0242	0.0142	0.0093
Total Grams Sample X 50	6.9800	2.9600	1.1500	0.8100	0.5000	0.2450	0.4650

Analyst: CC Date: 1/5/2015
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413105
Sample #: K1413106-014DUP

Client:	Industrial Economics, Inc.	Sample Name:	Batch QC
Project:	Portland Harbor 2014	Date Collected:	NA
Sample Matrix:	Sediment	Date Received:	NA
		Date Analyzed:	1/5/2015

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0000	N/A
V.C. Sand, 1.00 mm (g)	18	0.0081	N/A
C. Sand, 0.500 mm (g)	35	0.1564	N/A
M. Sand, 0.250 mm (g)	60	9.6956	N/A
F. Sand, 0.125 mm (g)	120	19.3458	N/A
V.F. Sand, 0.0625 mm (g)	230	8.7159	N/A
S/C <0.0625 mm (g)	Pan	3.6335	N/A

Total (g) Recov'd	41.5553
Total (%) Recov'd	100.1

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	142.9901
Grams Beake(Tare)	101.4806
GramsGravel/Sand	41.5095

I. Sample Preparation

Grams As Received Sample	100.0933
Percent (%) Solids	49.1
Grams Oven Dried Sample	49.1458

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	31.6392	29.3407	30.7631	27.9133	30.3312	29.4470	29.4136
Grams of Tare	31.3192	29.1553	30.6591	27.8416	30.2800	29.4146	29.3936
Grams of Dispersant Correction	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021
Grams of Sample	0.3179	0.1833	0.1019	0.0696	0.0491	0.0303	0.0179
Total Grams Sample X 50	6.7300	4.0700	1.6150	1.0265	0.9385	0.6200	0.8950

Analyst: CC Date: 1/5/2015
Reviewed by: EL Date: 1/12/2015

ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
T: 1-360-577-7222
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January 19, 2015

Analytical Report for Service Request No: K1413106

Rachel DelVecchio
Industrial Economics, Inc.
2067 Massachusetts Ave.
Cambridge, MA 02140

RE: Portland Harbor 2014/Ross

Dear Rachel:

Enclosed are the results of the sample(s) submitted to our laboratory on November 3, 2014. For your reference, these analyses have been assigned our service request number **K1413106**.

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 3364. You may also contact me via email at howard.holmes@alsglobal.com.

Respectfully submitted,

ALS Group USA Corp. dba ALS Environmental

Howard Holmes
Project Manager

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	-
Idaho DHW	http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx	-
ISO 17025	http://www.pjlabs.com/	L14-50
Louisiana DEQ	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	03016
Maine DHS	Not available	WA01276
Michigan DEQ	http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html	9949
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
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Phone (360)577-7222 Fax (360)636-1068
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ALS ENVIRONMENTAL

Client:	Industrial Economics, Inc.	**Service Request No.:**	K1413106
Project:	Portland harbor 2014/ Ross	**Date Received:**	11/03/14
Sample Matrix:	Sediment		

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 IV validation deliverables including summary forms and all of the associated raw data for each of the analyses. When appropriate to the method, method blank results have been reported with each analytical test.

Sample Receipt

Twenty-four sediment samples were received for analysis at ALS Environmental on 11/03/14. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

General Chemistry Parameters

Carbon Organic (TOC) by Method 9060:
Samples were received past their recommended holding time. The analysis was performed as soon as possible after receipt by the laboratory. The data was flagged to indicate the holding time anomaly.

The Relative Percent Difference (RPD) criterion for the replicate analysis of Carbon Organic (TOC) in sample 9206 was not applicable because the analyte concentration was not significantly greater than the Method Reporting Limit (MRL). Analytical values derived from measurements close to the detection limit are not subject to the same accuracy and precision criteria as results derived from measurements higher on the calibration range for the method.

Particle Size by PSEP:
Samples 6410, 5386, and 7434 were re-analyzed due to a percent of total weight recovered failure. Sample 6410 failed again for the reanalysis. A duplicate was also analyzed and produced results within acceptance limits but similar to the sample (RPD<20%). Insufficient sample was available for a third analysis of sample 6410. The second analysis was reported.

No other anomalies associated with the analysis of these samples were observed.

Approved by_____

Chain of Custody

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Rachel DelVecchio
Industrial Economics, Inc
Portland Harbor 2014

K1413106

Tests Requested
PSEP Particle Size
9060 TOC
Total Solids
Archive

Ross	8 oz Jar	4 oz Jar	PS	TOC	TS	Archive	Date
3594	4oz	2oz	Y	Y	Y	N	9/25
1034	4	2	Y	Y	Y	N	9/25
1546	4	2	Y	Y	Y	N	9/25
2314	2	1	N	Y	Y	N	9/25
3062	Rocks	Rocks	N	N	N	N	9/25
5110	Rocks	Rocks	N	N	N	N	9/25
3338	2	2	N	Y	Y	N	9/25
3830	0	Rocks	N	N	N	N	9/25
9206	2	1	N	Y	Y	N	9/25
2038	0	1	N	Y	Y	N	9/25
8714	1	1	N	Y	Y	N	9/25
7926	Rocks	Rocks	N	N	N	N	9/25
7286	Rocks	Rocks	N	N	N	N	9/25
6410	4	2	Y	Y	Y	N	9/25
5494	2	1	N	Y	Y	N	9/25
5642	4	2	Y	Y	Y	N	9/25
5130	4	2	Y	Y	Y	N	9/25
7158	Rocks	Rocks	N	N	N	N	9/25
8458	4	2	Y	Y	Y	N	9/25
5386	4	2	Y	Y	Y	N	9/25
7434	4	2	Y	Y	Y	N	9/25
6134	0	2	N	Y	Y	N	9/25
9482	0	2	N	Y	Y	N	9/25
9590	0	2	N	Y	Y	N	9/25

Recd 11/3/2014

PC HM

Cooler Receipt and Preservation Form

Client / Project: Dept of Fish and Wildlife Service Request *K14* 13106

Received: 11.3.14 Opened: 11.3.14 By: bw Unloaded: 11.3.14 By: bw

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
1.0	0.9	3.7	3.6	-0.1	339			
0.4	0.5	3.1	3.2	+0.1	340			

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
Ross 5494				X						
Ross 3594				X						

Notes, Discrepancies, & Resolutions: ABOVE SAMPLES CONTAINED IN 4 OZ JARS.

General Chemistry

ALS Environmental—Kelso Laboratory
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ALS Group USA, Corp.
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Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014/Ross	**Date Collected:**	09/25/14
Sample Matrix:	Sediment	**Date Received:**	11/3/14
Analysis Method:	160.3 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	As Received

Solids, Total

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
3594	K1413106-001	**46.0**	-	-	1	11/21/14 11:50	
1034	K1413106-002	**60.6**	-	-	1	11/21/14 11:50	
1546	K1413106-003	**52.4**	-	-	1	11/21/14 11:50	
2314	K1413106-004	**51.9**	-	-	1	11/21/14 11:50	
3338	K1413106-007	**42.9**	-	-	1	11/21/14 11:50	
9206	K1413106-009	**47.8**	-	-	1	11/21/14 11:50	
2038	K1413106-010	**56.6**	-	-	1	11/21/14 11:50	
8714	K1413106-011	**63.2**	-	-	1	11/21/14 11:50	
6410	K1413106-014	**49.1**	-	-	1	11/21/14 11:50	
5494	K1413106-015	**60.0**	-	-	1	11/21/14 11:50	
5642	K1413106-016	**43.3**	-	-	1	11/21/14 11:50	
5130	K1413106-017	**62.0**	-	-	1	11/21/14 11:50	
8458	K1413106-019	**63.8**	-	-	1	11/21/14 11:50	
5386	K1413106-020	**61.3**	-	-	1	11/21/14 11:50	
7434	K1413106-021	**49.3**	-	-	1	11/21/14 11:50	
6134	K1413106-022	**64.6**	-	-	1	11/21/14 11:50	
9482	K1413106-023	**71.6**	-	-	1	11/21/14 15:21	
9590	K1413106-024	**67.2**	-	-	1	11/21/14 15:21	

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QA/QC Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project	Portland Harbor 2014/Ross	**Date Collected:**	09/25/14
Sample Matrix:	Sediment	**Date Received:**	11/03/14
		Date Analyzed:	11/21/14

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	3594	**Units:**	Percent
Lab Code:	K1413106-001	**Basis:**	As Received

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample K1413106-001DUP Result	Average	RPD	RPD Limit
Solids, Total	160.3 Modified	-	-	46.0	45.5	45.8	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.

Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014/Ross	**Date Collected:**	09/25/14
Sample Matrix:	Sediment	**Date Received:**	11/3/14
Analysis Method:	9060	**Units:**	Percent
Prep Method:	Method	**Basis:**	Dry, per Method

Carbon Organic (TOC)

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
3594	K1413106-001	**2.56**	0.10	0.02	1	12/19/14 10:06	12/18/14	*
1034	K1413106-002	**0.27**	0.10	0.02	1	12/19/14 10:06	12/18/14	*
1546	K1413106-003	**0.39**	0.10	0.02	1	12/19/14 10:06	12/18/14	*
2314	K1413106-004	**0.27**	0.10	0.02	1	12/19/14 10:06	12/18/14	*
3338	K1413106-007	**2.33**	0.10	0.02	1	12/19/14 10:06	12/18/14	*
9206	K1413106-009	**0.04 J**	0.10	0.02	1	12/19/14 16:40	12/19/14	*
2038	K1413106-010	**0.45**	0.10	0.02	1	12/19/14 16:40	12/19/14	*
8714	K1413106-011	**0.13**	0.10	0.02	1	12/19/14 16:40	12/19/14	*
6410	K1413106-014	**0.98**	0.10	0.02	1	12/19/14 16:40	12/19/14	*
5494	K1413106-015	**0.23**	0.10	0.02	1	12/19/14 16:40	12/19/14	*
5642	K1413106-016	**3.51**	0.10	0.02	1	12/19/14 16:40	12/19/14	*
5130	K1413106-017	**0.41**	0.10	0.02	1	12/19/14 16:40	12/19/14	*
8458	K1413106-019	**0.36**	0.10	0.02	1	12/19/14 16:40	12/19/14	*
5386	K1413106-020	**0.42**	0.10	0.02	1	12/19/14 16:40	12/19/14	*
7434	K1413106-021	**0.96**	0.10	0.02	1	12/19/14 16:40	12/19/14	*
6134	K1413106-022	**0.24**	0.10	0.02	1	12/19/14 16:40	12/19/14	*
9482	K1413106-023	**0.15**	0.10	0.02	1	12/19/14 16:40	12/19/14	*
9590	K1413106-024	**0.28**	0.10	0.02	1	12/19/14 16:40	12/19/14	*
Method Blank	K1413106-MB1	ND U	0.10	0.02	1	12/19/14 10:06	12/18/14	
Method Blank	K1413106-MB2	ND U	0.10	0.02	1	12/19/14 16:40	12/19/14	

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QA/QC Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project	Portland Harbor 2014/Ross	**Date Collected:**	09/25/14
Sample Matrix:	Sediment	**Date Received:**	11/03/14
		Date Analyzed:	12/19/14

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	9206	**Units:**	Percent
Lab Code:	K1413106-009	**Basis:**	Dry, per Method

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample K1413106-009DUP Result	Average	RPD	RPD Limit
Carbon Organic (TOC)	9060	0.10	0.02	0.04 J	0.03 J	0.0355	25 *	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.

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014/Ross	**Date Collected:**	09/25/14
Sample Matrix:	Sediment	**Date Received:**	11/03/14
		Date Analyzed:	12/19/14
		Date Extracted:	12/19/14

Duplicate Matrix Spike Summary
Carbon Organic (TOC)

Sample Name:	9206	**Units:**	Percent
Lab Code:	K1413106-009	**Basis:**	Dry, per Method
Analysis Method:	9060		
Prep Method:	Method		

		Matrix Spike			Duplicate Matrix Spike					
		K1413106-009MS			K1413106-009DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Carbon Organic (TOC)	0.04 J	2.49	2.41	102	2.45	2.39	101	70-122	2	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.

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QA/QC Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014/Ross	**Date Analyzed:**	12/19/14
Sample Matrix:	Sediment	**Date Extracted:**	12/18/14

Lab Control Sample Summary
Carbon Organic (TOC)

Analysis Method:	9060	**Units:**	Percent
Prep Method:	Method	**Basis:**	Dry, per Method
		Analysis Lot:	426764

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1413106-LCS1	0.240	0.28	87	72-122

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014/Ross	**Date Analyzed:**	12/19/14
Sample Matrix:	Sediment	**Date Extracted:**	12/19/14

Lab Control Sample Summary
Carbon Organic (TOC)

Analysis Method:	9060	**Units:**	Percent
Prep Method:	Method	**Basis:**	Dry, per Method
		Analysis Lot:	426765

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1413106-LCS2	0.230	0.28	84	72-122

Client: Industrial Economics, Inc. **Service Request:** K1413106
Project: Portland Harbor 2014/Ross

Continuing Calibration Verification (CCV) Summary

Carbon Organic (TOC)

Analysis Method: 9060 **Units:** Percent

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	426764	KQ1416757-01	12/19/14 10:06	12.0	12.9	107	85-115
CCV2	426764	KQ1416757-02	12/19/14 10:06	12.0	13.0	109	85-115
CCV3	426764	KQ1416757-03	12/19/14 10:06	12.0	12.8	106	85-115
CCV4	426765	KQ1416759-01	12/19/14 16:40	12.0	12.4	103	85-115
CCV5	426765	KQ1416759-02	12/19/14 16:40	12.0	13.1	109	85-115
CCV6	426765	KQ1416759-03	12/19/14 16:40	12.0	13.0	108	85-115

Client: Industrial Economics, Inc. **Service Request:**K1413106
Project: Portland Harbor 2014/Ross

Continuing Calibration Blank (CCB) Summary
Carbon Organic (TOC)

Analysis Method: 9060 **Units:**Percent

	Analysis Lot	Lab Code	Date Analyzed	MRL	MDL	Result	Q
CCB1	426764	KQ1416757-04	12/19/14 10:06	0.10	0.02	ND	U
CCB2	426764	KQ1416757-05	12/19/14 10:06	0.10	0.02	ND	U
CCB3	426764	KQ1416757-06	12/19/14 10:06	0.10	0.02	ND	U
CCB4	426765	KQ1416759-04	12/19/14 16:40	0.10	0.02	ND	U
CCB5	426765	KQ1416759-05	12/19/14 16:40	0.10	0.02	ND	U
CCB6	426765	KQ1416759-06	12/19/14 16:40	0.10	0.02	ND	U

ALS Group USA, Corp.
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Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014/Ross	**Date Collected:**	9/25/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 3594
Lab Code: K1413106-001

Sand Fraction:	Dry Weight (Grams)	12.3643
Sand Fraction:	Weight Recovered (Grams)	12.3275
Sand Fraction:	Percent Recovery	99.70

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0305	0.16
Very Coarse Sand	-1 to 0 Ø	0.0846	0.45
Coarse Sand	0 to 1 Ø	0.0633	0.33
Medium Sand	1 to 2 Ø	0.4132	2.19
Fine Sand	2 to 3 Ø	5.7660	30.51
Very Fine Sand	3 to 4 Ø	4.5545	24.10
62.5 µm	4 to 5 Ø	2.5400	13.44
31.3 µm	5 to 6 Ø	2.1300	11.27
15.6 µm	6 to 7 Ø	1.0400	5.50
7.8 µm	7 to 8 Ø	0.6550	3.47
3.9 µm	8 to 9 Ø	0.4700	2.49
1.95 µm	9 to 10 Ø	0.2350	1.24
0.98 µm	> 10 Ø	0.0150	0.08
		17.9971	95.22

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014/Ross	**Date Collected:**	9/25/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 1034
Lab Code: K1413106-002

Sand Fraction:	Dry Weight (Grams)	33.4422
Sand Fraction:	Weight Recovered (Grams)	33.3963
Sand Fraction:	Percent Recovery	99.86

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Very Coarse Sand	-1 to 0 Ø	0.0125	0.03
Coarse Sand	0 to 1 Ø	0.1853	0.51
Medium Sand	1 to 2 Ø	8.2959	22.75
Fine Sand	2 to 3 Ø	21.4584	58.85
Very Fine Sand	3 to 4 Ø	2.6720	7.33
62.5 µm	4 to 5 Ø	1.2500	3.43
31.3 µm	5 to 6 Ø	0.5400	1.48
15.6 µm	6 to 7 Ø	0.3850	1.06
7.8 µm	7 to 8 Ø	0.1800	0.49
3.9 µm	8 to 9 Ø	0.2150	0.59
1.95 µm	9 to 10 Ø	0.0450	0.12
0.98 µm	> 10 Ø	0.1400	0.38
		35.3791	97.03

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014/Ross	**Date Collected:**	9/25/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 1546
Lab Code: K1413106-003

Sand Fraction:	Dry Weight (Grams)	13.1178
Sand Fraction:	Weight Recovered (Grams)	13.2182
Sand Fraction:	Percent Recovery	100.77

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Very Coarse Sand	-1 to 0 Ø	0.0159	0.10
Coarse Sand	0 to 1 Ø	0.0104	0.06
Medium Sand	1 to 2 Ø	0.2103	1.27
Fine Sand	2 to 3 Ø	3.4063	20.50
Very Fine Sand	3 to 4 Ø	8.2712	49.78
62.5 µm	4 to 5 Ø	2.5050	15.08
31.3 µm	5 to 6 Ø	0.7950	4.78
15.6 µm	6 to 7 Ø	0.1950	1.17
7.8 µm	7 to 8 Ø	0.1750	1.05
3.9 µm	8 to 9 Ø	0.1300	0.78
1.95 µm	9 to 10 Ø	0.0450	0.27
0.98 µm	> 10 Ø	0.0900	0.54
		15.8491	95.39

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014	**Date Collected:**	9/25/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	1/5/2015

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 6410
Lab Code: K1413106-014

Sand Fraction:	Dry Weight (Grams)	44.4140
Sand Fraction:	Weight Recovered (Grams)	44.2891
Sand Fraction:	Percent Recovery	99.72

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.2871	0.62
Very Coarse Sand	-1 to 0 Ø	0.0252	0.05
Coarse Sand	0 to 1 Ø	0.1367	0.30
Medium Sand	1 to 2 Ø	10.0132	21.72
Fine Sand	2 to 3 Ø	22.2367	48.23
Very Fine Sand	3 to 4 Ø	8.7247	18.92
62.5 µm	4 to 5 Ø	6.9800	15.14
31.3 µm	5 to 6 Ø	2.9600	6.42
15.6 µm	6 to 7 Ø	1.1500	2.49
7.8 µm	7 to 8 Ø	0.8100	1.76
3.9 µm	8 to 9 Ø	0.5000	1.08
1.95 µm	9 to 10 Ø	0.2450	0.53
0.98 µm	> 10 Ø	0.4650	1.01
		54.5336	118.29

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014/Ross	**Date Collected:**	9/25/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 5642
Lab Code: K1413106-016

Sand Fraction:	Dry Weight (Grams)	9.7440
Sand Fraction:	Weight Recovered (Grams)	9.7257
Sand Fraction:	Percent Recovery	99.81

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Very Coarse Sand	-1 to 0 Ø	0.0167	0.10
Coarse Sand	0 to 1 Ø	0.0223	0.14
Medium Sand	1 to 2 Ø	0.6919	4.20
Fine Sand	2 to 3 Ø	5.4984	33.41
Very Fine Sand	3 to 4 Ø	2.5974	15.78
62.5 µm	4 to 5 Ø	2.2550	13.70
31.3 µm	5 to 6 Ø	2.6800	16.28
15.6 µm	6 to 7 Ø	1.3800	8.39
7.8 µm	7 to 8 Ø	0.7600	4.62
3.9 µm	8 to 9 Ø	0.4350	2.64
1.95 µm	9 to 10 Ø	0.0650	0.39
0.98 µm	> 10 Ø	0.1350	0.82
		16.5367	100.48

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014/Ross	**Date Collected:**	9/25/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 5130
Lab Code: K1413106-017

Sand Fraction:	Dry Weight (Grams)	39.8964
Sand Fraction:	Weight Recovered (Grams)	40.0250
Sand Fraction:	Percent Recovery	100.32

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Very Coarse Sand	-1 to 0 Ø	0.0236	0.05
Coarse Sand	0 to 1 Ø	0.0842	0.20
Medium Sand	1 to 2 Ø	9.1836	21.38
Fine Sand	2 to 3 Ø	27.0318	62.94
Very Fine Sand	3 to 4 Ø	3.3062	7.70
62.5 µm	4 to 5 Ø	0.7100	1.65
31.3 µm	5 to 6 Ø	0.6200	1.44
15.6 µm	6 to 7 Ø	0.4200	0.98
7.8 µm	7 to 8 Ø	0.4400	1.02
3.9 µm	8 to 9 Ø	0.0900	0.21
1.95 µm	9 to 10 Ø	0.0650	0.15
0.98 µm	> 10 Ø	0.1300	0.30
		42.1044	98.03

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014/Ross	**Date Collected:**	9/25/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 8458
Lab Code: K1413106-019

Sand Fraction:	Dry Weight (Grams)	56.2612
Sand Fraction:	Weight Recovered (Grams)	56.2673
Sand Fraction:	Percent Recovery	100.01

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Very Coarse Sand	-1 to 0 Ø	0.0781	0.12
Coarse Sand	0 to 1 Ø	1.0450	1.61
Medium Sand	1 to 2 Ø	22.7737	35.16
Fine Sand	2 to 3 Ø	26.7238	41.25
Very Fine Sand	3 to 4 Ø	4.7700	7.36
62.5 µm	4 to 5 Ø	1.5000	2.32
31.3 µm	5 to 6 Ø	0.5200	0.80
15.6 µm	6 to 7 Ø	0.4050	0.63
7.8 µm	7 to 8 Ø	0.2600	0.40
3.9 µm	8 to 9 Ø	0.1750	0.27
1.95 µm	9 to 10 Ø	0.1100	0.17
0.98 µm	> 10 Ø	0.0750	0.12
		58.4356	90.21

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014	**Date Collected:**	9/25/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	1/5/2015

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 5386
Lab Code: K1413106-020

Sand Fraction:	Dry Weight (Grams)	53.2511
Sand Fraction:	Weight Recovered (Grams)	53.0839
Sand Fraction:	Percent Recovery	99.69

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0065	0.01
Very Coarse Sand	-1 to 0 Ø	0.0128	0.02
Coarse Sand	0 to 1 Ø	0.0314	0.06
Medium Sand	1 to 2 Ø	5.8977	10.79
Fine Sand	2 to 3 Ø	32.5453	59.57
Very Fine Sand	3 to 4 Ø	11.9284	21.83
62.5 µm	4 to 5 Ø	3.2550	5.96
31.3 µm	5 to 6 Ø	0.9000	1.65
15.6 µm	6 to 7 Ø	0.3100	0.57
7.8 µm	7 to 8 Ø	0.2900	0.53
3.9 µm	8 to 9 Ø	0.2800	0.51
1.95 µm	9 to 10 Ø	0.1400	0.26
0.98 µm	> 10 Ø	0.3250	0.59
		55.9221	102.35

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014/Ross	**Date Collected:**	9/25/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 7434
Lab Code: K1413106-021

Sand Fraction:	Dry Weight (Grams)	21.0344
Sand Fraction:	Weight Recovered (Grams)	21.0544
Sand Fraction:	Percent Recovery	100.10

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0196	0.06
Very Coarse Sand	-1 to 0 Ø	0.0242	0.07
Coarse Sand	0 to 1 Ø	0.0162	0.05
Medium Sand	1 to 2 Ø	0.2115	0.63
Fine Sand	2 to 3 Ø	5.8647	17.36
Very Fine Sand	3 to 4 Ø	12.7372	37.71
62.5 µm	4 to 5 Ø	5.9150	17.51
31.3 µm	5 to 6 Ø	2.8250	8.36
15.6 µm	6 to 7 Ø	1.3050	3.86
7.8 µm	7 to 8 Ø	0.6800	2.01
3.9 µm	8 to 9 Ø	0.3600	1.07
1.95 µm	9 to 10 Ø	0.1750	0.52
0.98 µm	> 10 Ø	0.1900	0.56
		30.3234	89.77

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014/Ross	**Date Collected:**	9/25/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 5386
Lab Code: K1413106-020 DUP

Sand Fraction:	Dry Weight (Grams)	25.7601
Sand Fraction:	Weight Recovered (Grams)	25.9227
Sand Fraction:	Percent Recovery	100.63

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Very Coarse Sand	-1 to 0 Ø	0.0085	0.03
Coarse Sand	0 to 1 Ø	0.0196	0.06
Medium Sand	1 to 2 Ø	3.0617	9.43
Fine Sand	2 to 3 Ø	15.3446	47.25
Very Fine Sand	3 to 4 Ø	6.5215	20.08
62.5 µm	4 to 5 Ø	1.6400	5.05
31.3 µm	5 to 6 Ø	0.6900	2.12
15.6 µm	6 to 7 Ø	0.2300	0.71
7.8 µm	7 to 8 Ø	0.1150	0.35
3.9 µm	8 to 9 Ø	0.1050	0.32
1.95 µm	9 to 10 Ø	0.1300	0.40
0.98 µm	> 10 Ø	0.0800	0.25
		27.9459	86.06

ALS Group USA, Corp.
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Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014/Ross	**Date Collected:**	9/25/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	11/26/2014

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 5386
Lab Code: K1413106-020 TRP

Sand Fraction:	Dry Weight (Grams)	25.6625
Sand Fraction:	Weight Recovered (Grams)	25.8262
Sand Fraction:	Percent Recovery	100.64

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Very Coarse Sand	-1 to 0 Ø	0.0000	0.00
Coarse Sand	0 to 1 Ø	0.0000	0.00
Medium Sand	1 to 2 Ø	2.7039	7.73
Fine Sand	2 to 3 Ø	15.1629	43.32
Very Fine Sand	3 to 4 Ø	6.7107	19.17
62.5 µm	4 to 5 Ø	1.9600	5.60
31.3 µm	5 to 6 Ø	0.5550	1.59
15.6 µm	6 to 7 Ø	0.3700	1.06
7.8 µm	7 to 8 Ø	0.1550	0.44
3.9 µm	8 to 9 Ø	0.1500	0.43
1.95 µm	9 to 10 Ø	0.0450	0.13
0.98 µm	> 10 Ø	0.1750	0.50
		27.9875	79.97

ALS Group USA, Corp.
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Analytical Report

Client:	Industrial Economics, Inc.	**Service Request:**	K1413106
Project:	Portland Harbor 2014	**Date Collected:**	9/25/2014
Sample Matrix:	Sediment	**Date Received:**	11/3/2014
		Date Analyzed:	1/5/2015

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: 6410
Lab Code: K1413106-14 DUP

Sand Fraction:	Dry Weight (Grams)	41.5095
Sand Fraction:	Weight Recovered (Grams)	41.5553
Sand Fraction:	Percent Recovery	100.11

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Very Coarse Sand	-1 to 0 Ø	0.0081	0.02
Coarse Sand	0 to 1 Ø	0.1564	0.32
Medium Sand	1 to 2 Ø	9.6956	19.73
Fine Sand	2 to 3 Ø	19.3458	39.36
Very Fine Sand	3 to 4 Ø	8.7159	17.73
62.5 µm	4 to 5 Ø	6.7300	13.69
31.3 µm	5 to 6 Ø	4.0700	8.28
15.6 µm	6 to 7 Ø	1.6150	3.29
7.8 µm	7 to 8 Ø	1.0265	2.09
3.9 µm	8 to 9 Ø	0.9385	1.91
1.95 µm	9 to 10 Ø	0.6200	1.26
0.98 µm	> 10 Ø	0.8950	1.82
		53.8168	109.50

Raw Data

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
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General Chemistry

ALS Environmental—Kelso Laboratory
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Benchsheet

Service Request #:	K1412953, KQ1415300, K1413106	Run #:	422476
Test:	TS-Air Dried	Balance ID:	K-Balance-16
Method:	160.3 Modified		

Pan ID:	Lab Code:	Tare (g)	Wet Wt. (g)	Tare + Dry Wt. (g)	Dry Weight (g)	% Total Solids	RPD
	K1412953-001	1.33	11.32	11.85	10.5	92.9	
	K1412953-001DUP	1.34	11.00	11.56	10.2	92.9	<1
	K1412953-002	1.34	10.72	11.04	9.70	90.5	
	K1412953-003	1.33	9.82	10.33	9.00	91.6	
	K1412953-004	1.33	10.15	10.95	9.62	94.8	
	K1413106-001	1.34	9.97	5.93	4.59	46.0	
	K1413106-001DUP	1.34	11.01	6.35	5.01	45.5	1
	K1413106-002	1.34	13.87	9.74	8.40	60.6	
	K1413106-003	1.34	10.72	6.96	5.62	52.4	
	K1413106-004	1.32	9.60	6.30	4.98	51.9	
	K1413106-007	1.33	11.78	6.38	5.05	42.9	
	K1413106-009	1.32	12.24	7.17	5.85	47.8	
	K1413106-010	1.34	9.52	6.73	5.39	56.6	
	K1413106-011	1.34	9.87	7.58	6.24	63.2	
	K1413106-014	1.34	10.45	6.47	5.13	49.1	
	K1413106-015	1.34	9.96	7.32	5.98	60.0	
	K1413106-016	1.34	9.90	5.63	4.29	43.3	
	K1413106-017	1.32	15.42	10.88	9.56	62.0	
	K1413106-019	1.34	13.41	9.90	8.56	63.8	
	K1413106-020	1.31	13.55	9.62	8.31	61.3	
	K1413106-021	1.33	10.82	6.66	5.33	49.3	
	K1413106-022	1.33	9.64	7.56	6.23	64.6	

	Oven ID	Temp In	Temp Out	Date In	Time In	Date Out	Time Out	Thermometer ID
Oven1	K-OVEN 07	105	105	11/21/2014	11:50	11/24/2014	08:02	

	Cal EQID	Cal Start Value	Cal End Value	Start Date	Start Time	End Date	End Time
Calibration1	K-Balance-16	1.00, 99.99	1.00, 99.99	11/21/2014	09:23	11/21/2014	10:22
Calibration2	K-Balance-16	1.00, 99.99	1.00, 99.99	11/24/2014	08:17	11/24/2014	08:20

11/24/14

Comments: ZR

Analytical Results Summary

Instrument Name: K-Balance-16 **Analyst:** DMADDEN **Analysis Lot:** 422476 **Method/Testcode:** 160.3 Modified/TS-Air Dried

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
K1412953-001	Solids, Total	N/A		Solid Fuel	92.90 Percent	11.32 g	92.9 Percent	1					11/21/14 11:50	N	I
K1412953-002	Solids, Total	N/A		Solid Fuel	90.50 Percent	10.72 g	90.5 Percent	1					11/21/14 11:50	N	I
K1412953-003	Solids, Total	N/A		Solid Fuel	91.60 Percent	9.82 g	91.6 Percent	1					11/21/14 11:50	N	I
K1412953-004	Solids, Total	N/A		Solid Fuel	94.80 Percent	10.15 g	94.8 Percent	1					11/21/14 11:50	N	I
K1413106-001	Solids, Total	N/A		Sediment	46.00 Percent	9.97 g	46.0 Percent	1					11/21/14 11:50	N	IV
K1413106-002	Solids, Total	N/A		Sediment	60.60 Percent	13.87 g	60.6 Percent	1					11/21/14 11:50	N	IV
K1413106-003	Solids, Total	N/A		Sediment	52.40 Percent	10.72 g	52.4 Percent	1					11/21/14 11:50	N	IV
K1413106-004	Solids, Total	N/A		Sediment	51.90 Percent	9.60 g	51.9 Percent	1					11/21/14 11:50	N	IV
K1413106-007	Solids, Total	N/A		Sediment	42.90 Percent	11.78 g	42.9 Percent	1					11/21/14 11:50	N	IV
K1413106-009	Solids, Total	N/A		Sediment	47.80 Percent	12.24 g	47.8 Percent	1					11/21/14 11:50	N	IV
K1413106-010	Solids, Total	N/A		Sediment	56.60 Percent	9.52 g	56.6 Percent	1					11/21/14 11:50	N	IV
K1413106-011	Solids, Total	N/A		Sediment	63.20 Percent	9.87 g	63.2 Percent	1					11/21/14 11:50	N	IV
K1413106-014	Solids, Total	N/A		Sediment	49.10 Percent	10.45 g	49.1 Percent	1					11/21/14 11:50	N	IV
K1413106-015	Solids, Total	N/A		Sediment	60.00 Percent	9.96 g	60.0 Percent	1					11/21/14 11:50	N	IV
K1413106-016	Solids, Total	N/A		Sediment	43.30 Percent	9.90 g	43.3 Percent	1					11/21/14 11:50	N	IV
K1413106-017	Solids, Total	N/A		Sediment	62.00 Percent	15.42 g	62.0 Percent	1					11/21/14 11:50	N	IV
K1413106-019	Solids, Total	N/A		Sediment	63.80 Percent	13.41 g	63.8 Percent	1					11/21/14 11:50	N	IV
K1413106-020	Solids, Total	N/A		Sediment	61.30 Percent	13.55 g	61.3 Percent	1					11/21/14 11:50	N	IV
K1413106-021	Solids, Total	N/A		Sediment	49.30 Percent	10.82 g	49.3 Percent	1					11/21/14 11:50	N	IV
K1413106-022	Solids, Total	N/A		Sediment	64.60 Percent	9.64 g	64.6 Percent	1					11/21/14 11:50	N	IV
KQ1415300-01	Solids, Total	DUP	K1412953-001	Solid Fuel	92.90 Percent	11.00 g	92.9 Percent	1				<1	11/21/14 11:50	N	I
KQ1415300-02	Solids, Total	DUP	K1413106-001	Sediment	45.50 Percent	11.01 g	45.5 Percent	1				1	11/21/14 11:50	N	IV

35

' indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Benchsheet

Service Request #:	K1413105, KQ1415336, K1413106, K1413085	Run #:	422563
Test:	TS	Balance ID:	K-Balance-16
Method:	160.3 Modified		

Pan ID:	Lab Code:	Tare (g)	Wet Wt. (g)	Tare + Dry Wt. (g)	Dry Weight (g)	% Total Solids	RPD
	K1413105-023	1.33	11.07	7.66	6.33	57.2	
	K1413105-023DUP	1.32	10.74	7.53	6.21	57.8	1
	K1413105-024	1.32	13.22	9.27	7.95	60.1	
	K1413105-026	1.33	10.03	8.77	7.44	74.2	
	K1413105-027	1.32	11.88	6.88	5.56	46.8	
	K1413105-028	1.33	10.67	9.22	7.89	73.9	
	K1413106-023	1.32	9.99	8.47	7.15	71.6	
	K1413106-024	1.32	11.55	9.08	7.76	67.2	
	K1413085-001	1.33	11.17	11.68	10.4	92.7	
	K1413085-001DUP	1.32	9.92	10.44	9.12	91.9	<1
	K1413085-002	1.33	10.92	11.49	10.2	93.0	
	K1413085-003	1.33	11.29	11.68	10.4	91.7	
	K1413085-004	1.33	9.55	10.06	8.73	91.4	
	K1413085-005	1.31	13.07	11.30	9.99	76.4	
	K1413085-006	1.32	10.69	10.37	9.05	84.7	
	K1413085-007	1.33	10.81	11.20	9.87	91.3	
	K1413085-008	1.33	11.39	11.54	10.2	89.6	
	K1413085-009	1.33	11.07	9.93	8.60	77.7	
	K1413085-010	1.33	10.80	11.22	9.89	91.6	
	K1413085-011	1.34	10.77	11.28	9.94	92.3	
	K1413085-012	1.32	11.58	12.08	10.8	92.9	
	K1413085-013	1.32	10.66	10.78	9.46	88.7	

	Oven ID	Temp In	Temp Out	Date In	Time In	Date Out	Time Out	Thermometer ID
Oven1	K-OVEN 07	105	105	11/21/2014	15:21	11/24/2014	08:05	

	Cal EQID	Cal Start Value	Cal End Value	Start Date	Start Time	End Date	End Time
Calibration1	K-Balance-16	1.00, 99.99	1.00, 99.99	11/21/2014	14:30	11/21/2014	15:21
Calibration2	K-Balance-16	1.00, 99.99	1.00, 99.99	11/24/2014	08:33	11/24/2014	08:36

11/24/14

Comments: ZR

Analytical Results Summary

nstrument Name: K-Balance-16 **Analyst:** DMADDEN **Analysis Lot:** 422563 **Method/Testcode:** 160.3 Modified/TS

b Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
413085-001	Solids, Total	N/A		Soil	92.70 Percent	11.17 g	92.7 Percent	1					11/21/14 15:21	N	II
413085-002	Solids, Total	N/A		Soil	93.00 Percent	10.92 g	93.0 Percent	1					11/21/14 15:21	N	II
413085-003	Solids, Total	N/A		Soil	91.70 Percent	11.29 g	91.7 Percent	1					11/21/14 15:21	N	II
413085-004	Solids, Total	N/A		Soil	91.40 Percent	9.55 g	91.4 Percent	1					11/21/14 15:21	N	II
413085-005	Solids, Total	N/A		Soil	76.40 Percent	13.07 g	76.4 Percent	1					11/21/14 15:21	N	II
413085-006	Solids, Total	N/A		Soil	84.70 Percent	10.69 g	84.7 Percent	1					11/21/14 15:21	N	II
413085-007	Solids, Total	N/A		Soil	91.30 Percent	10.81 g	91.3 Percent	1					11/21/14 15:21	N	II
413085-008	Solids, Total	N/A		Soil	89.60 Percent	11.39 g	89.6 Percent	1					11/21/14 15:21	N	II
413085-009	Solids, Total	N/A		Soil	77.70 Percent	11.07 g	77.7 Percent	1					11/21/14 15:21	N	II
413085-010	Solids, Total	N/A		Soil	91.60 Percent	10.80 g	91.6 Percent	1					11/21/14 15:21	N	II
413085-011	Solids, Total	N/A		Soil	92.30 Percent	10.77 g	92.3 Percent	1					11/21/14 15:21	N	II
413085-012	Solids, Total	N/A		Soil	92.90 Percent	11.58 g	92.9 Percent	1					11/21/14 15:21	N	II
413085-013	Solids, Total	N/A		Soil	88.70 Percent	10.66 g	88.7 Percent	1					11/21/14 15:21	N	II
413105-023	Solids, Total	N/A		Sediment	57.20 Percent	11.07 g	57.2 Percent	1					11/21/14 15:21	N	IV
413105-024	Solids, Total	N/A		Sediment	60.10 Percent	13.22 g	60.1 Percent	1					11/21/14 15:21	N	IV
413105-026	Solids, Total	N/A		Sediment	74.20 Percent	10.03 g	74.2 Percent	1					11/21/14 15:21	N	IV
413105-027	Solids, Total	N/A		Sediment	46.80 Percent	11.88 g	46.8 Percent	1					11/21/14 15:21	N	IV
413105-028	Solids, Total	N/A		Sediment	73.90 Percent	10.67 g	73.9 Percent	1					11/21/14 15:21	N	IV
413106-023	Solids, Total	N/A		Sediment	71.60 Percent	9.99 g	71.6 Percent	1					11/21/14 15:21	N	IV
413106-024	Solids, Total	N/A		Sediment	67.20 Percent	11.55 g	67.2 Percent	1					11/21/14 15:21	N	IV
)1415336-01	Solids, Total	DUP	K1413105-023	Sediment	57.80 Percent	10.74 g	57.8 Percent	1				1	11/21/14 15:21	N	IV
)1415336-02	Solids, Total	DUP	K1413085-001	Soil	91.90 Percent	9.92 g	91.9 Percent	1				<1	11/21/14 15:21	N	II

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ndicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Work Request # (Original) K1413105, 13106

Tier: IV IV

Date Analyzed: 12/19/14

Analyst: AB

Analysis: Toc Soil / 9060 Run # 426764

DATA QUALITY REPORT
INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1.	Is the method name and number correct and appropriate?	yes/no/NA
2.	Holding times met for all analyses and for all samples?	yes/no/NA
3.	Are calculations correct?	yes/no/NA
4.	Is the reporting basis correct? (Dry Weight)	yes/no/NA
5.	All quality control criteria met?	yes/no
6.	Is the calibration curve correlation coefficient ≥ 0.995?	yes/no/NA
7.	MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?	yes/no/NA
8.	Are ICVs, CCVs, and CCBs all within acceptance limits?	yes/no/NA
9.	Are results for methods blanks all ND?	yes/no/NA
10.	Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)	yes/no/NA
11.	Are all exceptions explained?	yes/no/NA
12.	Have all applicable service requests been reviewed?	yes/no/NA
13.	Are all samples labeled correctly?	yes/no/NA
14.	Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V)	yes/no/NA
15.	Are detection limits and units reported correctly?	yes/no/NA
16.	Is the unused space on the benchsheet crossed out?	yes/no/NA
17.	Was analysis turned in by the due date? (n-2) (If not record SR#)	yes/no/NA Late

COMMENTS:

Final Approved by: [signature] Date: 12/23/14

DQREPORT

Analytical Results Summary

Instrument Name: K-TOC-04 **Analyst:** DBRADBURY **Analysis Lot:** 426764 **Method/Testcode:** 9060/TOC

ab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
1413105-018	Carbon Organic (TOC)	N/A		Sediment	0.18 Percent		0.18 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-019	Carbon Organic (TOC)	N/A		Sediment	0.73 Percent		0.73 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-020	Carbon Organic (TOC)	N/A		Sediment	2.65 Percent		2.65 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-021	Carbon Organic (TOC)	N/A		Sediment	0.20 Percent		0.20 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-022	Carbon Organic (TOC)	N/A		Sediment	0.12 Percent		0.12 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-023	Carbon Organic (TOC)	N/A		Sediment	1.44 Percent		1.44 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-024	Carbon Organic (TOC)	N/A		Sediment	3.61 Percent		3.61 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-026	Carbon Organic (TOC)	N/A		Sediment	0.19 Percent		0.19 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-027	Carbon Organic (TOC)	N/A		Sediment	14.23 Percent		14.2 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413105-028	Carbon Organic (TOC)	N/A		Sediment	0.13 Percent		0.13 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413106-001	Carbon Organic (TOC)	N/A		Sediment	2.56 Percent		2.56 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413106-002	Carbon Organic (TOC)	N/A		Sediment	0.27 Percent		0.27 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413106-003	Carbon Organic (TOC)	N/A		Sediment	0.39 Percent		0.39 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413106-004	Carbon Organic (TOC)	N/A		Sediment	0.27 Percent		0.27 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
1413106-007	Carbon Organic (TOC)	N/A		Sediment	2.33 Percent		2.33 Percent	1	0.02	0.10			12/19/14 10:06:00	N	IV
Q1416756-01	Carbon Organic (TOC)	DUP	K1413105-018	Sediment	0.18 Percent		0.18 Percent	1	0.02	0.10		<1	12/19/14 10:06:00	N	IV
Q1416756-02	Carbon Organic (TOC)	MS	K1413105-018	Sediment	2.77 Percent		2.77 Percent	1	0.02	0.10	108		12/19/14 10:06:00	N	IV
Q1416756-03	Carbon Organic (TOC)	DMS	K1413105-018	Sediment	2.56 Percent		2.56 Percent	1	0.02	0.10	100	8	12/19/14 10:06:00	N	IV
Q1416756-04	Carbon Organic (TOC)	LCS		Sediment	0.24 Percent		0.240 Percent	1	0.02	0.10	87		12/19/14 10:06:00	N	IV
Q1416756-05	Carbon Organic (TOC)	MB		Sediment	0.01 Percent		0.10 Percent U	1	0.02	0.10			12/19/14 10:06:00	N	IV
Q1416757-01	Carbon Organic (TOC)	CCV		Sediment	12.85 Percent		12.9 Percent	1			107		12/19/14 10:06:00	N	IV
Q1416757-02	Carbon Organic (TOC)	CCV		Sediment	13.04 Percent		13.0 Percent	1			109		12/19/14 10:06:00	N	IV
Q1416757-03	Carbon Organic (TOC)	CCV		Sediment	12.77 Percent		12.8 Percent	1			106		12/19/14 10:06:00	N	IV
Q1416757-04	Carbon Organic (TOC)	CCB		Sediment	0.01 Percent		0.10 Percent U	1	0.02	0.10			12/19/14 10:06:00	N	IV
Q1416757-05	Carbon Organic (TOC)	CCB		Sediment	0.01 Percent		0.10 Percent U	1	0.02	0.10			12/19/14 10:06:00	N	IV
Q1416757-06	Carbon Organic (TOC)	CCB		Sediment	0.01 Percent		0.10 Percent U	1	0.02	0.10			12/19/14 10:06:00	N	IV

AB 12/23/14

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indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

aj-analyzer multi EA 4000; multiWin 5.2; Serial number: N4-138/M
% TOTAL ORGANIC CARBON

AnalysisGroup

AnalysisGroup: % TOC

Remark: % Total Organic Carbon

Run # 426764

Created on: 3/16/2013 11:53:50 AM
Last modification: 12/19/2014 3:06:57 PM
State: solid

Analysis name	Result (average)	Sample quantity	Time of analysis
CCV	TC: 12.85%	25.200mg % REC = 107	12/19/2014 10:06:38 AM
CCB	TC: 0.012%	250.000mg	12/19/2014 10:20:20 AM
LCS	TC: 0.24%	252.100mg % REC = 87	12/19/2014 10:28:32 AM
MB	TC: 0.012%	250.000mg	12/19/2014 10:38:34 AM
K1413105-018	TC: 0.18%	250.700mg	12/19/2014 10:46:46 AM
K1413105-018d	TC: 0.18%	251.100mg	12/19/2014 10:56:54 AM
K1413105-018ms	TC: 2.77%	127.100mg	12/19/2014 11:07:04 AM
K1413105-018msd	TC: 2.56%	127.700mg	12/19/2014 11:24:11 AM
K1413105-019	TC: 0.73%	252.700mg	12/19/2014 11:38:12 AM
K1413105-020	TC: 2.65%	251.600mg	12/19/2014 11:48:42 AM
K1413105-021	TC: 0.20%	251.800mg	12/19/2014 12:02:15 PM
K1413105-022	TC: 0.12%	251.900mg	12/19/2014 12:12:21 PM
CCV	TC: 13.04%	25.100mg % REC = 107	12/19/2014 12:22:37 PM
CCB	TC: 0.012%	250.000mg	12/19/2014 12:37:31 PM
K1413105-023	TC: 1.44%	251.800mg	12/19/2014 12:45:47 PM
K1413105-024	TC: 3.61%	250.900mg	12/19/2014 12:57:32 PM
K1413105-026	TC: 0.19%	251.700mg	12/19/2014 1:13:36 PM
K1413105-027	TC: 14.23%	251.800mg	12/19/2014 1:23:42 PM
K1413105-028	TC: 0.13%	251.900mg	12/19/2014 1:40:22 PM
K1413106-001	TC: 2.56%	250.900mg	12/19/2014 1:50:40 PM
K1413106-002	TC: 0.27%	252.500mg	12/19/2014 2:01:56 PM
K1413106-003	TC: 0.39%	251.600mg	12/19/2014 2:12:01 PM
K1413106-004	TC: 0.27%	252.900mg	12/19/2014 2:22:04 PM
K1413106-007	TC: 2.33%	252.500mg	12/19/2014 2:32:07 PM
CCV	TC: 12.77%	25.100mg % REC = 106	12/19/2014 2:45:15 PM
CCB	TC: 0.012%	250.000mg	12/19/2014 2:59:11 PM

Prep # 220147
Run # 426764

Service Request: K1413105, K1413106 **Method:** EPA 9060

Date Weighed: 12/18/14 **Analysis:** Total Organic Carbon in Soil

Analyst: AB **Reviewed By:** _____

Sample Position	Sample ID	Weight (mg)
1	Clean	NA
2	CCV	25.2
3	CCB	250.0
4	LCS	252.1
5	MB	250.0
6	K1413105-018	250.7
7	K1413105-018d	251.1
8	K1413105-018ms	127.1
9	K1413105-018msd	127.7
10	K1413105-019	252.7
11	K1413105-020	251.6
12	K1413105-021	251.8
13	K1413105-022	251.9
14	CCV	25.1
15	CCB	250.0
16	K1413105-023	251.8
17	K1413105-024	250.9
18	K1413105-026	251.7
19	K1413105-027	251.8
20	K1413105-028	251.9
21	K1413106-001	250.9
22	K1413106-002	252.5
23	K1413106-003	251.6
24	K1413106-004	252.9

Sample Position	Sample ID	Weight (mg)
25	K1413106-007	252.5
26	CCV	25.1
27	CCB	250.0
28		
29		
30		
31		
32		
33		
34		
35		
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42		
43		
44		
45		
46		
47		
48		

MS CaCO3 (mg)	K1413105-018ms	25.4
MSD CaCO3 (mg)	K1413105-018msd	25.4

Balance ID: K-BALANCE-38 **Oven ID:** K-OVEN-01

HCL ID: TOC/2-81-C **Thermometer ID:** K31316

CCV: CaCO3, Alfa Aesar, ID: 13-TOC-01-1C, Lot # J05X011, TV = 12.0% % REC = 107, 109, 106

LCS: Nutrients in Soil, ERA, ID: TOCS/1-17-D, Lot # D076-542, TV = 0.275% % REC = 87

MS: (mg CCV)(% TV CCV) / (mg sample) = (12)(25.4) / 127.1 = 2.40 % REC = 108

MSD: (mg CCV)(% TV CCV) / (mg sample) = (12)(25.4) / 127.7 = 2.39 % REC = 100

Work Request # Original ( ) K1413106, 14138

Tier: IV V

Date Analyzed: 12/19/14

Analyst: AB

Analysis: TOC Soil/9060

Run # 926765

DATA QUALITY REPORT
INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1.	Is the method name and number correct and appropriate?	(yes/no/NA
2.	Holding times met for all analyses and for all samples?	(yes/no/NA
3.	Are calculations correct?	(yes/no/NA
4.	Is the reporting basis correct? (Dry Weight)	(yes/no/NA
5.	All quality control criteria met?	(yes/no
6.	Is the calibration curve correlation coefficient ≥ 0.995?	(yes/no/NA
7.	MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?	(yes/no/NA
8.	Are ICVs, CCVs, and CCBs all within acceptance limits?	(yes/no/NA
9.	Are results for methods blanks all ND?	(yes/no/NA
10.	Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)	(yes/no/NA
11.	Are all exceptions explained?	yes/no(NA)
12.	Have all applicable service requests been reviewed?	(yes/no/NA
13.	Are all samples labeled correctly?	(yes/no/NA
14.	Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V)	(yes/no/NA
15.	Are detection limits and units reported correctly?	(yes/no/NA
16.	Is the unused space on the benchsheet crossed out?	(yes/no/NA
17.	Was analysis turned in by the due date? (n-2) (If not record SR#)	yes/no(NA) Late

COMMENTS:

Final Approved by: [signature] Date: 12/23/14

DOREPORT

Analytical Results Summary

Instrument Name: K-TOC-04 **Analyst:** DBRADBURY **Analysis Lot:** 426765 **Method/Testcode:** 9060/TOC

ab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	POL	% Rec	% RSD	Date Analyzed	QC?	Tier
1413106-009	Carbon Organic (TOC)	N/A		Sediment	0.04 Percent		0.04 Percent J	1	0.02	0.10			12/19/14 16:40:00	N	IV
1413106-010	Carbon Organic (TOC)	N/A		Sediment	0.45 Percent		0.45 Percent	1	0.02	0.10			12/19/14 16:40:00	N	IV
1413106-011	Carbon Organic (TOC)	N/A		Sediment	0.13 Percent		0.13 Percent	1	0.02	0.10			12/19/14 16:40:00	N	IV
1413106-014	Carbon Organic (TOC)	N/A		Sediment	0.98 Percent		0.98 Percent	1	0.02	0.10			12/19/14 16:40:00	N	IV
1413106-015	Carbon Organic (TOC)	N/A		Sediment	0.23 Percent		0.23 Percent	1	0.02	0.10			12/19/14 16:40:00	N	IV
1413106-016	Carbon Organic (TOC)	N/A		Sediment	3.51 Percent		3.51 Percent	1	0.02	0.10			12/19/14 16:40:00	N	IV
1413106-017	Carbon Organic (TOC)	N/A		Sediment	0.41 Percent		0.41 Percent	1	0.02	0.10			12/19/14 16:40:00	N	IV
1413106-019	Carbon Organic (TOC)	N/A		Sediment	0.36 Percent		0.36 Percent	1	0.02	0.10			12/19/14 16:40:00	N	IV
1413106-020	Carbon Organic (TOC)	N/A		Sediment	0.42 Percent		0.42 Percent	1	0.02	0.10			12/19/14 16:40:00	N	IV
1413106-021	Carbon Organic (TOC)	N/A		Sediment	0.96 Percent		0.96 Percent	1	0.02	0.10			12/19/14 16:40:00	N	IV
1413106-022	Carbon Organic (TOC)	N/A		Sediment	0.24 Percent		0.24 Percent	1	0.02	0.10			12/19/14 16:40:00	N	IV
1413106-023	Carbon Organic (TOC)	N/A		Sediment	0.15 Percent		0.15 Percent	1	0.02	0.10			12/19/14 16:40:00	N	IV
1413106-024	Carbon Organic (TOC)	N/A		Sediment	0.28 Percent		0.28 Percent	1	0.02	0.10			12/19/14 16:40:00	N	IV
1414188-001	Carbon Organic (TOC)	N/A		Misc. Solid	59.43 Percent		59.4 Percent	1	0.02	0.10			12/19/14 16:40:00	N	V
Q1416758-01	Carbon Organic (TOC)	DUP	K1413106-009	Sediment	0.03 Percent		0.03 Percent J	1	0.02	0.10		25*	12/19/14 16:40:00	N	IV
Q1416758-02	Carbon Organic (TOC)	MS	K1413106-009	Sediment	2.49 Percent		2.49 Percent	1	0.02	0.10	102		12/19/14 16:40:00	N	IV
Q1416758-03	Carbon Organic (TOC)	DMS	K1413106-009	Sediment	2.45 Percent		2.45 Percent	1	0.02	0.10	101	2	12/19/14 16:40:00	N	IV
Q1416758-04	Carbon Organic (TOC)	LCS		Sediment	0.23 Percent		0.230 Percent	1	0.02	0.10	84		12/19/14 16:40:00	N	IV
Q1416758-05	Carbon Organic (TOC)	MB		Sediment	0.01 Percent		0.10 Percent U	1	0.02	0.10			12/19/14 16:40:00	N	IV
Q1416759-01	Carbon Organic (TOC)	CCV		Sediment	12.36 Percent		12.4 Percent	1			103		12/19/14 16:40:00	N	IV
Q1416759-02	Carbon Organic (TOC)	CCV		Sediment	13.05 Percent		13.1 Percent	1			109		12/19/14 16:40:00	N	IV
Q1416759-03	Carbon Organic (TOC)	CCV		Sediment	12.97 Percent		13.0 Percent	1			108		12/19/14 16:40:00	N	IV
Q1416759-04	Carbon Organic (TOC)	CCB		Sediment	0.01 Percent		0.10 Percent U	1	0.02	0.10			12/19/14 16:40:00	N	IV
Q1416759-05	Carbon Organic (TOC)	CCB		Sediment	0.01 Percent		0.10 Percent U	1	0.02	0.10			12/19/14 16:40:00	N	IV
Q1416759-06	Carbon Organic (TOC)	CCB		Sediment	0.01 Percent		0.10 Percent U	1	0.02	0.10			12/19/14 16:40:00	N	IV

AB 12/23/14

indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

aj-analyzer multi EA 4000; multiWin 5.2; Serial number: N4-138/M
% TOTAL ORGANIC CARBON

AnalysisGroup

AnalysisGroup: % TOC

Remark: % Total Organic Carbon

Run # 426765

Created on: 3/16/2013 11:53:50 AM
Last modification: 12/19/2014 9:16:31 PM
State: solid

Analysis name	Result (average)	Sample quantity	Time of analysis
CCV	TC: 12.36%	25.300mg % REC = 103	12/19/2014 4:40:21 PM
CCB	TC: 0.012%	250.000mg	12/19/2014 4:52:59 PM
LCS	TC: 0.23%	253.000mg % REC = 84	12/19/2014 5:01:11 PM
MB	TC: 0.012%	250.000mg	12/19/2014 5:11:06 PM
K1413106-009	TC: 0.040%	251.600mg	12/19/2014 5:19:22 PM
K1413106-009d	TC: 0.031%	252.300mg	12/19/2014 5:29:33 PM
K1413106-009ms	TC: 2.49%	127.000mg	12/19/2014 5:39:52 PM
K1413106-009msd	TC: 2.45%	127.500mg	12/19/2014 5:53:37 PM
K1413106-010	TC: 0.45%	253.100mg	12/19/2014 6:06:11 PM
K1413106-011	TC: 0.13%	251.600mg	12/19/2014 6:16:13 PM
K1413106-014	TC: 0.98%	251.600mg	12/19/2014 6:26:21 PM
K1413106-015	TC: 0.23%	251.900mg	12/19/2014 6:37:23 PM
CCV	TC: 13.05%	25.200mg % REC = 104	12/19/2014 6:47:31 PM
CCB	TC: 0.012%	250.000mg	12/19/2014 7:02:41 PM
K1413106-016	TC: 3.51%	250.900mg	12/19/2014 7:10:54 PM
K1413106-017	TC: 0.41%	253.300mg	12/19/2014 7:26:25 PM
K1413106-019	TC: 0.36%	250.500mg	12/19/2014 7:36:26 PM
K1413106-020	TC: 0.42%	251.000mg	12/19/2014 7:46:21 PM
K1413106-021	TC: 0.96%	252.700mg	12/19/2014 7:56:29 PM
K1413106-022	TC: 0.24%	252.600mg	12/19/2014 8:07:47 PM
K1413106-023	TC: 0.15%	251.700mg	12/19/2014 8:17:47 PM
K1413106-024	TC: 0.28%	252.300mg	12/19/2014 8:27:52 PM
K1414188-001	TC: 59.43%	25.400mg	12/19/2014 8:37:50 PM
CCV	TC: 12.97%	25.100mg % REC = 108	12/19/2014 8:54:33 PM
CCB	TC: 0.012%	250.000mg	12/19/2014 9:08:48 PM

Prep # 220103
Run # 426765

Service Request: K1413106, K1414188 **Method:** EPA 9060

Date Weighed: 12/19/14 **Analysis:** Total Organic Carbon in Soil

Analyst: AB **Reviewed By:** _____

Sample Position	Sample ID	Weight (mg)
1	Clean	NA
2	CCV	25.3
3	CCB	250.0
4	LCS	253.0
5	MB	250.0
6	K1413106-009	251.6
7	K1413106-009d	252.3
8	K1413106-009ms	127.0
9	K1413106-009msd	127.5
10	K1413106-010	253.1
11	K1413106-011	251.6
12	K1413106-014	251.6
13	K1413106-015	251.9
14	CCV	25.2
15	CCB	250.0
16	K1413106-016	250.9
17	K1413106-017	253.3
18	K1413106-019	250.5
19	K1413106-020	251.0
20	K1413106-021	252.7
21	K1413106-022	252.6
22	K1413106-023	251.7
23	K1413106-024	252.3
24	K1414188-001	25.4

Sample Position	Sample ID	Weight (mg)
25	CCV	25.1
26	CCB	250.0
27		
28		
29		
30		
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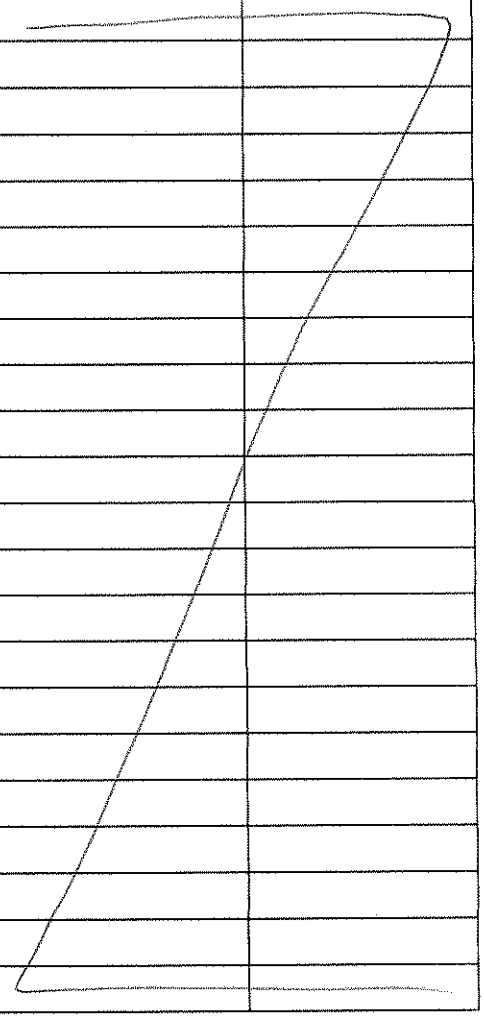

MS CaCO3 (mg)	K1413106-009ms	25.5
MSD CaCO3 (mg)	K1413106-009msd	25.4

Balance ID: K-BALANCE-38 **Oven ID:** K-OVEN-01

HCL ID: TOC/2-81-C **Thermometer ID:** K31316

CCV: CaCO3, Alfa Aesar, ID: 13-TOC-01-1C, Lot # J05X011, TV = 12.0% % REC = 103, 109, 108

LCS: Nutrients in Soil, ERA, ID: TOCS/1-17-D, Lot # D076-542, TV = 0.275% % REC = 84

MS: (mg CCV)(% TV CCV) / (mg sample) = (25.5)(12) / 127.0 = 2.41 % REC = 102

MSD: (mg CCV)(% TV CCV) / (mg sample) = (25.4)(12) / 127.5 = 2.39 % REC = 101

Work Request # (Original) L1413D6

Tier:

Date Analyzed: 11/26/14, 1/5/14

Analyst: ER/CC/CS

Analysis: G.S.

423901

DATA QUALITY REPORT
INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1.	Is the method name and number correct and appropriate?	yes/no/NA
2.	Holding times met for all analyses and for all samples?	yes/no/NA
3.	Are calculations correct?	yes/no/NA
4.	Is the reporting basis correct? (Dry Weight)	yes/no/NA
5.	All quality control criteria met?	yes/no
6.	Is the calibration curve correlation coefficient ≥ 0.995?	yes/no/NA
7.	MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?	yes/no/NA
8.	Are ICVs, CCVs, and CCBs all within acceptance limits?	yes/no/NA
9.	Are results for methods blanks all ND?	yes/no/NA
10.	Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)	yes/no/NA
11.	Are all exceptions explained?	yes/no/NA
12.	Have all applicable service requests been reviewed?	yes/no/NA
13.	Are all samples labeled correctly?	yes/no/NA
14.	Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V)	yes/no/NA
15.	Are detection limits and units reported correctly?	yes/no/NA
16.	Is the unused space on the benchsheet crossed out?	yes/no/NA
17.	Was analysis turned in by the due date? (n-2) (If not record SR#)	yes/no/NA

COMMENTS:

samples 14, 20, 21 were re-analyzed due to % of total wt. recovered failure. L1413D6-14 still failed. A duplicate was also analyzed and produced results within acceptance limits but somewhat to the sample (RPD<20%). Limited sample #14 - no triplicate analyzed.

Final Approved by: GR Date: 1/12/15

DQREPORT

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413106
Sample #: K1413106-001

Client:	Industrial Economics, Inc.	Sample Name:	3594
Project:	Portland Harbor 2014/Ross	Date Collected:	9/25/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0305	N/A
V.C. Sand, 1.00 mm (g)	18	0.0846	N/A
C. Sand, 0.500 mm (g)	35	0.0633	N/A
M. Sand, 0.250 mm (g)	60	0.4132	N/A
F. Sand, 0.125 mm (g)	120	5.7660	N/A
V.F. Sand, 0.0625 mm (g)	230	4.5545	N/A
S/C <0.0625 mm (g)	Pan	1.4154	N/A

Total (g) Recov'd	12.3275
Total (%) Recov'd	99.7

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	113.2311
Grams Beaker(Tare)	100.8668
GramsGravel/Sand	12.3643

I. Sample Preparation

Grams As Received Sample	41.0883
Percent (%) Solids	46.0
Grams Oven Dried Sample	18.9006

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	30.7569	40.4038	34.1489	44.8813	30.7358	41.9895	41.5748
Grams of Tare	30.6130	40.3107	34.0984	44.8516	30.7192	41.9823	41.5723
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.1417	0.0909	0.0483	0.0275	0.0144	0.0050	0.0003
Total Grams Sample X 50	2.5400	2.1300	1.0400	0.6550	0.4700	0.2350	0.0150

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413106
Sample #: K1413106-002

Client:	Industrial Economics, Inc.	Sample Name:	1034
Project:	Portland Harbor 2014/Ross	Date Collected:	9/25/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation

	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0000	N/A
V.C. Sand, 1.00 mm (g)	18	0.0125	N/A
C. Sand, 0.500 mm (g)	35	0.1853	N/A
M. Sand, 0.250 mm (g)	60	8.2959	N/A
F. Sand, 0.125 mm (g)	120	21.4584	N/A
V.F. Sand, 0.0625 mm (g)	230	2.6720	N/A
S/C <0.0625 mm (g)	Pan	0.7722	N/A

Total (g) Recov'd	33.3963
Total (%) Recov'd	100

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	138.2521
Grams Beaker(Tare)	104.8099
GramsGravel/Sand	33.4422

I. Sample Preparation

Grams As Received Sample	60.1697
Percent (%) Solids	60.6
Grams Oven Dried Sample	36.4628

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	30.9390	40.5091	33.6282	31.2317	29.7078	30.5613	34.0664
Grams of Tare	30.8817	40.4768	33.6067	31.2179	29.6976	30.5554	34.0614
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0551	0.0301	0.0193	0.0116	0.0080	0.0037	0.0028
Total Grams Sample X 50	1.2500	0.5400	0.3850	0.1800	0.2150	0.0450	0.1400

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413106
Sample #: K1413106-003

Client:	Industrial Economics, Inc.	Sample Name:	1546
Project:	Portland Harbor 2014/Ross	Date Collected:	9/25/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0000	N/A
V.C. Sand, 1.00 mm (g)	18	0.0159	N/A
C. Sand, 0.500 mm (g)	35	0.0104	N/A
M. Sand, 0.250 mm (g)	60	0.2103	N/A
F. Sand, 0.125 mm (g)	120	3.4063	N/A
V.F. Sand, 0.0625 mm (g)	230	8.2712	N/A
S/C <0.0625 mm (g)	Pan	1.3041	N/A

Total (g) Recov'd	13.2182
Total (%) Recov'd	100.8

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	115.4153
Grams Beaker(Tare)	102.2975
GramsGravel/Sand	13.1178

I. Sample Preparation

Grams As Received Sample	44.1903
Percent (%) Solids	37.6
Grams Oven Dried Sample	16.6156

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	31.3305	31.9696	30.0009	33.6335	40.0032	28.6443	30.2843
Grams of Tare	31.2496	31.9388	29.9860	33.6225	39.9957	28.6394	30.2803
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0787	0.0286	0.0127	0.0088	0.0053	0.0027	0.0018
Total Grams Sample X 50	2.5050	0.7950	0.1950	0.1750	0.1300	0.0450	0.0900

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413106
Sample #: K14113106-014

Client:	Industrial Economics, Inc.	Sample Name:	6410
Project:	Portland Harbor 2014	Date Collected:	9/25/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	1/5/2015

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.2871	N/A
V.C. Sand, 1.00 mm (g)	18	0.0252	N/A
C. Sand, 0.500 mm (g)	35	0.1367	N/A
M. Sand, 0.250 mm (g)	60	10.0132	N/A
F. Sand, 0.125 mm (g)	120	22.2367	N/A
V.F. Sand, 0.0625 mm (g)	230	8.7247	N/A
S/C <0.0625 mm (g)	Pan	2.8655	N/A

Total (g) Recov'd	44.2891
Total (%) Recov'd	99.7

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	150.0059
Grams Beake(Tare)	105.5919
GramsGravel/Sand	44.4140

I. Sample Preparation

Grams As Received Sample	93.8945
Percent (%) Solids	49.1
Grams Oven Dried Sample	46.1022

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	29.7911	31.9162	31.4044	31.1490	28.0432	30.7517	31.3358
Grams of Tare	29.5268	31.7915	31.3389	31.1065	28.0169	30.7354	31.3244
Grams of Dispersant Correction	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021
Grams of Sample	0.2622	0.1226	0.0634	0.0404	0.0242	0.0142	0.0093
Total Grams Sample X 50	6.9800	2.9600	1.1500	0.8100	0.5000	0.2450	0.4650

Analyst: CC/CS Date: 1/5/2015
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413106
Sample #: K1413106-14 DUP

Client:	Industrial Economics, Inc.	Sample Name:	6410
Project:	Portland Harbor 2014	Date Collected:	9/25/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	1/5/2015

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0000	N/A
V.C. Sand, 1.00 mm (g)	18	0.0081	N/A
C. Sand, 0.500 mm (g)	35	0.1564	N/A
M. Sand, 0.250 mm (g)	60	9.6956	N/A
F. Sand, 0.125 mm (g)	120	19.3458	N/A
V.F. Sand, 0.0625 mm (g)	230	8.7159	N/A
S/C <0.0625 mm (g)	Pan	3.6335	N/A

Total (g) Recov'd	41.5553
Total (%) Recov'd	100.1

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	142.9901
Grams Beake(Tare)	101.4806
GramsGravel/Sand	41.5095

I. Sample Preparation

Grams As Received Sample	100.0933
Percent (%) Solids	49.1
Grams Oven Dried Sample	49.1458

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	31.6392	29.3407	30.7631	27.9133	30.3312	29.4470	29.4136
Grams of Tare	31.3192	29.1553	30.6591	27.8416	30.2800	29.4146	29.3936
Grams of Dispersant Correction	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021
Grams of Sample	0.3179	0.1833	0.1019	0.0696	0.0491	0.0303	0.0179
Total Grams Sample X 50	6.7300	4.0700	1.6150	1.0265	0.9385	0.6200	0.8950

Analyst: CC Date: 1/5/2015
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413106
Sample #: K1413106-014

Client:	Industrial Economics, Inc.	Sample Name:	6410
Project:	Portland Harbor 2014/Ross	Date Collected:	9/25/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation

	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0000	N/A
V.C. Sand, 1.00 mm (g)	18	0.0000	N/A
C. Sand, 0.500 mm (g)	35	0.0000	N/A
M. Sand, 0.250 mm (g)	60	1.3930	N/A
F. Sand, 0.125 mm (g)	120	3.8920	N/A
V.F. Sand, 0.0625 mm (g)	230	2.8938	N/A
S/C <0.0625 mm (g)	Pan	1.1894	N/A

NR

Total (g) Recov'd	9.3682
Total (%) Recov'd	100.2

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	114.3255
Grams Beaker(Tare)	104.9785
GramsGravel/Sand	9.3470

I. Sample Preparation

Grams As Received Sample	39.9681
Percent (%) Solids	49.1
Grams Oven Dried Sample	19.6243

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	41.6043	34.7397	41.9586	33.8132	39.6212	31.5515	31.7956
Grams of Tare	41.4789	34.6603	41.9176	33.7891	39.6075	31.5430	31.7902
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.1232	0.0772	0.0388	0.0219	0.0115	0.0063	0.0032
Total Grams Sample X 50	2.3000	1.9200	0.8450	0.5200	0.2600	0.1550	0.1600

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413106
Sample #: K1413106-016

Client:	Industrial Economics, Inc.
Project:	Portland Harbor 2014/Ross
Sample Matrix:	Sediment

Sample Name:	5642
Date Collected:	9/25/2014
Date Received:	11/3/2014
Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0000	N/A
V.C. Sand, 1.00 mm (g)	18	0.0167	N/A
C. Sand, 0.500 mm (g)	35	0.0223	N/A
M. Sand, 0.250 mm (g)	60	0.6919	N/A
F. Sand, 0.125 mm (g)	120	5.4984	N/A
V.F. Sand, 0.0625 mm (g)	230	2.5974	N/A
S/C <0.0625 mm (g)	Pan	0.8990	N/A

Total (g) Recov'd	9.7257
Total (%) Recov'd	100

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	122.1405
Grams Beaker(Tare)	112.3965
GramsGravel/Sand	9.7440

I. Sample Preparation

Grams As Received Sample	38.0085
Percent (%) Solids	43.3
Grams Oven Dried Sample	16.4577

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	31.2147	29.9145	30.5042	31.4429	30.9534	39.5720	31.7214
Grams of Tare	31.0583	29.8032	30.4465	31.4128	30.9385	39.5658	31.7165
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.1542	0.1091	0.0555	0.0279	0.0127	0.0040	0.0027
Total Grams Sample X 50	2.2550	2.6800	1.3800	0.7600	0.4350	0.0650	0.1350

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413106
Sample #: K1413106-017

Client:	Industrial Economics, Inc.
Project:	Portland Harbor 2014/Ross
Sample Matrix:	Sediment

Sample Name:	5130
Date Collected:	9/25/2014
Date Received:	11/3/2014
Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0000	N/A
V.C. Sand, 1.00 mm (g)	18	0.0236	N/A
C. Sand, 0.500 mm (g)	35	0.0842	N/A
M. Sand, 0.250 mm (g)	60	9.1836	N/A
F. Sand, 0.125 mm (g)	120	27.0318	N/A
V.F. Sand, 0.0625 mm (g)	230	3.3062	N/A
S/C <0.0625 mm (g)	Pan	0.3956	N/A

Total (g) Recov'd	40.0250
Total (%) Recov'd	100.3

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	151.3492
Grams Beaker(Tare)	111.4528
GramsGravel/Sand	39.8964

I. Sample Preparation

Grams As Received Sample	78.6661
Percent (%) Solids	54.6
Grams Oven Dried Sample	42.9517

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	27.5582	30.7458	40.2127	33.6781	28.5306	31.5802	30.0956
Grams of Tare	27.5065	30.7083	40.1876	33.6614	28.5227	31.5741	30.0908
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0495	0.0353	0.0229	0.0145	0.0057	0.0039	0.0026
Total Grams Sample X 50	0.7100	0.6200	0.4200	0.4400	0.0900	0.0650	0.1300

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413106
Sample #: K1413106-019

Client:	Industrial Economics, Inc.	Sample Name:	8458
Project:	Portland Harbor 2014/Ross	Date Collected:	9/25/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0000	N/A
V.C. Sand, 1.00 mm (g)	18	0.0781	N/A
C. Sand, 0.500 mm (g)	35	1.0450	N/A
M. Sand, 0.250 mm (g)	60	22.7737	N/A
F. Sand, 0.125 mm (g)	120	26.7238	N/A
V.F. Sand, 0.0625 mm (g)	230	4.7700	N/A
S/C <0.0625 mm (g)	Pan	0.8767	N/A

Total (g) Recov'd	56.2673
Total (%) Recov'd	100.0

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	161.0987
Grams Beaker(Tare)	104.8375
GramsGravel/Sand	56.2612

I. Sample Preparation

Grams As Received Sample	101.5317
Percent (%) Solids	63.8
Grams Oven Dried Sample	64.7772

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID: C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	30.5441	31.1657	42.0445	30.2879	30.3441	42.5524	29.0100
Grams of Tare	30.4810	31.1326	42.0218	30.2733	30.3347	42.5465	29.0063
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0609	0.0309	0.0205	0.0124	0.0072	0.0037	0.0015
Total Grams Sample X 50	1.5000	0.5200	0.4050	0.2600	0.1750	0.1100	0.0750

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413106
Sample #: K14113106-020

Client:	Industrial Economics, Inc.	Sample Name:	5386
Project:	Portland Harbor 2014	Date Collected:	9/25/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	1/5/2015

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0065	N/A
V.C. Sand, 1.00 mm (g)	18	0.0128	N/A
C. Sand, 0.500 mm (g)	35	0.0314	N/A
M. Sand, 0.250 mm (g)	60	5.8977	N/A
F. Sand, 0.125 mm (g)	120	32.5453	N/A
V.F. Sand, 0.0625 mm (g)	230	11.9284	N/A
S/C <0.0625 mm (g)	Pan	2.6618	N/A

Total (g) Recov'd	53.0839
Total (%) Recov'd	100

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	159.0825
Grams Beake(Tare)	105.8314
GramsGravel/Sand	53.2511

I. Sample Preparation

Grams As Received Sample	89.1315
Percent (%) Solids	61.3
Grams Oven Dried Sample	54.6376

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	31.3972	31.3649	41.7399	34.3714	30.9915	40.8236	30.0382
Grams of Tare	31.2851	31.3179	41.7109	34.3486	30.9745	40.8122	30.0296
Grams of Dispersant Correction	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021
Grams of Sample	0.1100	0.0449	0.0269	0.0207	0.0149	0.0093	0.0065
Total Grams Sample X 50	3.2550	0.9000	0.3100	0.2900	0.2800	0.1400	0.3250

Analyst: CC Date: 1/5/2015
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413106
Sample #: K1413106-020

Client:	Industrial Economics, Inc.	Sample Name:	5386
Project:	Portland Harbor 2014/Ross	Date Collected:	9/25/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0000	N/A
V.C. Sand, 1.00 mm (g)	18	0.0000	N/A
C. Sand, 0.500 mm (g)	35	0.0346	N/A
M. Sand, 0.250 mm (g)	60	3.2983	N/A
F. Sand, 0.125 mm (g)	120	14.8875	N/A
V.F. Sand, 0.0625 mm (g)	230	6.6930	N/A
S/C <0.0625 mm (g)	Pan	1.0858	N/A

Total (g) Recov'd	25.9992
Total (%) Recov'd	100

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	121.9797
Grams Beaker(Tare)	96.0813
GramsGravel/Sand	25.8984

I. Sample Preparation

Grams As Received Sample	51.1258
Percent (%) Solids	61.3
Grams Oven Dried Sample	31.3401

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	28.6628	40.8624	26.4524	31.2231	42.5015	29.9963	40.6674
Grams of Tare	28.6016	40.8394	26.4362	31.2117	42.4931	29.9905	40.6631
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0590	0.0208	0.0140	0.0092	0.0062	0.0036	0.0021
Total Grams Sample X 50	1.9100	0.3400	0.2400	0.1500	0.1300	0.0750	0.1050

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413106
Sample #: K1413106-021

Client:	Industrial Economics, Inc.	Sample Name:	7434
Project:	Portland Harbor 2014/Ross	Date Collected:	9/25/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation

	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0196	N/A
V.C. Sand, 1.00 mm (g)	18	0.0242	N/A
C. Sand, 0.500 mm (g)	35	0.0162	N/A
M. Sand, 0.250 mm (g)	60	0.2115	N/A
F. Sand, 0.125 mm (g)	120	5.8647	N/A
V.F. Sand, 0.0625 mm (g)	230	12.7372	N/A
S/C <0.0625 mm (g)	Pan	2.1810	N/A

Total (g) Recov'd	21.0544
Total (%) Recov'd	100.1

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	123.9973
Grams Beaker(Tare)	102.9629
GramsGravel/Sand	21.0344

I. Sample Preparation

Grams As Received Sample	68.5198
Percent (%) Solids	49.3
Grams Oven Dried Sample	33.7803

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	40.4842	40.6622	28.8445	29.8537	31.6905	30.4038	40.4269
Grams of Tare	40.2530	40.5493	28.7881	29.8234	31.6738	30.3943	40.4209
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.2290	0.1107	0.0542	0.0281	0.0145	0.0073	0.0038
Total Grams Sample X 50	5.9150	2.8250	1.3050	0.6800	0.3600	0.1750	0.1900

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413106
Sample #: K14113106-021

Client:	Industrial Economics, Inc.	Sample Name:	7434
Project:	Portland Harbor 2014	Date Collected:	9/25/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	1/5/2015

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0053	N/A
V.C. Sand, 1.00 mm (g)	18	0.0226	N/A
C. Sand, 0.500 mm (g)	35	0.0087	N/A
M. Sand, 0.250 mm (g)	60	0.1899	N/A
F. Sand, 0.125 mm (g)	120	6.2982	N/A
V.F. Sand, 0.0625 mm (g)	230	14.6628	N/A
S/C <0.0625 mm (g)	Pan	3.6826	N/A

Total (g) Recov'd	24.8701
Total (%) Recov'd	100.2

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	151.6695
Grams Beake(Tare)	126.8607
GramsGravel/Sand	24.8088

I. Sample Preparation

Grams As Received Sample	93.3972
Percent (%) Solids	49.3
Grams Oven Dried Sample	46.0448

NR

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	30.7728	30.1795	30.2175	28.6429	31.0101	39.3143	30.1017
Grams of Tare	30.5619	30.0946	30.1825	28.6233	30.9983	39.3085	30.0962
Grams of Dispersant Correction	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021
Grams of Sample	0.2088	0.0828	0.0329	0.0175	0.0097	0.0037	0.0034
Total Grams Sample X 50	6.3000	2.4950	0.7700	0.3900	0.3000	0.0150	0.1700

Analyst: CC Date: 1/5/2015
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413106
Sample #: K1413106-020 DUP

Client:	Industrial Economics, Inc.
Project:	Portland Harbor 2014/Ross
Sample Matrix:	Sediment

Sample Name:	5386
Date Collected:	9/25/2014
Date Received:	11/3/2014
Date Analyzed:	11/26/2014

I. Sieving Operation	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0000	N/A
V.C. Sand, 1.00 mm (g)	18	0.0085	N/A
C. Sand, 0.500 mm (g)	35	0.0196	N/A
M. Sand, 0.250 mm (g)	60	3.0617	N/A
F. Sand, 0.125 mm (g)	120	15.3446	N/A
V.F. Sand, 0.0625 mm (g)	230	6.5215	N/A
S/C <0.0625 mm (g)	Pan	0.9668	N/A

Total (g) Recov'd	25.9227
Total (%) Recov'd	100.6

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	133.9066
Grams Beaker(Tare)	108.1465
GramsGravel/Sand	25.7601

I. Sample Preparation

Grams As Received Sample	52.9745
Percent (%) Solids	61.3
Grams Oven Dried Sample	32.4734

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	41.0316	31.6780	29.9419	31.8607	42.6991	39.5106	30.8018
Grams of Tare	40.9696	31.6488	29.9265	31.8499	42.6906	39.5042	30.7980
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0598	0.0270	0.0132	0.0086	0.0063	0.0042	0.0016
Total Grams Sample X 50	1.6400	0.6900	0.2300	0.1150	0.1050	0.1300	0.0800

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 1/12/2015

COLUMBIA ANALYTICAL SERVICES, INC.

1317 South 13th Avenue
Kelso, Wa 98626

Method: PSEP Particle Size
Puget Sound Protocol

Service Request #: K1413106
Sample #: K1413106-020 TRP

Client:	Industrial Economics, Inc.	Sample Name:	5386
Project:	Portland Harbor 2014/Ross	Date Collected:	9/25/2014
Sample Matrix:	Sediment	Date Received:	11/3/2014
		Date Analyzed:	11/26/2014

I. Sieving Operation

	Sieve #	Weight (g)	As Rec'd (g)
Gravel 2.00 mm (g)	10	0.0000	N/A
V.C. Sand, 1.00 mm (g)	18	0.0000	N/A
C. Sand, 0.500 mm (g)	35	0.0000	N/A
M. Sand, 0.250 mm (g)	60	2.7039	N/A
F. Sand, 0.125 mm (g)	120	15.1629	N/A
V.F. Sand, 0.0625 mm (g)	230	6.7107	N/A
S/C <0.0625 mm (g)	Pan	1.2487	N/A

Total (g) Recov'd	25.8262
Total (%) Recov'd	101

II. Dry Sieving of Gravel/Sand

Grams Gravel/Sand & Beaker	143.3883
Grams Beaker(Tare)	117.7258
GramsGravel/Sand	25.6625

I. Sample Preparation

Grams As Received Sample	57.0940
Percent (%) Solids	61.3
Grams Oven Dried Sample	34.9986

III. Determination of Silt/Clay Fraction

Temperature: 21 Thermometer ID C65669

	4	5	6	7	8	9	10
Total Volume of Sample (mls)	1000	1000	1000	1000	1000	1000	1000
Amount of Dispersant	10	10	10	10	10	10	10
Volume of Aliquot (mls)	20	20	20	20	20	20	20
Grams Sample, Dispersant & Tare	30.7849	35.2516	31.5710	32.0784	31.7355	42.7587	30.8837
Grams of Tare	30.7145	35.2204	31.5509	32.0657	31.7259	42.7521	30.8780
Grams of Dispersant Correction	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Grams of Sample	0.0682	0.0290	0.0179	0.0105	0.0074	0.0044	0.0035
Total Grams Sample X 50	1.9600	0.5550	0.3700	0.1550	0.1500	0.0450	0.1750

Analyst: ER Date: 11/26/2014
Reviewed by: EL Date: 1/12/2015