Technical Report No. 14-01

Aquatic Studies at Kensington Gold Mine, 2013

by

Jackie Timothy and Katrina M. Kanouse

February 2014

Alaska Department of Fish and Game **Division of Habitat**

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_{2,}$ etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

TECHNICAL REPORT NO. 14-01

AQUATIC STUDIES AT KENSINGTON GOLD MINE, 2013

by
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February 2014

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Cover: Gordon Willson-Naranjo counting adult anadromous fish in Johnson Creek.

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Habitat Division biologists assisting with this year’s report include Benjamin Brewster, Gordon Willson-Naranjo, Greg Albrecht, Rick Hoffman, Matt Kern, Nicole Legere, Tess Quinn, and Johnny Zutz. The draft report was reviewed by Sport Fish Division biometrician Dan Reed, Habitat Division deputy director Dr. Al Ott, and Commercial Fisheries Division publication specialist Amy Carroll. Thank you all so very much.

EXECUTIVE SUMMARY

The Alaska Department of Fish and Game (ADF&G) Division of Habitat completes the aquatic resource monitoring the U.S. Forest Service (USFS) and the Alaska Department of Environmental Conservation (ADEC) require for Coeur Alaska Inc.'s (Coeur) Kensington Gold Mine. This partnership provides ADF&G the opportunity to gather and review aquatic information and identify, assess, and resolve issues at the Kensington Gold Mine as they arise.

The National Weather Service reported May was a lot wetter than normal in 2013 and June, July, and August were warmer and drier than normal (Joel Curtis, Warning Coordination Meteorologist, National Weather Service, Juneau, personal communication).

The anadromous Lower Slate Creek mean periphyton chlorophyll *a* density this warm July was the highest we've observed in three years of monitoring. Macroalgae near the stream mouth were a lush, emerald green. The nonanadromous East Fork Slate Creek mean periphyton chlorophyll *a* density, on the other hand, was the lowest we've observed at that sampling site[a] since the 2011 algal bloom in the Kensington Gold Mine tailings treatment facility (TTF) increased densities in that stream reach. Though not required by the ADEC Alaska Pollutant Discharge Elimination System (APDES) permit AK0050571 or Coeur's USFS approved Plan of Operations (2005), we sampled Lower, East Fork, and Upper Slate Creeks for periphyton densities in February,[b] May,[c] and October[d] to observe the range of variability in the Slate Creek system throughout the year, and to continue monitoring for changes that may be precipitated by the TTF. In 2013, chlorophyll densities in the Slate, Johnson, and Sherman Creek drainages were within the range of natural variation.

Though not required, Coeur continues to sample chlorophyll, nitrogen, organic carbon, phosphorus, potassium, sulfur, and others upstream of the TTF, in the TTF, in the TTF water treatment plant effluent, and downstream of effluent discharge in East Fork Slate Creek. We theorized in 2011 that a source of phosphorous was the causal link to the algal bloom we observed in the TTF. We recently compared monthly data for tons of tailings disposed in the TTF and phosphorus concentrations in the TTF for the period September 2011 through November 2013, finding no statistical correlation. Phosphorus was lower in the TTF in 2013 than in 2011 and 2012, suggesting phosphorus-rich parent rock is occasionally intercepted during underground mining and processed in the mill. We also compared monthly data for tons of tailings disposed in the TTF and total dissolved solids[e] in East Fork Slate Creek for the period September 2011 through November 2013 and found that they are statistically correlated.

Habitat biologists Gordon Willson-Naranjo and Greg Albrecht designed and constructed a mechanical elutriator with sorting screens to separate benthic macroinvertebrates in a sample from substrate and debris. After conducting trials to determine the efficiency and sorting accuracy of the device, they determined average sort time and identification by hand was 4.75 hours per sample with 79% sorting accuracy and average sort time and identification using the

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[a] Ben Brewster, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Kensington Gold Mine Spring Periphyton Sampling Trip Report; dated 1/6/2014 and amended 1/10/2014.

[b] Ben Brewster, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: 2013 Feb Periphyton Sampling Trip Report, Kensington Gold Mine; dated 3/21/2013.

[c] Ben Brewster, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Kensington Gold Mine Spring Periphyton Sampling Trip Report; dated 6/28/2013.

[d] Ben Brewster, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Kensington Gold Mine Spring Periphyton Sampling Trip Report; dated 1/6/2014 and amended 1/10/2014.

[e] Total dissolved solids is a measure of minerals, salts, metals, cations or anions dissolved in water.

elutriator is 1.75 hours with about 95% sorting accuracy.[f] Greg Albrecht has attained the macroinvertebrate identification experience necessary to provide quality assurance in-house, so we no longer hire a contractor to provide that service.

We added six additional benthic macroinvertebrate samples at riffle habitats upstream of our designated benthic macroinvertebrate sampling site in Lower Slate Creek so we can evaluate whether we can replace the designated sampling site with one better suited for sampling. Benthic macroinvertebrate samples gathered below the TTF in East Fork Slate Creek in May indicated an increase in the density of benthic macroinvertebrates, but a change in the number and proportion of sensitive aquatic insects. Ostracoda, a class of filter feeding bivalve-like crustaceans referred to as seed shrimp, and Bivalvia Sphaeriidae: *Pisidium*, a freshwater bivalve often called pea clams, dominated the April samples. We investigated this change, sampling benthic macroinvertebrate samples in East Fork Slate Creek again in both June and October. In October, pea clam and seed shrimp abundance diminished and Chironomidae, known as nonbiting midges, increased. These changes may be due to the life history of the animals present and we will research this further in 2014.[g]

In July, biologists observed a white substance on East Fork and Lower Slate Creek stream bottoms. Biologists collected and sent samples to a private laboratory for biological speciation of algae, bacteria, and yeast, with the final laboratory report yielding nothing extraordinary. Coeur hired a consultant, tested the white substance using x-ray fluorescence and x-ray diffraction, and had the consultant interpret results. The consultant suggests the white material may be gypsum. Gypsum is not known to be toxic to aquatic life, and precipitates in the presence of a salt.[h]

Potassium amyl xanthate, a salt, is a chemical used in the milling process and is deposited with the tailing slurry in the TTF. This compound contains potassium and sulfur which we found were statistically correlated in water samples from the TTF. As documented in Timothy and Kanouse (2013), we occasionally smell a mill-like odor when we sample in East Fork and Lower Slate Creeks. Should the white substance persist in 2014, we will collect additional samples for analysis. We will continue to schedule additional benthic macroinvertebrate sampling events in East Fork Slate Creek.

Konopacky (1995), Earthworks Technology (2002), and Kline (2001, 2005) presented data suggesting East Fork Slate Creek was a downstream migration corridor for resident fish, devoid of overwintering habitat. However, in early February, we investigated winter fish use and captured nine adult Dolly Varden char *Salvelinus malma*.[i] Then, though we attempted, we never captured another Dolly Varden char in East Fork Slate Creek the remainder of 2013.[j] Of importance, Coeur staff blocked downstream fish passage through the diversion pipe in East Fork Slate Creek between July 28–31 and August 8–24 when water levels were low, so they

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[f] Gordon Willson-Naranjo and Greg Albrecht, Habitat Biologists, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Benthic Macroinvertebrate Elutriation Trials Amendment; dated 12/17/2013.

[g] Ben Brewster, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: 2013 Kensington Gold Mine Benthic Macroinvertebrate Trip Report; dated 1/27/2014.

[h] Gordon Willson-Naranjo, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Kensington Gold Mine White Material in LSC/EFSC; dated 1/13/2014.

[i] Gordon Willson-Naranjo, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: EFSC DV Survey, Kensington Trip Report; dated 3/4/2013.

[j] Ben Brewster, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: 2013 Kensington Gold Mine Resident Fish Trip Report; dated 1/15/2014.

could dilute water in the TTF water treatment plant. Our failed attempts to capture resident fish in late August after fish passage was blocked supports the theory that Dolly Varden char migrate downstream from Upper Slate Lake to Lower Slate Creek where they complete their life history, potentially becoming anadromous.[k,l]

Quinn (2005) cites studies where researchers caution that even when fish response is not complicated by marine survival, a level of variation exists that makes it difficult to quantify changes in resident fish abundance resulting from a detrimental or beneficial action. The natural variation, bedrock controlled cascades, paucity of resident fish habitat, small number of Dolly Varden char we capture, and unknown length of time fish spend transiting East Fork Slate Creek, impairs our ability to accurately estimate resident fish abundance. Our biometrician is concerned with our ability to consistently deliver reliable abundance estimates with acceptable and unbiased measures of precision using the three-pass removal method (Dan Reed, Sport Fish Biometrician, ADF&G, Nome, personal communication). If we have little confidence in our resident fish abundance estimates, fish population monitoring is useless. For this reason, we recommend ADEC discontinue the resident fish population surveys required in the Slate Creek Drainage.[m] Nine years of Upper Slate Creek resident fish population surveys provide sufficient baseline information for TTF reclamation. If ADEC chooses to discontinue population studies required under the APDES Permit, we would recommend continuing fish presence monitoring in East Fork Slate Creek throughout the year every year.

We investigated resident fish habitat in Ophir Creek, a tributary to Sherman Creek that runs along the toe of the development rock pile at the Comet portal, and documented Dolly Varden char using the water body. A rockslide deposited material into Ophir Creek, but did not present a barrier to fish passage.[n]

We sampled Dolly Varden char in West Fork Slate Creek for whole body metals concentrations for comparison with other Slate Creek drainage sampling locations. We expect this information will help improve our understanding of natural metals concentrations and variability in the Slate Creek drainage.[o] In East Fork Slate Creek, we minnow trapped in August, and electrofished in November, but failed to capture resident fish for whole body metals concentration analysis.[p] As previously mentioned, Dolly Varden char in East Fork Slate Creek may be migrating through the reach. If the fish are downstream migrants from Upper Slate Lake, the metals analysis would not provide information on the downstream effects of the TTF on resident fish. We have to assume resident fish in Lower Slate Creek have a minimum two-month resident period and that the maximum size of 130 mm fork length improves the likelihood that we are sampling less than a three-year-old resident fish. These uncertainties and assumptions are reason enough for

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[k] Lower Slate Creek is actually where Konopacky (1995) documented Dolly Varden char, though he called it East Fork Slate Creek.

[l] Even if those nine Dolly Varden char were overwintering, the fish do not complete their life history there; young of the year have been documented in Upper Slate Creek but have never been documented in East Fork Slate Creek. See Balon (1980) for southeast Alaska, resident, stream-type Dolly Varden char life history.

[m] We did consider capturing resident fish and caging them in East Fork Slate Creek pools so we could continue these studies. Then we remembered our 2011 work in Lower Slate Creek documenting outmigrating pink salmon fry during the spring. Though we were there daily, the cages were difficult to maintain, continually clogging with debris that impinged the fish, subject to sudden abrupt changes in flow that entrapped fish, and invaded by river otters that entered the cage for an easy, captive meal. While the 2011 work took just over a month, we would need to cage the resident fish year round in an area often frequented by bears.

[n] Gordon Willson-Naranjo, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Ophir Creek Fish Passage Kensington Gold Mine; dated 08/16/2013.

[o] Ben Brewster, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Kensington Gold Mine Metals Fish Trip Report; dated 1/6/2014.

[p] Ibid.

us to recommend that since this is the final year of metals fish sampling required under the APDES permit, that ADEC discontinue the requirement for resident fish whole body metals concentrations analysis.

In addition to the sediment metals concentrations sampling stations required by the APDES permit, we sampled stream sediments in West Fork Slate Creek and Upper Sherman Creek in 2013 to help improve our understanding of naturally occurring background conditions. There were changes in sediment metals concentrations values in the Slate, Johnson, and Sherman Creek drainages, with most values remaining within the range observed in 2011 and 2012. In 2013, the nonmetal selenium was higher in both Upper and East Fork Slate Creeks and the metalloid arsenic was lower in Upper Slate Creek, higher in East Fork Slate Creek, and slightly higher in Lower Slate Creek. East Fork Slate Creek cadmium and zinc metal concentrations, however, which in 2012 we noted were above NOAA sediment guidelines for freshwater ecosystems (Buchman 2008; MacDonald et al. 2000), were lower in 2013. There were no significant differences in growth or survival of *Chironomus dilutes* or *Hyalella azteca* between the laboratory control sediments and the individual sediment samples in our short-term chronic sediment toxicity tests at any sampling location.[q]

We were finally able to document that the age-0 and 1-year-old juvenile coho salmon *Oncorhynchus kitsutch* we observed in Lower Slate Creek in 2011, 2012 and 2013, are the progeny of adults that spawned there, and the juveniles didn't migrate in from other systems (Timothy and Kanouse 2012, 2013).[r] Habitat biologists surveying on foot in late October plunged a GoPro® Hero3 camera under log jams and into deep pools and captured photographic evidence of adult coho salmon spawning near the anadromous fish barrier where we find most of the juveniles.[s] We also documented the average geometric mean particle size in Lower Slate Creek spawning substrates increased a few millimeters between 2011 and 2013.[t]

Pink salmon *O. gorbuscha,* is the most abundant salmon species and the smallest at maturity, laying small eggs in the lower reaches of Slate, Johnson, and Sherman Creeks, largely in August. It is well documented that food and rearing habitat limits the production and survival of juvenile Chinook *O. tshawytscha*, coho, and sockeye *O. nerka* salmon, whose life histories include months to years of freshwater rearing before smolting. Pink and chum *O. keta* salmon, on the other hand, emerge from the gravel in Slate, Johnson, and Sherman Creeks mid-April through mid-May, and migrate immediately to the marine environment. Pink salmon are two years old at maturity, return to their natal stream to spawn, and die. Pink salmon odd-year and even-year populations do not interbreed and even-year returns are largest in Alaska (Quinn 2005; Timothy and Kanouse 2012, 2013).

Coeur has collected adult salmon counts in Lower Sherman Creek since 1999, and in Lower Slate and Johnson Creeks since 2005. Adult pink salmon counts in Lower Slate Creek were lower in 2013 than in 2011 and 2012 and the even years dominated. Adult pink salmon counts in Lower Johnson Creek were lower in 2013 than in 2011 and higher than in 2012, but the odd

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[q] Ben Brewster, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: 2013 Kensington Gold Mine Sediment Sampling Trip Report; dated 1/8/2013.

[r] Ben Brewster, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Lower Slate Creek juvenile coho salmon survey; dated 9/20/2013.

[s] Ben Brewster, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: 2013 Kensington Adult Salmon Count Report; dated 12/3/2013.

[t] Gordon Willson-Naranjo, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Kensington Gold Mine Slate Creek Spawning Substrate; dated 12/18/2013.

years dominated. Adult pink salmon counts in Lower Sherman Creek were higher in 2013 than in 2011 and 2012 and the odd years dominated.[u] How can we use information that often doesn't follow trends to help us understand the impact Kensington Gold Mine construction and operations might be having on pink salmon populations?

Quinn (2005) cites studies opining the ineffectiveness of trying to detect the effects of human activities on anadromous salmonids using adult counts. Researchers claim detecting changes in populations, when the natural variation in freshwater is complicated by marine survival, cannot generally be achieved with accepted levels of statistical confidence, even when there are large underlying changes in abundance.

Coeur's USFS approved Plan of Operations (2005) states in Section 4.8, Marine Aquatic Resources, that the spawning salmon escapement surveys will be reviewed in the annual monitoring report and with the Berners Bay working group to assess the results and potential for modification or need of this program. We recommend the USFS and the Berners Bay working group terminate the requirement for spawning salmon escapement surveys.[v]

Coeur's USFS approved Plan of Operations (2005), and ADF&G's fish habitat permit FH-I-0050 C for the TTF, require a tailings habitability study, the results of which will be used to design a closure plan that will achieve the reclamation goal of restoring and improving aquatic productivity in Lower Slate Lake.

Habitat biologists assisted with study design and review, and prepared to implement the study by:

- coordinating with the ADF&G Division of Commercial Fisheries lead dive safety officer to complete the training necessary for compliance with ADF&G dive safety procedures;[w]
- bringing the Douglas Island building laboratory into compliance with ADF&G and Occupational Safety and Health Administration laboratory safety procedures;[x]
- collecting substrate from Upper Slate Lake, the northwest bank of the TTF, and tailings from the mill;
- investigating ways to eradicate macroinvertebrates from the Upper Slate Lake substrate, including boiling, drying, and rehydrating the substrate;
- delineating transects across Upper Slate Lake, measuring water depth for placement of sample trays, and testing tray buoyancy, and;
- practicing diving and placing the arrays on the bottom of Auke Lake.[y]

In June of 2013, the tailings habitability study plan was complete, and habitat biologists began study implementation. They collected, sterilized and froze substrate, and finalized study logistics.[z] In July, they placed 16 pipe/rebar/mesh/tray[aa] arrays across four transects in Upper Slate Lake.[bb]

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[u] Ben Brewster, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: 2013 Kensington Adult Salmon Count Report; dated 12/3/2013.

[v] We make our point why adult salmon surveys in these drainages should be discontinued using pink salmon as an example. Though chum and coho salmon have different life histories than pink salmon, the rationale to discontinue these studies applies to all species of salmon.

[w] Gordon Willson-Naranjo is Habitat Division's dive safety officer. Greg Albrecht and Nicole Legere are certified department divers.

[x] Kate Kanouse is the Douglas Island building laboratory manager and safety officer.

[y] The preparatory diving informed of the need to structurally stabilize arrays and to freeze the substrate prior to submersion.

[z] Gordon Willson-Naranjo, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: TTF EMP Preparation Kensington Gold Mine; dated 08/22/2013.

[aa] 160 total substrate trays.

[bb] Gordon Willson-Naranjo, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: KGM TTF EMP: Sample Tray Deployment; dated 10/4/2013.

They retrieved 40 trays on October 28, 2013 for the first semiannual analysis and will publish the results annually in February in a Technical Report independent of this one. They set minnow traps in the TTF to document fish presence, capturing threespine stickleback *Gasterosteus aculeatus,* in 2012[cc] and 2013.[dd]

[cc] Tally Teal, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Kensington Gold Mine Tailings Habitability Study Preliminary Field Work; dated 10/16/2012.

[dd] Ben Brewster, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Tailings Treatment Facility threespine stickleback study; dated 10/2/2013.

INTRODUCTION

The Kensington Gold Mine is located near Berners Bay in southeast Alaska; about 72.5 km north of Juneau by air and about 56 km south of Haines by air (Figure 1). The site, where mining began near the end of the 19th century, is within the City and Borough of Juneau and the Tongass National Forest (Tetra Tech Inc. et al. 2004a, b). The mine is owned and operated by Coeur Alaska, Inc., a wholly owned subsidiary of Coeur Mining, Inc., Chicago, Illinois.

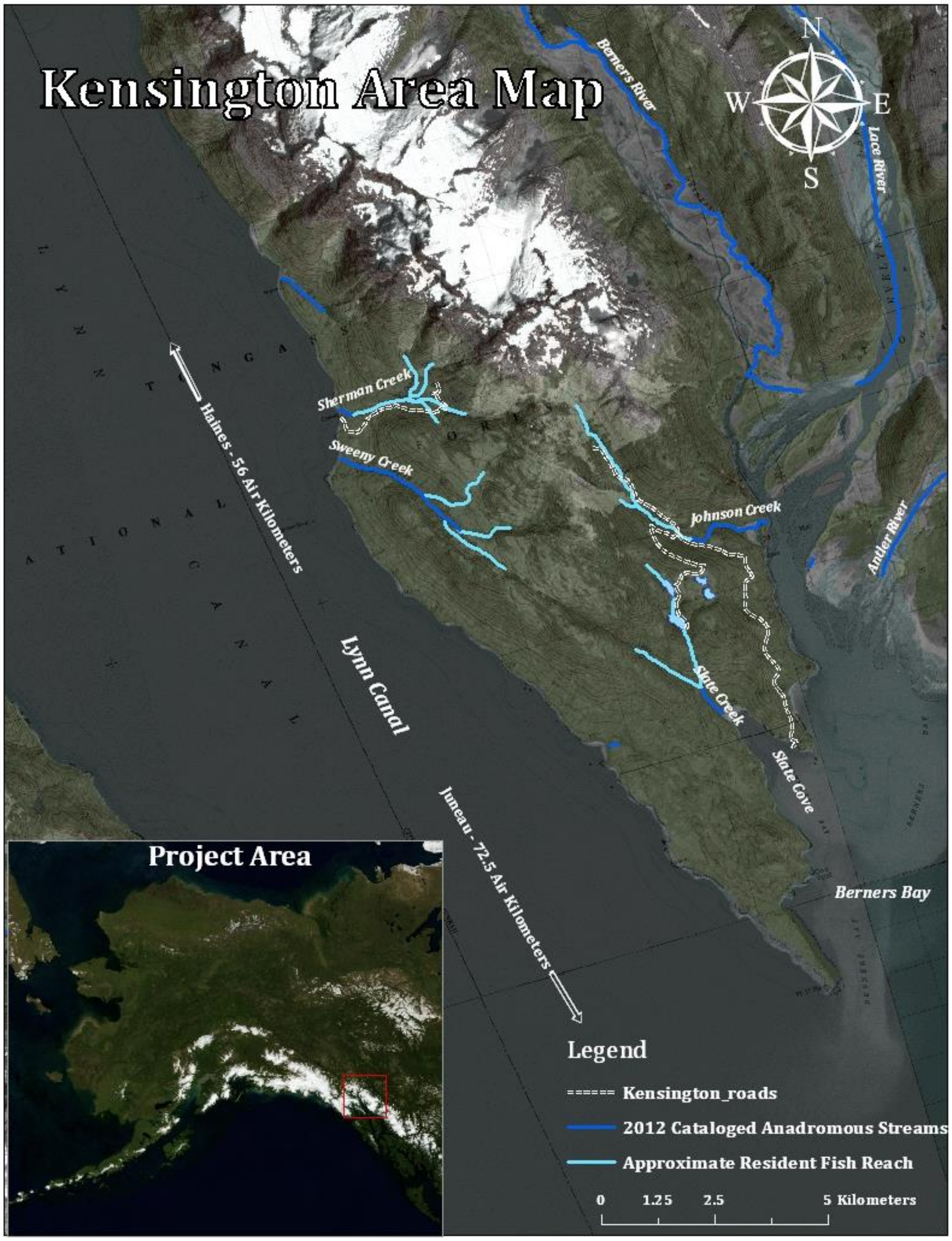

Figure 1.–Kensington Gold Mine area map.

Mine infrastructure is located in three drainages that support anadromous fish; the TTF in the Slate Creek drainage, the camp and mill facilities in the Johnson Creek drainage, and the mine water treatment facility in the Sherman Creek drainage (Figure 2).

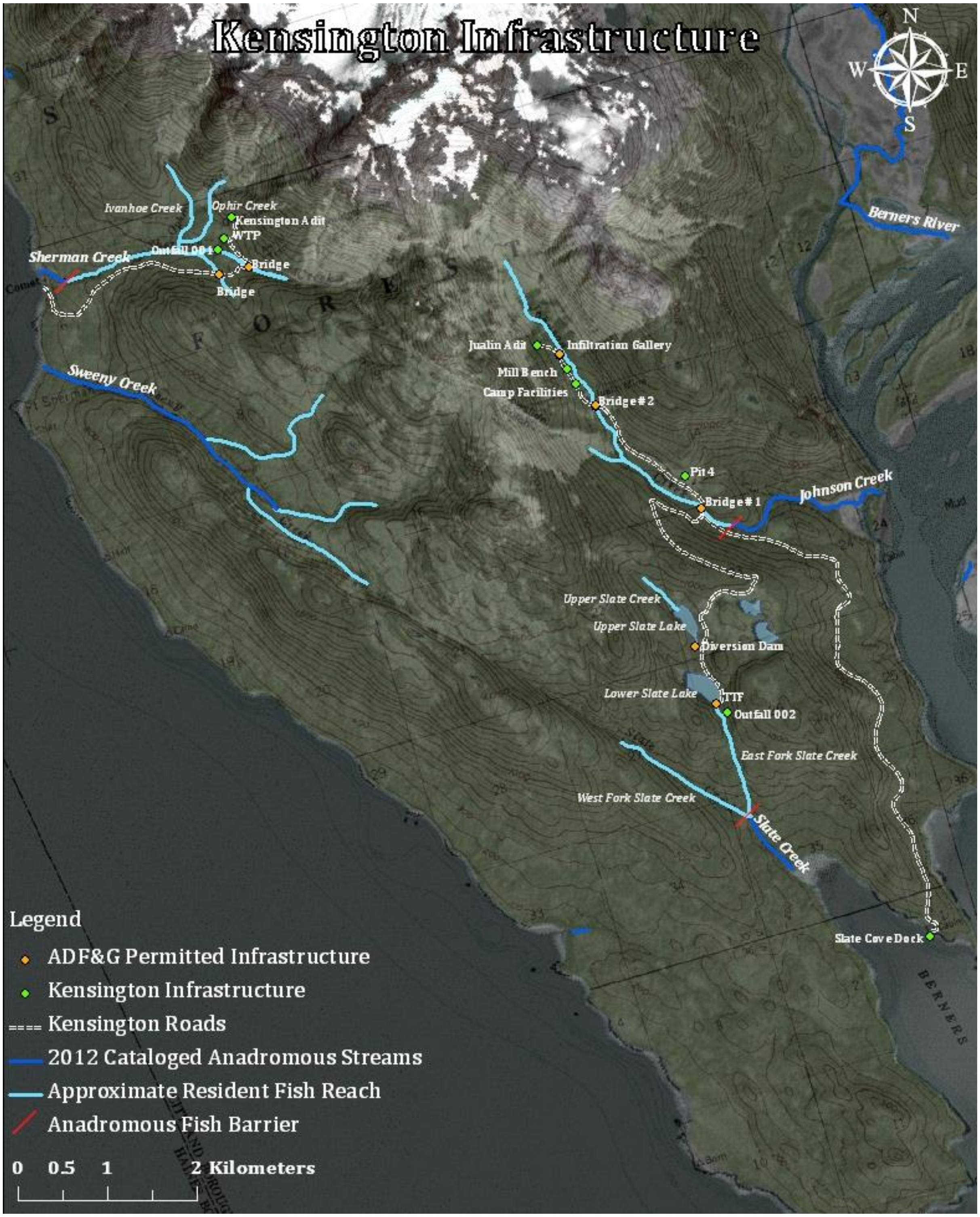

Figure 2.–Kensington Gold Mine infrastructure.

The Kensington and Jualin adits were connected in July 2007, making travel through the ore body between the Johnson and Sherman Creek drainages possible. The mine began production on June 24, 2010 and produces gold concentrate that is exported for processing. Tailings are disposed as slurry from the mill through a pipeline into the TTF. Under ADF&G's authorities at Alaska Statute (AS) 16.05.841 and AS 16.05.871, the Division of Habitat permits a dam and stream diversion in the Slate Creek drainage that allows Dolly Varden char to bypass the TTF and move downstream into East Fork Slate Creek. The Division of Habitat permits activities in two other waterbodies where Kensington Gold Mine activities occur, including an infiltration gallery and bridges at Johnson Creek, and bridges over tributaries to Sherman Creek (Timothy and Kanouse 2012, Appendix B).

Contractors gathered aquatic data for the Kensington Gold Mine from the late 1980s through 2005 which provided a basis for Division of Habitat permit decisions, Coeur's USFS approved 2005 Plan of Operations monitoring requirements (Coeur 2005), the Environmental Protection Agency (EPA) National Pollutant Elimination Discharge System (NPDES) Permit No. AK-005057-1 (Timothy and Kanouse 2012, Appendix A), and the DEC Alaska Pollutant Elimination System (APDES) Permit No. AK0050571 (Timothy and Kanouse 2012, Appendix A). Contractor reports include Archipelago Marine Research Ltd. (1991), Dames and Moore (1991), Earthworks Technology, Inc. (2002), EVS Environment Consultants (2000), Flory (1998, 1999, 2000, 2001a, 2001b, 2002, 2004), HDR Alaska, Inc. (2003), Kline (2003) Kline Environmental Research, LLC (2001, 2003, 2005), Konopacky Environmental (1992a, 1992b, 1993a, 1993b, 1993c, 1995, 1996a, 1996b, 1996c, 1996d), Pentec Environmental (1990, 1991), and Steffen Robertson and Kirsten Consulting Engineers and Scientists (1997). Monitoring reports include Flory (2006, 2007, 2008, 2009a, 2009b, 2009c, 2009d, 2011) and (Timothy and Kanouse 2012, 2013).

The Division of Habitat began the aquatic studies for the Kensington Gold Mine in Slate, Johnson, and Sherman Creeks in 2011. The APDES Permit requires periphyton, benthic macroinvertebrate, resident fish and sediment sampling. Overall stream health is assessed by estimates of periphyton community composition and chlorophyll *a* biomass, benthic macroinvertebrate composition and abundance, resident Dolly Varden char abundance, condition, and whole body metals concentrations in the Slate Creek system, sediment metals concentrations, sediment toxicity, and pink salmon spawning substrate quality. The Division of Habitat also completes adult salmon counts and the tailing habitability studies required by Coeur's USFS approved Plan of Operations (2005).

PURPOSE

The purpose of this technical report is to summarize our 2013 aquatic study data and document the condition of biological communities and sediments in the Slate, Johnson, and Sherman Creek drainages near mine development and operations. This report satisfies the aquatic study requirements of Coeur's USFS approved Plan of Operations (2005) and ADEC's APDES Permit AK0050571.

STUDY AREA

We sample within the waterbodies of each drainage listed in Table 1.

Table 1.–Aquatic studies sampling locations.

Slate Creek	Johnson Creek	Sherman Creek
Lower Slate Creek	Lower Johnson Creek	Lower Sherman Creek
East Fork Slate Creek	Upper Johnson Creek	Upper Sherman Creek
West Fork Slate Creek		
TTF (Lower Slate Lake)		
Upper Slate Creek		

Slate Creek Drainage

Slate Creek drains a 10.5 km^2 watershed (Coeur 2005) into Slate Cove on the northwest side of Berners Bay. Two waterfalls about 1 km upstream of the mouth prevent upstream anadromous fish passage to the East and West Forks. There are two lakes in this drainage; Lower Slate and Upper Slate Lakes, both upstream of East Fork Slate Creek. Many of the plants and animals that inhabit lakes differ from those that inhabit rivers, so results of samples taken in Lower Slate and East Fork Slate Creeks below the lakes will differ from those of West Fork Slate and Upper Slate Creeks, Johnson Creek, and Sherman Creek, where lakes are not present.

The Catalog of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes (Catalog; Johnson and Daigneault 2013) lists Lower Slate Creek (Stream No. 115-20-10030) providing habitat for pink salmon, chum salmon, coho salmon, and eulachon *Thaleichthys pacificus*. Dolly Varden char and cutthroat trout *O. clarkii* are present below the waterfalls. Above the waterfalls, Dolly Varden char are present in East Fork Slate, West Fork Slate and Upper Slate Creeks.

We access Slate Creek by kayak from the Slate Cove dock when conditions permit. During inclement weather, we access the creek hiking along the rocky shoreline, or through the woods to the mouth. Above the waterfalls, East Fork Slate Creek is on river left and West Fork Slate Creek is on river right.[ee] The 1 km East Fork Slate Creek reach above the waterfalls, to a plunge pool at the base of an earthen dam that contains the TTF, is a series of steep cascade falls. Upstream of the TTF, a small concrete dam diverts water draining from Upper Slate Lake through a diversion pipeline and into East Fork Slate Creek at the plunge pool, bypassing the TTF. Upper Slate Creek is the inlet creek to Upper Slate Lake and is upstream of current mine operations.

Johnson Creek Drainage

Johnson Creek drains a 14.6 km^2 watershed (Coeur 2005) to the north side of Berners Bay. A waterfall about 1.5 km upstream of the mouth prevents anadromous fish passage. The Catalog (Johnson and Daigneault 2013) lists Johnson Creek (Stream No. 115-20-10070) providing habitat for pink, chum, and coho salmon. Dolly Varden char and cutthroat trout are present below the waterfall, and Dolly Varden char are present above the waterfall.

[ee] The terms “river right” and “river left” are looking downstream in the direction water is flowing, per USGS convention.

We access Lower Johnson Creek by hiking downhill from mile 3 of the Jualin road, through the woods and across meadows to the mouth. About 0.5 km above the anadromous barrier, the creek runs beneath the Jualin Road Bridge 1. The Snowslide Gulch tributary is on river right about 1 km upstream of Jualin Road Bridge 1. Further upstream, the creek runs beneath the Jualin Road Bridge 2 with camp facilities, the mill and the Jualin adit on river right. Upper Johnson Creek is between Jualin Road Bridge 2 and the headwaters. An infiltration gallery collects water from Upper Johnson Creek at the mill bench to support the camp. Upper Johnson Creek above the waste rock pile near the Jualin adit to the headwaters is upstream of current mine operations.

Sherman Creek Drainage

Sherman Creek drains a 10.84 km^2 watershed (Coeur 2005) to the east shore of Lynn Canal. A waterfall about 360 m upstream from the mouth prevents anadromous fish passage. The Catalog (Johnson and Daigneault 2013) lists Sherman Creek (Stream No. 115-31-10330) providing habitat for pink and chum salmon. ADF&G removed coho salmon from the 2013 Catalog, since neither juvenile or adult coho salmon have been documented in Sherman Creek. Above the waterfall, Dolly Varden char are present.

We access Sherman Creek by driving underground from the Jualin adit to the Kensington adit and then down the Comet Road to the beach where we walk north about 100 m to the mouth. Middle Sherman Creek is upstream of the waterfall and intercepts Ophir Creek on river right. Upstream of the Sherman and Ophir Creeks confluence, the South Fork of Sherman Creek is on river left. The mine water treatment plant Outfall 001 is upstream of the Sherman and South Fork Creeks confluence. The outfall discharge into Sherman Creek does not require an ADF&G fish passage permit as the discharge does not block fish passage (AS 16.05.841). Upper Sherman Creek above the Comet Road to the headwaters is upstream of current mine operations. The historic 2050 adit and a cabin are in this drainage.

AQUATIC STUDIES

We conduct the Kensington Gold Mine aquatic studies[ff] at the frequency specified in Coeur's USFS approved Plan of Operations (2005) and ADEC APDES Permit AK0050571 (Table 2). We note when we include studies in excess of those required by the USFS or ADEC. We show maps of the stream segments and aquatic study sampling stations for 2013 studies in Figures 3–5. The latitude and longitude of each aquatic study sampling station is listed in Table 3.

[ff] For our own information, we use an Extech Exstick II field meter to measure basic water quality at each site during sampling, including temperature and conductivity. We use a Global Water Flow Probe FP101 to measure stream flow.

Table 2.–Aquatic studies sampling frequency.

Location	Location Description	Aquatic Study	Sampling Frequency
Lower Slate Creek	Anadromous, drains to Berners Bay downstream of a 25 m barrier waterfall	Periphyton biomass and composition	1/year
		Benthic macroinvertebrate composition and abundance	1/year
		Resident fish metals concentrations (Ag, Al, Cd, Cr, Cu, Pb, Hg, Ni, Se, and Zn)	1/year
		Sediment metals concentrations and toxicity (Ag, Al, As, Cd, Cr, Cu, Pb, Hg, Ni, Se, and Zn)	1/year
		Spawning substrate quality	1/year
		Adult salmon counts	Annually
East Fork Slate Creek	Riffles and cascade falls downstream of the TTF to the barrier waterfall	Periphyton biomass and composition	1/year
		Benthic macroinvertebrate composition and abundance	1/year
		Resident fish population and condition	1/year
		Resident fish metals concentrations (Ag, Al, Cd, Cr, Cu, Pb, Hg, Ni, Se, and Zn)	1/year
		Sediment metals concentrations and toxicity (Ag, Al, As, Cd, Cr, Cu, Pb, Hg, Ni, Se, and Zn)	1/year
West Fork Slate Creek	Reference site, a tributary to Slate Creek located outside of mine influence	Periphyton biomass and composition	1/year
		Benthic macroinvertebrate composition and abundance	1/year
Upper Slate Creek	Control site located on the north side of upper Slate Lake upstream of mine influence	Periphyton biomass and composition	1/year
		Benthic macroinvertebrate composition and abundance	1/year
		Resident fish population and condition	1/year
		Resident fish metals concentrations (Ag, Al, Cd, Cr, Cu, Pb, Hg, Ni, Se, and Zn)	1/year
		Sediment metals concentrations and toxicity (Ag, Al, As, Cd, Cr, Cu, Pb, Hg, Ni, Se, and Zn)	1/year
Lower Johnson Creek	Anadromous, drains to Berners Bay below a 30 m barrier waterfall	Sediment metals concentrations and toxicity (Ag, Al, As, Cd, Cr, Cu, Pb, Hg, Ni, Se, and Zn)	1/year
		Adult salmon counts	Annually
Upper Johnson Creek	Adjacent to camp facilities, downstream of the mill bench	Benthic macroinvertebrate composition and abundance	1/year
Lower Sherman Creek	Anadromous, drains to Lynn Canal below a 15 m barrier waterfall	Periphyton biomass and composition	1/year
		Benthic macroinvertebrate composition and abundance	1/year
		Sediment metals concentrations and toxicity (Ag, Al, As, Cd, Cr, Cu, Pb, Hg, Ni, Se, and Zn)	1/year
		Adult salmon counts	1/year

Note: Requirements of the APDES Permit and Plan of Operations.

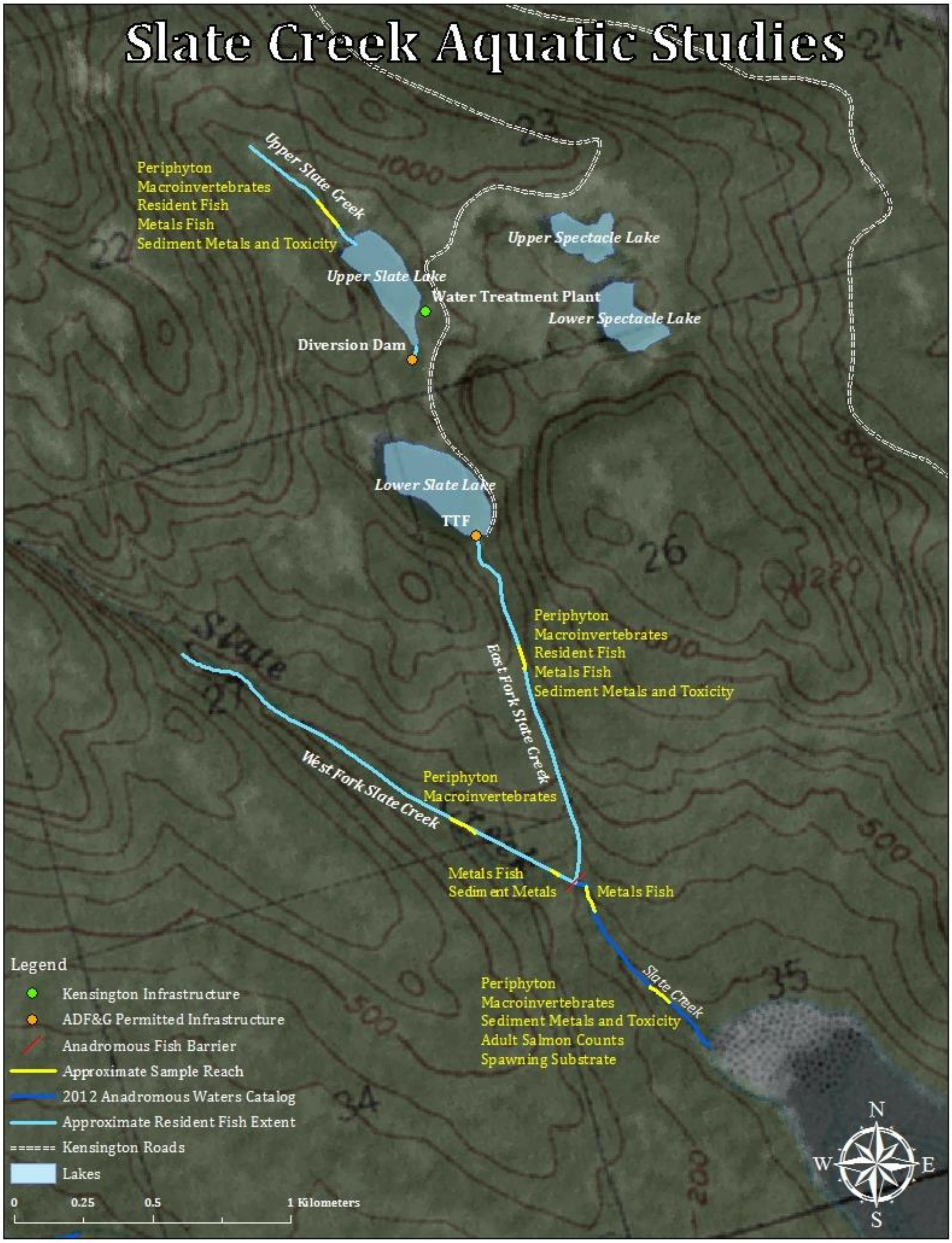

Figure 3.–Slate Creek aquatic studies.

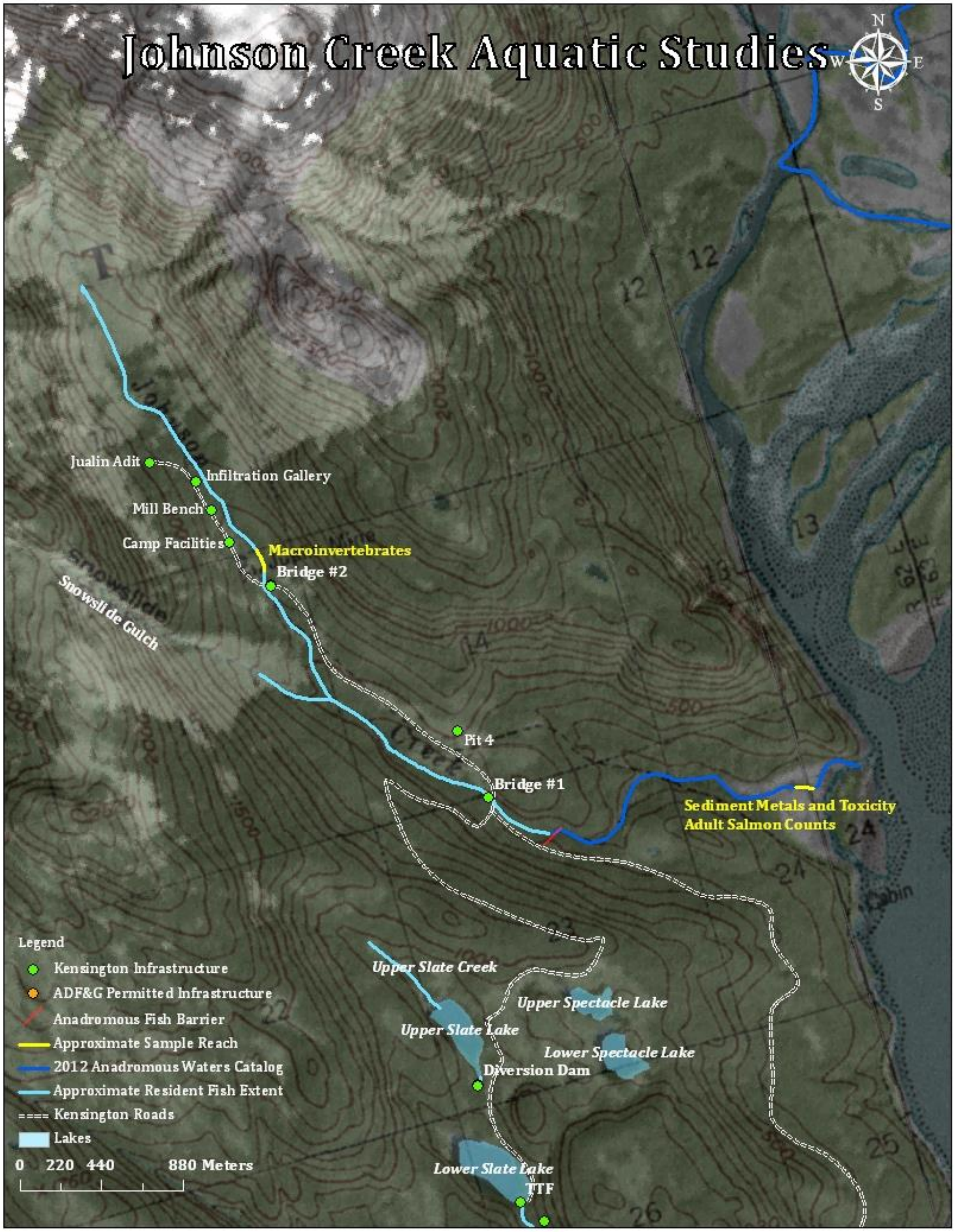

Figure 4.–Johnson Creek aquatic studies.

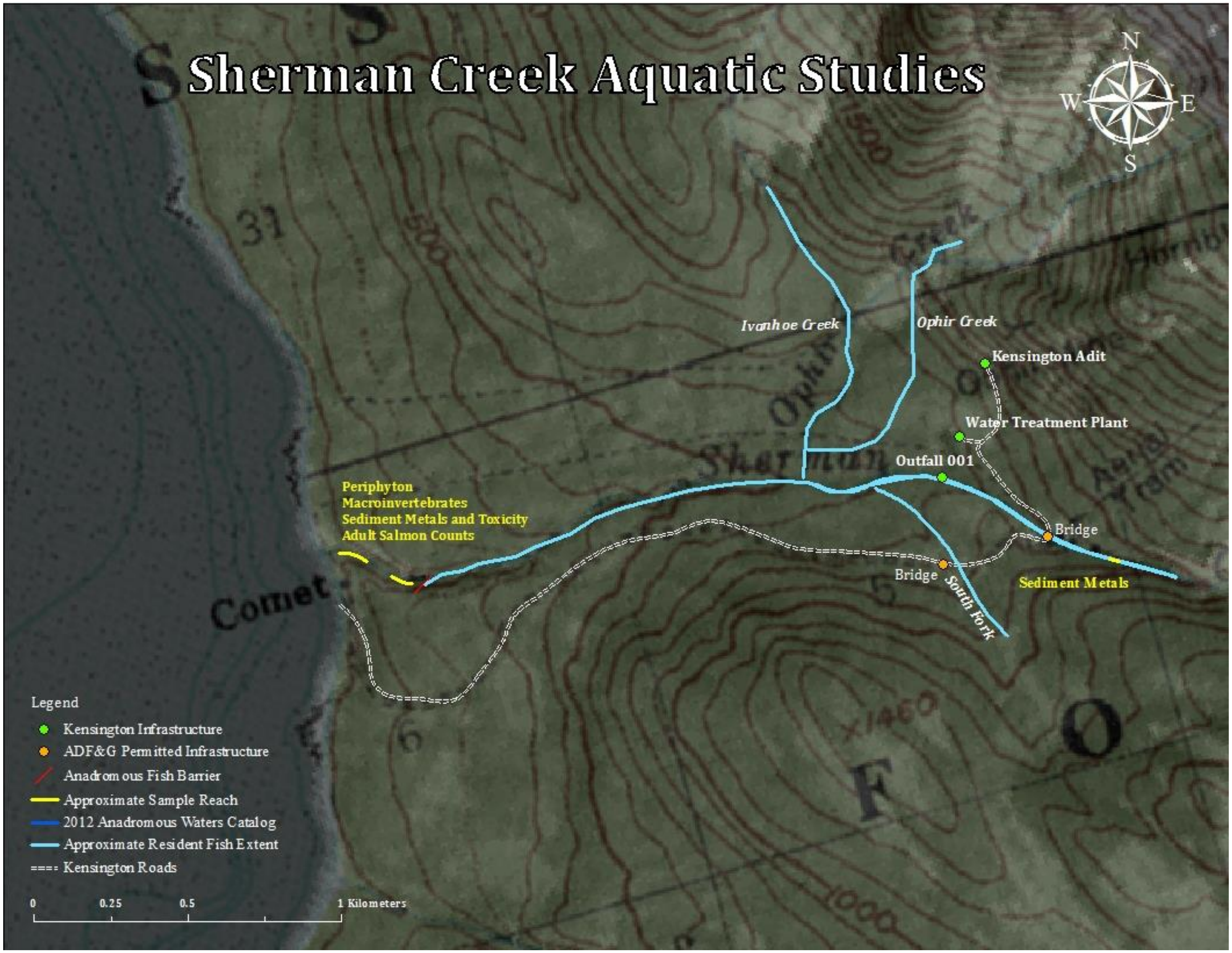

Figure 5.–Sherman Creek aquatic studies.

Table 3.–Latitude and longitude of sampling stations.

Waterbody	Sampling Station	Latitude	Longitude
Lower Slate Creek	Periphyton	58.790^{o}N	135.0343^{o}W
	Benthic Macroinvertebrates Sample Point 1	58.7901^{o}N	135.0342^{o}W
	Benthic Macroinvertebrates Sample Point 2	58.7919^{o}N	135.0359^{o}W
	Resident Fish Metals	58.7964^{o}N	135.0389^{o}W
	Sediment Metals and Toxicity	58.7920^{o}N	135.0360^{o}W
	Spawning Substrate Sample Point 1	58.7905^{o}N	135.0345^{o}W
	Spawning Substrate Sample Point 2	58.7916^{o}N	135.0356^{o}W
	Adult Salmon Counts	Table 4	
East Fork Slate Creek	Periphyton	58.8046^{o}N	135.0382^{o}W
	Benthic Macroinvertebrates	58.8045^{o}N	135.0381^{o}W
	Resident Fish	58.8040^{o}N	135.0382^{o}W
	Resident Fish Metals	58.8040^{o}N	135.0382^{o}W
	Sediment Metals and Toxicity	58.8053^{o}N	135.0383^{o}W
West Fork Slate Creek	Periphyton	58.7992^{o}N	135.0460^{o}W
	Benthic Macroinvertebrates	58.7995^{o}N	135.0459^{o}W
	Resident Fish Metals	58.7967^{o}N	135.0403^{o}W
	Sediment Metals and Toxicity	58.7967^{o}N	135.0403^{o}W
Upper Slate Creek	Periphyton	58.8191^{o}N	135.0416^{o}W
	Benthic Macroinvertebrates	58.8189^{o}N	135.0415^{o}W
	Resident Fish	58.8199^{o}N	135.0425^{o}W
	Resident Fish Metals	58.8199^{o}N	135.0425^{o}W
	Sediment Metals and Toxicity	58.8189^{o}N	135.0416^{o}W
Lower Johnson Creek	Sediment Metals and Toxicity	58.8235^{o}N	135.0048^{o}W
	Adult Salmon Count	Table 5	
Upper Johnson Creek	Benthic Macroinvertebrates	58.8407^{o}N	135.0450^{o}W
Lower Sherman Creek	Periphyton Sample Point 1	58.8687^{o}N	135.1414^{o}W
	Periphyton Sample Point 2	58.8672^{o}N	135.1376^{o}W
	Benthic Macroinvertebrates Sample Point 1	58.8688^{o}N	135.1412^{o}W
	Benthic Macroinvertebrates Sample Point 2	58.8674^{o}N	135.1381^{o}W
	Sediment Metals and Toxicity	58.8687^{o}N	135.1413^{o}W
	Adult Salmon Count	Table 6	
Upper Sherman Creek	Sediment Metals and Toxicity	58.8615^{o}N	135.0998^{o}W

Source: World Geodetic System 84 datum.

Table 4.–Lower Slate Creek GPS Points.

Location	Latitude	Longitude
100m	58.7884°N	135.0324°W
200m	58.7893°N	135.0337°W
300m	58.7905°N	135.0349°W
400m	58.7915°N	135.0359°W
500m	58.7920°N	135.0366°W
600m	58.7933°N	135.0375°W
700m	58.7936°N	135.0379°W
800m	58.7944°N	135.0384°W
900m	58.7952°N	135.0386°W
Falls	58.7964°N	135.0389°W

Table 5.–Lower Johnson Creek GPS Points.

Location	Latitude	Longitude
Lace	58.8215°N	135.0010°W
Mouth	58.8236°N	134.9987°W
Trap	58.8235°N	135.0007°W
#4	58.8236°N	135.0039°W
#7	58.8243°N	135.0072°W
#10	58.8254°N	135.0109°W
Power House	58.8259°N	135.0148°W
Log Falls	58.8256°N	135.0169°W
#15	58.8255°N	135.0194°W
Falls	58.8240°N	135.0260°W

Table 6.–Lower Sherman Creek GPS Points.

Location	Latitude	Longitude
Mouth	58.8684°N	135.1405°W
Falls	58.8669°N	135.1370°W

Note: We will record 50 m reach GPS points in Lower Sherman Creek in 2014.

MONITORING SCHEDULE

In 2013, we collected data on the dates shown in Table 7.

Table 7.–Aquatic studies sampling schedule.

Aquatic Study	Lower Slate	East Fork Slate	West Fork Slate	Upper Slate	Lower Johnson	Upper Johnson	Lower Sherman	Upper Sherman
Periphyton	02/06/13 04/30/13 07/31/13 10/21/13	02/06/13 04/29/13 07/30/13 10/21/13	07/31/13	02/06/13 04/29/13 07/30/13 10/22/13			07/29/13(1) 07/29/13(2)	
Benthic Macroinvertebrates	04/30/13(1) 04/30/13(2) 10/21/13(1)	04/29/13 06/03/13 10/21/13	04/30/13	04/29/13		04/29/13	05/01/13(1) 05/01/13(2)	
Resident Fish		08/28/13		08/27/13				
Resident Fish Metals	09/09/13	08/28/13 11/20/13	09/10/13 09/16/13	08/27/13				
Sediment Metals & Toxicity	07/02/13	07/01/13	07/02/13	07/01/13	07/01/13		07/01/13	07/01/13
Spawning Substrate Quality	07/02/13(1) 07/02/13(2)							
Adult Salmon Counts	07/15/13– 10/15/13				07/15/13– 10/22/13		07/15/13– 09/16/13	

Note: The grey cells indicate data not required in the APDES Permit or Plan of Operations.

METHODS

We will provide footnotes under each specific aquatic study in the *Results* section when we deviate from the methods described in this section.

PERIPHYTON COMMUNITY COMPOSITION AND BIOMASS

Requirement APDES 1.5.3.5.2

Periphyton are primary producers whose microcommunites include algae, cyanobacteria, heterotrophic microbes, and detritus attached to the submerged surfaces of aquatic ecosystems. The chlorophyll *a* pigment in periphyton samples provides an estimate of active algal biomass present. Chlorophyll *b* and *c* pigments provide an estimate of the composition of organisms present in addition to those found in chlorophyll *a*. We monitor periphyton community composition and biomass in Lower Slate Creek, East Fork Slate Creek, and Lower Sherman Creek receiving waters downstream of Kensington Gold Mine discharges as a reliable indicator of water quality and to detect changes over time. We monitor periphyton community composition and biomass in the West Fork Slate Creek and Upper Slate Creek reference sites to detect variations due to other natural factors that may include mineral seeps, climate, and stream flow.

Sample Collection and Analysis

We attempt to sample periphyton annually at low flows when there have not been high flows within the previous three weeks. We collect 10[gg] smooth, flat, undisturbed, and perennially wetted rocks from a riffle area of submerged cobble in less than 0.45 m of water within each study reach using the collection methods described in Ott et al. (2010). We place a 5 × 5 cm square of high-density foam on each rock and scrub the area around the foam with a toothbrush to remove all attached algae outside the covered area. We rinse the rock by dipping it with foam intact in the stream.

We remove the foam square and scrub the sample area with a rinsed toothbrush over a 1 µm, 47 mm glass fiber filter attached to a vacuum pump. We use stream water in a wash bottle to rinse the loosened periphyton from the rock, the toothbrush, and the inside of the vacuum pump onto the filter. We pump most of the water through the filter then add a few drops[hh] of saturated magnesium carbonate ($MgCO_3$) to the filter before we pump the sample dry. This prevents acidification and conversion of chlorophyll to phaeophyton. We remove the dry glass fiber filter, fold it in half with the sample on the inside, and wrap it in a white coffee filter to absorb additional water. We place the sample in a sealed, labeled plastic bag with desiccant and store the samples in a light-proof cooler containing frozen gel packs until we can freeze them. Once we return to the office, we keep the samples frozen at –20°C until processing.

We follow U.S. Environmental Protection Agency protocol (1997) for chlorophyll extraction and measurement and instrument detection limit and error.[ii] We remove the samples from the freezer, cut them into small pieces, and place them in a centrifuge tube with 10 ml of 90% buffered acetone. We cap the centrifuge tubes and place them in a metal rack, cover them with aluminum

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[gg] We are working with Dan Reed, ADF&G Sport Fish biometrician, to evaluate sample size.

[hh] This measurement is not exact as the amount of water used to dilute the magnesium carbonate is not exact and fixes the sample regardless of the concentration and without affecting data integrity.

[ii] There are two main deviations from EPA Method 446. Our sample storage may exceed 3.5 weeks. Our filters are cut rather than homogenized due to risk of acetone exposure (Ott et al. 2010).

foil, and hold them in a refrigerator for not more than 24 hours to extract the chlorophyll. After extraction, we centrifuge the samples for 20 minutes at 1,600 rpm and then read them on a Shimadzu UV-1800 Spectrophotometer at optical densities (OD) 664 nm, OD 647 nm, and OD 630 nm. We also take a reading at OD 750 nm to correct for turbidity. We use an acetone blank to correct for the solvent. We treat the samples with 80 μ1 of 0.1 N hydrochloric acid to convert chlorophyll to phaeophyton, and then read them again at OD 665 nm and OD 750 nm.

We use Statistix® 9 (Analytical Software. 2008. Statistix 9 User's Manual. Analytical Software, Tallahassee, Florida, http://www.statistix.com/features.html) to conduct the Kruskal-Wallis One-Way Analysis of Variance by ranks test to investigate significant differences ($p \leq 0.05$) in data distribution within sites between sample events (Neter et al. 1990).

Data Presentation

We include a figure of stream flow three weeks prior to field sampling in the East Fork Slate Creek section when the information is available. Discharge data is not available in Johnson or Sherman Creeks.

For each sample site, we provide a table showing sampling dates and chlorophylls *a, b,* and *c* mean concentrations (mg/m^2) for the calendar year, present a graph of the mean proportion of chlorophylls *a, b,* and *c* for all sampling events, and show algal biomass, estimated by the chlorophyll *a* concentration in each sample, for all sampling events. Data are in Appendix A.

BENTHIC MACROINVERTEBRATE COMPOSITION AND ABUNDANCE

Requirement APDES 1.5.3.2

We sample benthic macroinvertebrates, paying close attention to the proportion of those classified in the Orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies); collectively known as EPT taxa. EPT taxa have limited mobility, a short life cycle, and are sensitive to changes in water quality. We monitor macroinvertebrate community composition and abundance in Lower Slate Creek, East Fork Slate Creek, Upper Johnson Creek, and Lower Sherman Creek annually between March and May after spring breakup and before peak snowmelt to detect changes over time. We monitor West Fork Slate Creek and Upper Slate Creek reference sites to detect variations due to other natural factors.

Sample Collection and Analysis

The APDES Permit requires we evaluate each reach for all areas that contain stream substrate with particles less than 20 cm along the longest axis, and then sample opportunistically, until we collect six benthic macroinvertebrate samples. We sample with a Surber stream bottom sampler in riffles and runs representing different velocities (Barbour et al. 1999).

The Surber stream bottom sampler has a 0.093 m^2 sample area and a 300-micron mesh net that terminates at the cod end. After setting the frame in the substrate, we scrub rocks within the sample area with a brush and disturb gravels and silt manually, to about 10 cm depth, to dislodge insects into the net.

We remove each macroinvertebrate sample from the cod end of the Surber sampler by rinsing the sample into a prelabeled 500 mL plastic bottle with minimum 70% denatured ethanol. We add additional ethanol to each bottle at three parts ethanol to one part sample. Habitat biologists use an elutriator and two sieves to sort macroinvertebrates from debris.[jj] Biologists use dissecting stereoscopes and identify oligochaetes to order, chironomids to family, and all others to genus, using Merritt and Cummins (1996) and Stewart and Oswood (2006). An experienced habitat biologist provides quality assurance and control by verifying our insect identification in 10% of our total samples.

We calculate the density of aquatic macroinvertebrates per square meter by dividing the number of aquatic insects per sample by 0.093 m^2, the Surber sampling area. Aquatic macroinvertebrate density is expressed as the mean number of invertebrates per m^2.

The Shannon Diversity (H) and Evenness (E) Indices are commonly applied measures of diversity (Magurran 1988). We calculated the indices using the following equations:

$$H = -\sum_{i=1}^{S} (P_i \ \log_{10} P_i)$$

and

$$E = \frac{H}{\log_{10} S},$$

where P_i is the number of invertebrates per genus divided by the total number of invertebrates in the sample, and S is the number of genera in the sample, assuming all species are represented in the sample.[kk] A single insect community has an H value of 0 that increases with the insect number (richness) and insect evenness (abundance equality).

We use Statistix® 9 (Analytical Software 2008) to conduct the Kruskal-Wallis One-Way Analysis of Variance by ranks test to investigate significant differences ($p \leq 0.05$) in data distribution within sites between sample events (Neter et al. 1990).

Data Presentation

We present a figure of macroinvertebrate community composition and abundance by year. The Shannon Indices of Diversity and Evenness are in narrative. Data are in Appendix B.

RESIDENT FISH POPULATION

Requirement APDES 1.5.3.3

The APDES Permit requires resident fish population estimates by species and habitat type in 360 m reaches in East Fork Slate and Upper Slate Creeks so that comparisons can be made between years within a reach. We estimate the variability of the data, including minimum detectable differences between samples, and the precision of the 95% confidence interval so that we can refine or revise sampling protocols.

[jj] Gordon Willson-Naranjo and Greg Albrecht, Habitat Biologists, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Benthic Macroinvertebrate Elutriation Trials Amendment; dated 12/17/2013.

[kk] Assuming all species are represented in the sample.

Sample Collection and Analysis

In 2011, we completed habitat surveys in about the same 360 m reaches surveyed by Flory (2011) using the habitat types described in Bisson et al. (1981). Based on the results of those habitat surveys, we selected a 90 m sampling reach representative of the habitat types present. Though Bisson subdivides three main habitat types for precision to detect environmental change, we counted the main habitat types—riffles (steepest slopes and shallowest depths at flows below bankfull with a poorly defined thalweg), pools (deepest areas where water surface slope below bankfull is near zero), and glides (immediately downstream of pools with negative bed slope and positive water surface slope). The East Fork and Upper Slate Creeks sample sites are moderate gradient, narrow, shallow, and contained, with East Fork Slate Creek dominated by bedrock and boulder substrate. Channels of this type are stable and habitat features are unlikely to change during the mine's period of operation. In 2013, we sampled in the 90 m stream reaches that were selected in 2011.

We sample resident fish populations using a modification (shorter reaches, more minnow traps and three passes instead of four) of a depletion method described by Bryant (2000). We isolate sample reaches using fine mesh nets and secure them to the stream bottom with large rocks. We saturate the 90 m reaches with 0.635 cm (1/4 in) and 0.317 cm (1/8 in) soft mesh and wire mesh minnow traps baited with whirl packs containing sterilized salmon roe (Magnus et al. 2006).

Beginning at the downstream end of each reach, we set baited minnow traps opportunistically in all habitat types where water depth and flow allow. We record the habitat type in which each trap is set. We move away from the sampling site so fish are not disturbed while the traps soak for 1.5 hours. We retrieve each trap, record the fish in each trap, and then place the fish in an aerated bucket for processing. We remove the spent bait packet, rebait each trap and reset it in the exact same spot, as quickly as possible. We leave the trap for another 1.5 hour soak period, and then complete the sequence a third time.

We anesthetize fish in the aerated bucket with diluted clove oil[ll], measure FL to the nearest 1 mm, weigh each to the nearest 0.1 g, and record the species (Pollard et al. 1997). Fish are kept in a live well secured in the stream outside the delineated sample reach during the sampling period, and returned to the sample reach after all three passes are complete.

We collect data to meet the assumptions of closure and of equal probability of capture (Lockwood and Schneider 2000) during all three sampling events by ensuring the following:

- Fish emigration and immigration during the sampling period is negligible.
    - Sample reaches are isolated using fine mesh nets having a cork and lead line.
    - The net is secured to the streambed with large rocks along the lead line.
- All fish are equally vulnerable to capture during a pass.
    - Baited minnow traps are set in all habitat types where water depth and flow allow.
- Fish do not become more wary of capture with each pass.
    - Trap numbers and placement remain constant during all three capture events.

[ll] Clove oil (0.5 mL/gal) in 2013. In 2014 we may use AQUI-S® 20E (10% eugenol) to anesthetize fish.

  - Instream field crew is limited to two biologists.
  - Field crew completes all three capture events as quickly possible.
  - Field crews move away from sampling sites so fish are not disturbed while the traps soak 1.5 h each capture event.
- Collection effort and conditions which affect collection efficiency remain constant.
  - All capture events begin at the downstream end of each reach.
  - Field crew moves upstream setting, retrieving and replacing traps as quickly as possible.
  - Data recorder notes time between capture events in data sheets.
  - Water temperature and clarity are recorded at the beginning of each capture event.
  - For the second and third capture events, the field crew removes the spent bait packet and rebaits and resets each trap in the exact same location.

We estimate resident fish populations using the multiple-pass depletion method developed by Lockwood and Schneider (2000), based on methods developed by Carle and Strub (1978). The repetitive method produces a maximum likelihood estimate (MLE) of fish with a 95% confidence interval.

Let X represent an intermediate sum statistic where the total number of passes, k, is reduced by the pass number, i, and multiplied by the number of fish caught in the pass, $C_{i,}$, for each pass,

$$X = \sum_{i=1}^{k} (k - i) C_i$$

Let T represent the total number of fish captured in the minnow traps for all passes. Let n represent the predicted population of fish, using T as the initial value tested. Using X, the MLE, N, is calculated by repeated estimations of n. The MLE is the smallest integer value of n greater than or equal to T which satisfies[mm] the following:

$$\left[\frac{n+1}{n-T+1}\right] \prod_{i=1}^{k} \left[\frac{kn - X - T + 1 + (k-i)}{kn - X + 2 + (k-i)}\right]_{i} \leq 1.000$$

The probability of capture, p, is given by the total number of fish captured, divided by an equation where the number of passes is multiplied by the MLE and subtracted by the intermediate statistic, X,

$$p = \frac{T}{kN - X}$$

[mm] Lockwood and Schneider (2000) suggest the result should be rounded to one decimal place (1.0). We use three decimal places (1.000) which is an option in Carle and Strub (1978).

The variance of N, a measure of variability from the mean, is given by

$$Variance\ of\ N = \frac{N(N-T)T}{T^2 - N(N-T)\left[\frac{(kp)^2}{(1-p)}\right]}$$

The SE of N is calculated by the square root of the variance of N, and the 95% confidence interval for the MLE is given by MLE ± 2(SE). Because we sample a 90 m reach, we multiply the MLE and 95% confidence interval by four to extrapolate the data to a 360 m sample reach. A MLE cannot be generated from samples from small populations if few fish are captured during the three sample events; in these cases, we present the number of fish captured as the result and do not include a MLE. We determine the precision of the estimate by expressing the 95% confidence interval as a percentage of the MLE.

Calculating a MLE using three-pass depletion data relies heavily on equal capture probability among passes (Bryant 2000, Carle and Strub 1968, Lockwood and Schneider 2000). To evaluate equal capture probability, we use the goodness of fit test in White et al. (1982), recommended by Lockwood and Schneider (2000), which follows the χ^2 test form. We first calculate expected numbers of fish captured for each pass $(C_1, C_{2.}, C_3)$ using variables previously described:

$$E(C_1) = N(1-p)^{i-1}p$$

Then we calculate χ^2,

$$\chi^2 = \frac{[\mathrm{C}_1 - \mathrm{E}(\mathrm{C}_1)]^2}{\mathrm{E}(\mathrm{C}_1)} + \frac{[\mathrm{C}_2 - \mathrm{E}(\mathrm{C}_2)]^2}{\mathrm{E}(\mathrm{C}_2)} + \frac{[\mathrm{C}_3 - \mathrm{E}(\mathrm{C}_3)]^2}{\mathrm{E}(\mathrm{C}_3)}$$

If the goodness of fit test indicates we did not achieve equal capture probability, the MLE will be biased low.

We use Monte-Carlo simulations to assess the power of our three-pass depletion studies to detect changes in abundance of small ($N < 200$) fish populations. We simulate sampling according to the three-pass depletion design on each year's population of fish where the abundance of fish differs by varying degrees, and estimate the abundance of each population using the techniques described in Lockwood and Schneider (2000). We use a Student's *t*-test with two degrees of freedom to test the null hypothesis that both estimates come from populations of equal size, with one degree of freedom associated with each estimate. We evaluate significance at $\alpha = 0.05$. To assess power we conduct 10,000 simulations of two three-pass depletion experiments, sampling from two populations using parameters N and p calculated as described above for the two populations of interest. Values of N and variance of N are calculated for each set of simulated sampling data and a *t*-test is conducted. Power is estimated as the proportion of simulations where the null hypothesis is rejected (Dan Reed, Sport Fish Biometrician, ADF&G, Nome, personal communication).

Data Presentation

We present resident fish population estimates by 360 m reach by year, population estimates by habitat type by 360 m reach by year, and the length frequency of this year's captures in figures. We present resident fish capture data, population estimates by reach by year, population estimates by habitat type by reach by year, precision of the population estimates, and power of the current year population estimates compared to the previous year population estimate in Appendix C.

RESIDENT FISH CONDITION

Requirement APDES 1.5.3.3.1

The APDES Permit requires us to compare fish condition by reach and by year in East Fork Slate and Upper Slate Creeks. Age, sex, season, maturation, diet, gut fullness, fat reserve, and muscular development affect fish condition.

Sample Collection and Analysis

We weigh the resident fish captured in our resident fish surveys to the nearest 0.1 g and measure FL to the nearest 1 mm. We use the lengths and weights to calculate Fulton's condition factor (K) using the equation given in Anderson and Neumann (1996) where the weight of each fish measured in grams (W) is divided by the cubed length of each fish (L) measured in millimeters, and the product multiplied by 100,000:

$$K = \frac{W}{L^3} \times 100{,}000$$

Data Presentation

We present the mean condition factor of resident fish in the East Fork Slate Creek and Upper Slate Creek sections, and provide resident fish length, weight, and condition factor data in Appendix C.

RESIDENT FISH METALS CONCENTRATIONS

Requirement APDES 1.5.3.4

The APDES Permit requires us to sample six Dolly Varden char within the size class 90–130 mm for whole body concentrations of aluminum (Al), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni), selenium (Se), silver (Ag), and zinc (Zn) in Lower, East Fork, and Upper Slate Creeks for a total of 18 fish. We recommended ADEC choose this sample size as it is used for aquatic studies at other mines in Alaska and provides information without being cost prohibitive. The minimum size of 90 mm FL is the minimum amount of tissue (about 5 g) required for the laboratory to conduct the analyses. The maximum size of 130 mm FL improves the likelihood of sampling less than a three-year-old resident fish in Lower Slate Creek where Dolly Varden char may be anadromous (Balon 1980).

Sample Collection and Analysis

We capture fish in minnow traps baited with sterilized salmon roe, individually package them in clean, prelabeled bags, and measure FL to 1 mm. We store samples in a cooler containing gel ice packs, then in a camp freezer until we return to Juneau and weigh the fish in the sealed bags, correcting for bag weight. We freeze the samples at –20°C until we ship them to a private laboratory, where they are individually digested, dried, and analyzed for Ag, Al, Cd, Cr, Cu, Pb, Hg, Ni, Se, and Zn on a dry-weight basis. The private analytical laboratory provides Tier II quality assurance/quality control validation information for each analyte including matrix spikes, standard reference materials, laboratory calibration data, sample blanks and duplicates.

Data Presentation

We present a figure of whole body metals concentrations for each sample by element in the Lower Slate, East Fork Slate, and Upper Slate Creeks sections. We provide a figure with the 2012 whole body metals concentrations for Lower, East Fork and Upper Slate Creeks, a table with all data, and the laboratory report in Appendix D.

SEDIMENT METALS CONCENTRATIONS

Requirement APDES 1.5.2

Sediment metals concentrations are influenced by a variety of factors, including mineralogy, grain size, organic content, and human activity. We sample Lower Slate, East Fork Slate, Upper Slate, Lower Johnson, and Lower Sherman Creeks for the metallic elements Ag, Al, Cd, Cr, Cu, Pb, Hg, Ni, and Zn, the metalloid arsenic (As) and nonmetal Se.

Sample Collection and Analysis

We collect sediment samples opportunistically in areas with fine sediment deposition, usually along the perimeter of the stream and in shallow eddies. We collect the top four cm of sediment and retain sediment that passes through a 1.7 mm sieve in a new plastic bucket, transferring the sediment to a 100 mL glass jar the laboratory provides. Between sites, we rinse our sampling equipment in stream water. We store the samples in coolers on ice during transport between the mine and our lab, and store them in our refrigerator until we ship them to the AECOM Environmental Toxicology laboratory in Fort Collins, Colorado for analysis.

Data Presentation

We present sediment metals concentrations for each sample site in a figure and for each site across years in a figure. We include tables with Kensington Gold Mine sediment sample compositions, metallic, metalloid and nonmetal element concentrations for all 6 sample sites across years with this year’s laboratory report in Appendix E.

SEDIMENT METALS TOXICITY

Requirement APDES 1.5.2.3

Sediment is a repository of metals introduced into surface waters. We monitor the toxicity of metals in sediments in the laboratory using *Chironomus dilutus* (midges) and *Hyalella azteca* (amphipods). We sample Lower Slate, East Fork Slate, Upper Slate, Lower Johnson, and Lower Sherman Creeks for the metallic elements Ag, Al, Cd, Cr, Cu, Pb, Hg, Ni, and Zn, the metalloid As and nonmetal Se. Survival of *Chironomus dilutus* is generally lower than survival of *Hyalella azteca* on all mediums including the laboratory control sand.

Sample Collection and Analysis

We collect sediment samples opportunistically in areas with fine sediment deposition, usually along the perimeter of the stream and in shallow eddies. We retain the sediment that passes through a 1.7 mm sieve in a new plastic bucket, and transfer the sediment to a 2 L plastic container the laboratory provides. Between sites, we rinse our sampling equipment in stream water. We store the samples in coolers on ice during transport between the mine and our lab, and store them in our refrigerator until we ship them to the AECOM Environmental Toxicology laboratory in Fort Collins, Colorado for analysis.

The private laboratory tests for short-term chronic toxicity of sediment using the organisms *Chironomus dilutus* and *Hyalella azteca* , and removes debris and large sediment from the sample prior to homogenizing. The laboratory uses eight replicates of sediment for each treatment, and the laboratory control sediment is commercial grade sand.

Data Presentation

We present organism survival and growth for each sample site in a narrative. We provide the laboratory report that lists significant differences ($p \leq 0.05$) between control and individual samples in Appendix E.

SPAWNING SUBSTRATE QUALITY

Requirement APDES 1.5.3.5.1

The APDES permit requires annual pink salmon spawning substrate sampling in Lower Slate Creek during July prior to spawning activity. We calculate the geometric mean particle size (d_g), an index of substrate textural composition, for each sample and for each sample site. We monitor spawning substrate quality to detect change over time.

Sample Collection

We collect four replicate samples from two locations in the anadromous portion of Slate Creek using a McNeil sampler, which has a 15 cm basal core diameter and 25 cm core depth. We choose sample sites selecting substrate measuring less than 10 cm, the maximum gravel size used by pink salmon (Lotspeich and Everest 1981; Kondolf and Wolman 1993), where the stream gradient is less than 3% (Valentine, B. E. 2001. Unpublished. Stream substrate quality for salmonids: Guidelines for Sampling, Processing, and Analysis. California Department of Forestry and Fire Protection, Coast Cascade Regional Office, Santa Rosa, CA). We push the McNeil sampler into the substrate until the sample core is buried, then transfer the sediments to a five gallon bucket using a stainless steel scoop. Samples are wet-sieved onsite using sieve sizes 101.6, 50.8, 25.4, 12.7, 6.35, 1.68, 0.42, and 0.15 mm. We measure the contents of each sieve to the nearest 5 mL[nn] by the volume of displaced water in 600 mL and 1 L plastic beakers. We transfer the fines that pass through the 0.15 mm sieve to an Imhoff cone and allow them to settle for 10 minutes, then measure the displacement using the Imhoff cone gradations.

Data Presentation

We convert the wet weights to dry weights using standards identified by Zollinger (1981) for the fines that settle in the Imhoff cones and 0.15 mm sieve. For all others, we convert the wet weights to dry weights using a correction factor derived from Shirazi et. al (1979), assuming a gravel density of 2.6 g/cm^3 previously used by Timothy and Kanouse (2012). We calculate the geometric mean particle size (d_g) using methods developed by Lotspeich and Everest (1981), where the midpoint diameter of particles retained in each sieve (d) are raised to a power equal to the decimal fraction of volume retained by that sieve (w), and multiplied the products of each sieve size to obtain the final product,

$$d_g = d_1^{w1} \times d_2^{w2} \times d_3^{w3} \ldots d_{\mathrm{n}}^{w\mathrm{n}}$$

[nn] The contents of the 0.15 mm sieve are measured to the nearest 1 mL using an Imhoff cone.

We present a figure that shows the geometric mean particle size calculated for each sample at each sample point and a figure that shows the geometric mean particle size of all samples by year in the Lower Slate Creek results section. Raw data are in Appendix F.

ADULT SALMON COUNTS

Requirement Plan of Operations

Coeur's USFS approved Plan of Operations (2005) requires weekly surveys of adult chum salmon, coho salmon, and pink salmon in Lower Slate, Lower Johnson, and Lower Sherman Creeks throughout the spawning season.

Sample Collection

We survey Slate Creek, Johnson Creek, and Sherman Creek downstream of fish migration barriers once per week between mid-July and mid-September to count the number of live adult pink salmon, chum salmon and carcasses. We survey Slate and Sherman Creeks once per week, and survey Johnson Creek from a helicopter once per week, verifying survey results three times with foot surveys. We snorkel Slate and Johnson Creek deep pools and large woody debris jams through October to count the number of live adult coho salmon.

We begin surveys at the stream mouth, moving upstream by section, and end at the anadromous fish barrier. Slate Creek is sectioned in 100 m reaches, Johnson Creek by landmarks and Sherman Creek in 50 m reaches. A team of two biologists wearing polarized sunglasses independently record the number of live fish and carcasses by species during each foot and aerial survey. We also record weather and flow conditions each survey.

Data Presentation

We use the average of the two biologists' counts to estimate the total number of fish, by species, each survey. We present figures of adult pink salmon counts by week and by distribution in Lower Slate, Lower Johnson, and Lower Sherman Creeks. We present a table showing the total of each species each year we sampled. Beginning 2013, we do not adjust the residency time for any salmon species (Dan Reed, Sport Fish Biometrician, ADF&G, Nome, personal communication). To account for pink salmon not seen in Lower Johnson Creek during aerial surveys, we multiply our mean weekly counts for each reach by a factor of 2.5 as described in Jones et al. (1998), and round down all numbers to whole numbers in the calculations.[oo] Comparing the 2013 Lower Johnson Creek foot count and aerial count data, our average aerial survey underestimation of pink salmon counted was an approximate factor of 2.1.[pp] Data are in Appendix G.

[oo] We adjusted the 2011 pink and chum salmon returns previously reported per this method.

[pp] Our average aerial survey underestimation of pink salmon in 2011 was a factor of 3.06, and in 2012 was a factor of 1.8.

RESULTS

SLATE CREEK

Lower Slate Creek

Periphyton

We collected periphyton in Lower Slate Creek on July 31, 2013, and present three years of late-July chlorophylls *a*, *b*, and *c* mean density data in Table 8. The chlorophyll *a* density for each sample each year is shown in Figure 6, and the proportion of chlorophylls *a*, *b*, and *c* each year is presented in Figure 7.

Table 8.–Lower Slate Creek chlorophylls *a*, *b*, and *c* mean density.

Sample Date	Chlorophyll *a* (mg/m^2)	Chlorophyll *b* (mg/m^2)	Chlorophyll *c* (mg/m^2)
July 29, 2011	5.65	0.43	0.26
July 25, 2012	2.31	0.05	0.18
July 31, 2013	12.59	0.00	1.64

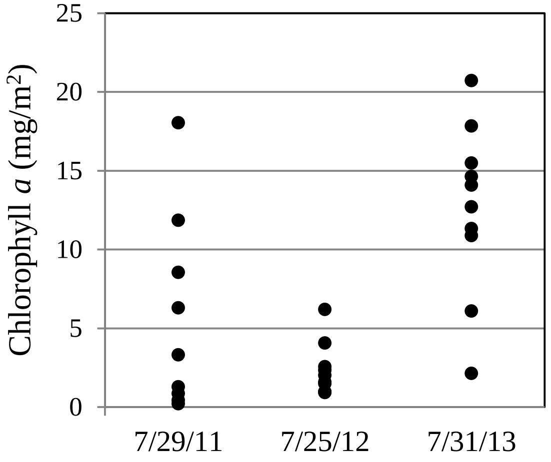


Figure 6.–Lower Slate Creek chlorophyll *a* sample densities.

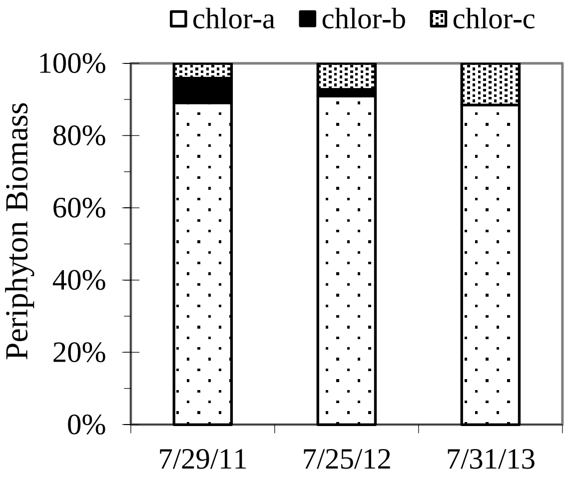


Figure 7.–Lower Slate Creek chlorophylls *a*, *b*, and *c* proportion.

There are significant differences ($p \leq 0.05$) between the 2013 mean rank for

- chlorophyll *a* density and the 2011 and 2012 mean ranks;
- chlorophyll *b* density and the 2011 mean rank, and;
- chlorophyll *c* density and the 2011 and 2012 mean ranks.

Benthic Macroinvertebrate Composition and Abundance

On April 30, 2013 we sampled benthic macroinvertebrates in two locations in Lower Slate Creek, as Sample Point 1, the designated site, does not appear to provide the quality of habitat found at proposed Sample Point 2, just upstream (Timothy and Kanouse 2013). If after a few years we find EPT taxa at the upstream site similar to those of the downstream sampling site, we will use the upstream location over the long term.

Sample Point 1

We identified 27 taxa and estimate benthic macroinvertebrate density at 2,581 insects per m^2, of which 51% were EPT taxa (Figure 1).[qq] The Shannon Diversity score was 0.85 and the Evenness score was 0.70. The dominant taxa were Diptera: Chironomidae (nonbiting midges), representing 35% of the samples, and Ephemeroptera: Baetis (mayflies), representing 23% of the samples (Figure 8).

Sample Point 2

Among the April 30 samples, we identified 24 taxa and we estimate benthic macroinvertebrate density at 1,333 insects/m^2, of which 63% were EPT taxa. The Shannon Diversity score was 0.93 and Evenness score was 0.78. The dominant taxa were Diptera: Chironomidae and Ephemeroptera: Baetis, each representing 22% of the samples (Figure 8).

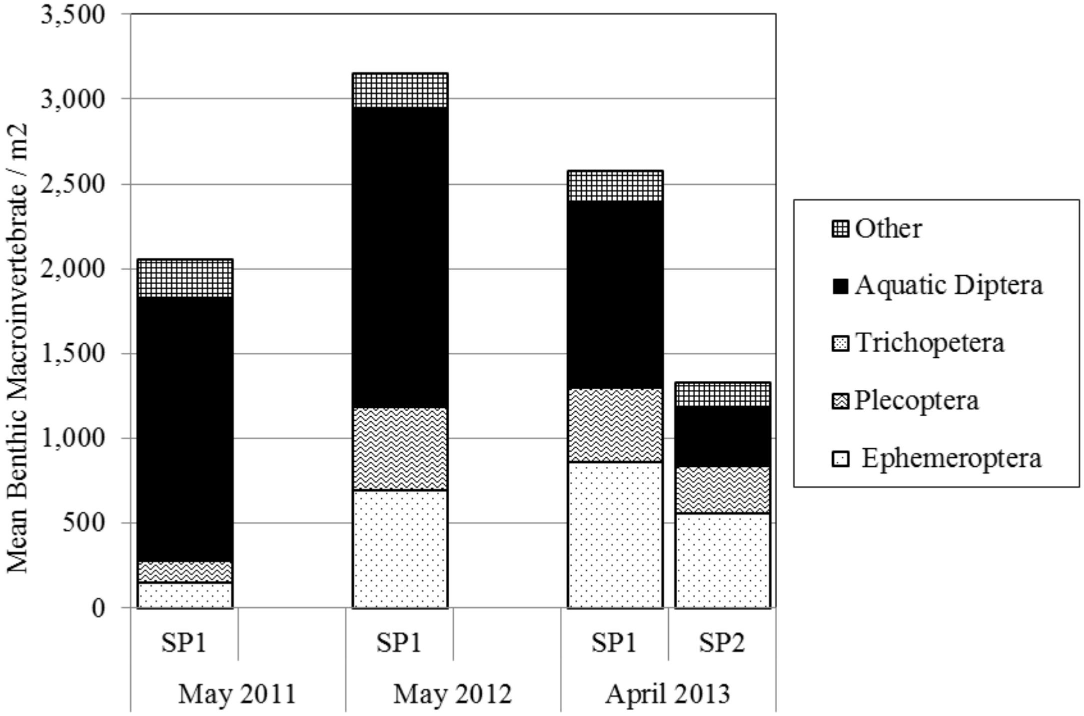


Figure 8.–Lower Slate Creek Sample Point 1 and 2 benthic macroinvertebrates.

[qq] We spilled Lower Slate Creek Sample #4 taken at Sample Point 1 during sorting and identification and do not include it in our results.

Resident Fish Metals Concentrations

On September 9, 2013, we captured six Dolly Varden char in Lower Slate Creek within 200 m downstream of the waterfall barrier. We shipped the samples to ALS Environmental in Kelso, Washington, for laboratory analyses on October 15 and received the results November 19, 2013. Among the six Dolly Varden char we collected in Lower Slate Creek, Hg and Zn concentrations were greater in the 2013 samples than values observed in the 2012 samples and the 2011 homogenized fish sample, while the other metals and Se concentrations were less than or similar to the 2011–2012 data (Figure 9). Pb was undetected at the method reporting limit (0.02 mg/kg) in one sample.

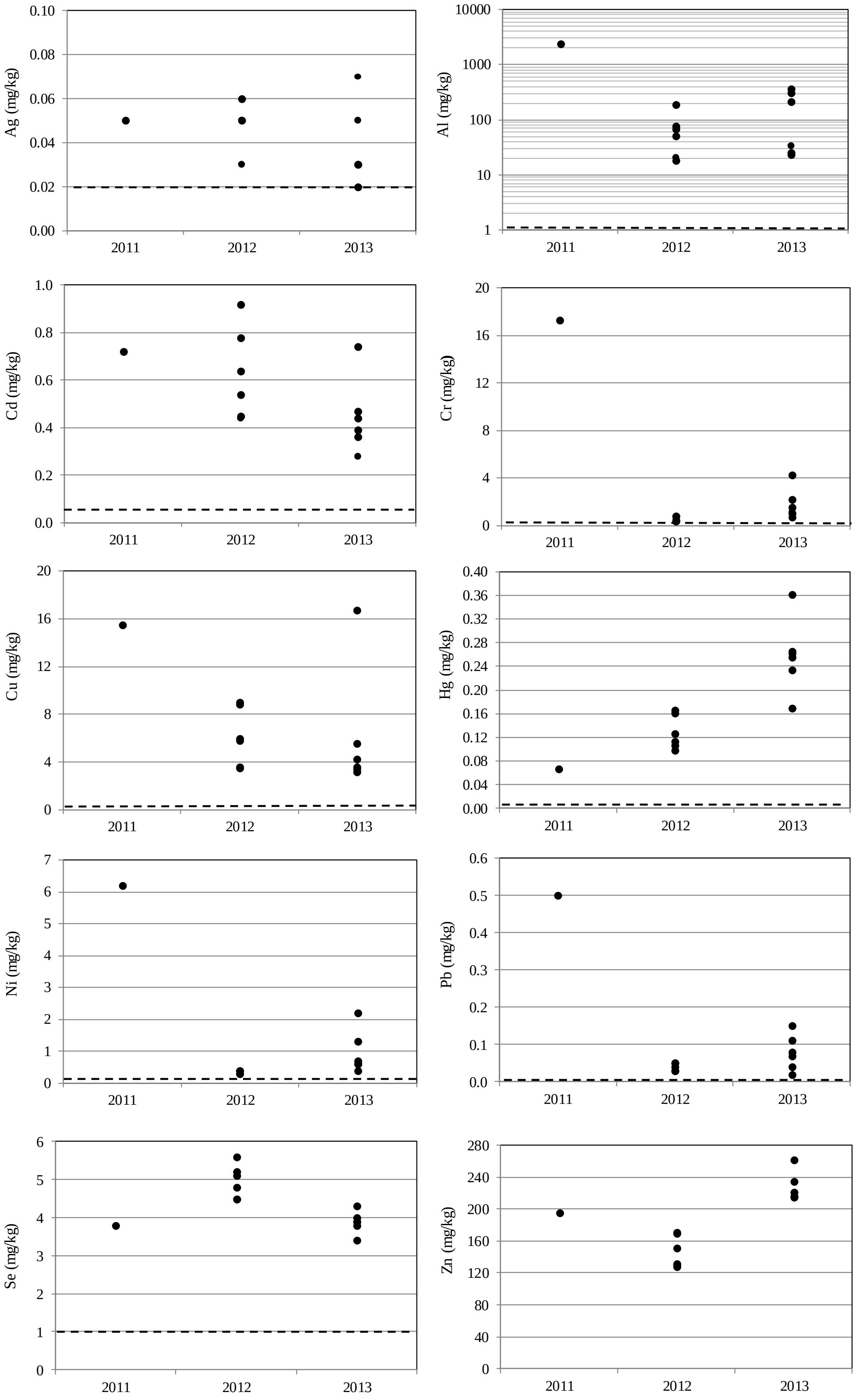


Figure 9.–Lower Slate Creek whole body metals concentrations.

Note: 2011, 2012 and 2013 juvenile Dolly Varden char.
Note: Dashed lines represent the method reporting limit.

Sediment Metals Concentrations

Sediment metals, As, and Se concentrations for the Lower Slate Creek sample we collected on July 2, 2013 are shown in Figure 10. Figure 11 shows the 2011–2013 sediment metals concentrations. The 2013 sample contained greater concentrations of As, Cr, Ni, Pb, and Se compared to samples collected in 2011 and 2012. Concentrations of Ag, Al, Cd, Cu, Hg, and Zn were similar to those observed in 2011 and 2012.

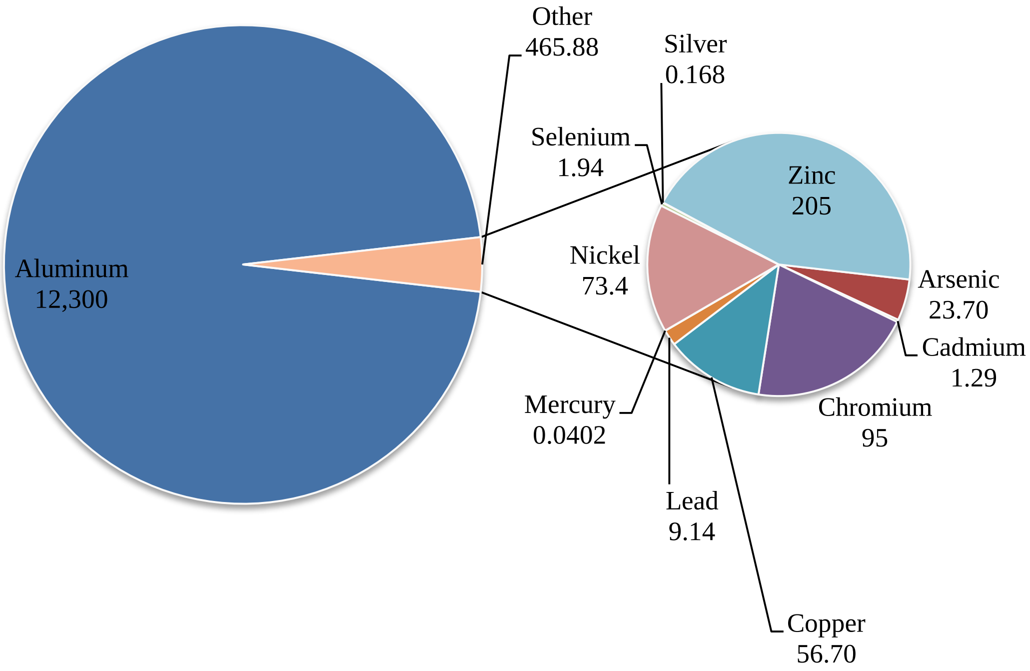


Figure 10.–Lower Slate Creek sediment metals concentrations.

Note: 2013 data presented in parts per million (mg/kg).

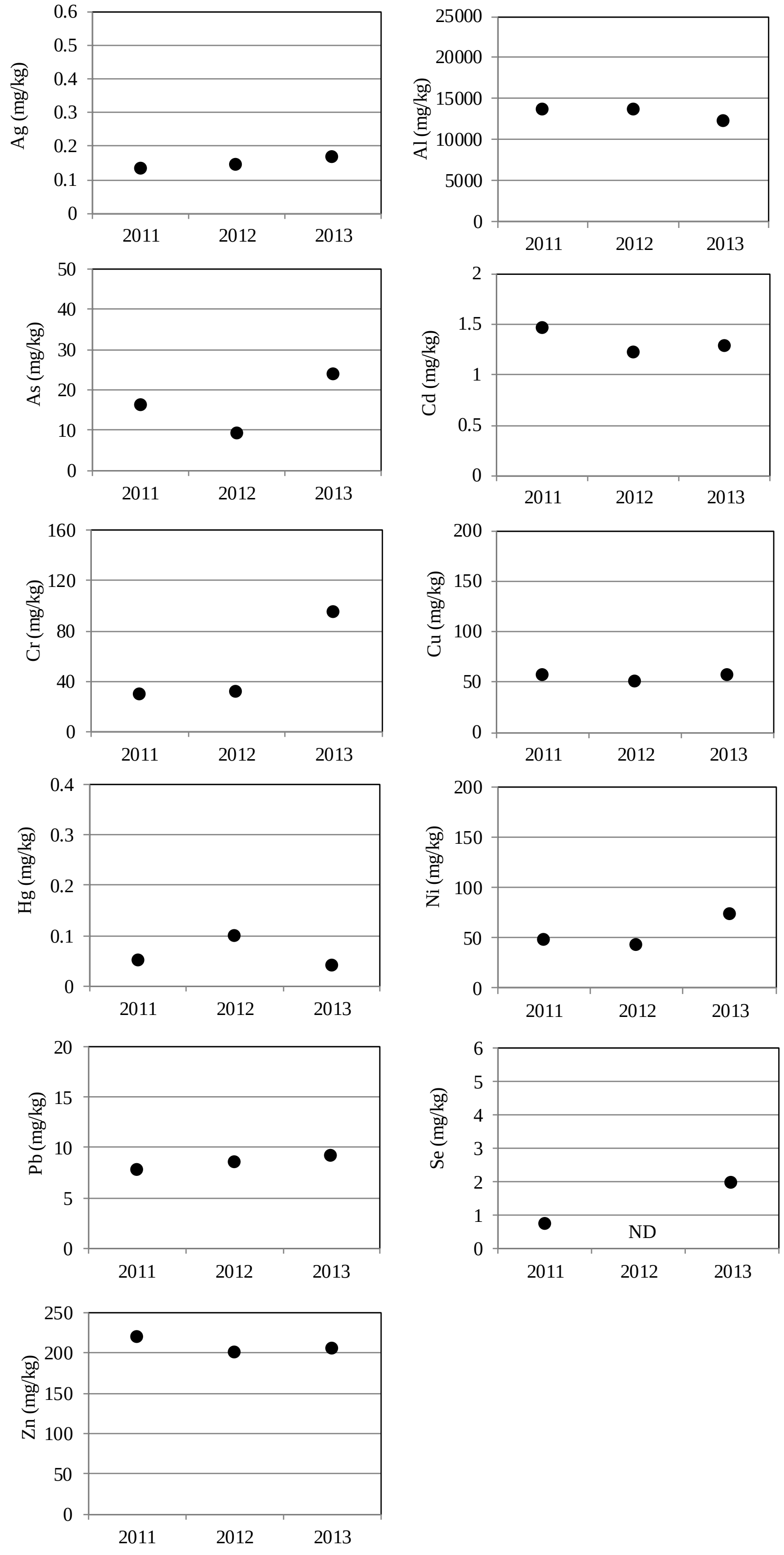


Figure 11.–Lower Slate Creek sediment metals concentrations, 2011–2013.

Note: Data presented in parts per million (mg/kg), ND indicates not detected.

Sediment Toxicity

There were no significant differences in growth or survival of *Chironomus dilutus* or *Hyalella azteca* between the Lower Slate Creek sediment sample and the laboratory control.

Spawning Substrate Quality

The geometric mean of each spawning substrate sample at sample point 1 is 15.08, 9.59, 17.76, and 13.31 mm, with an average geometric mean of 13.9 mm. The geometric mean of each spawning substrate sample at sample point 2 is 9.53, 12.87, 14.79, and 14.58 mm, with an average geometric mean of 12.9 mm (Figure 12).

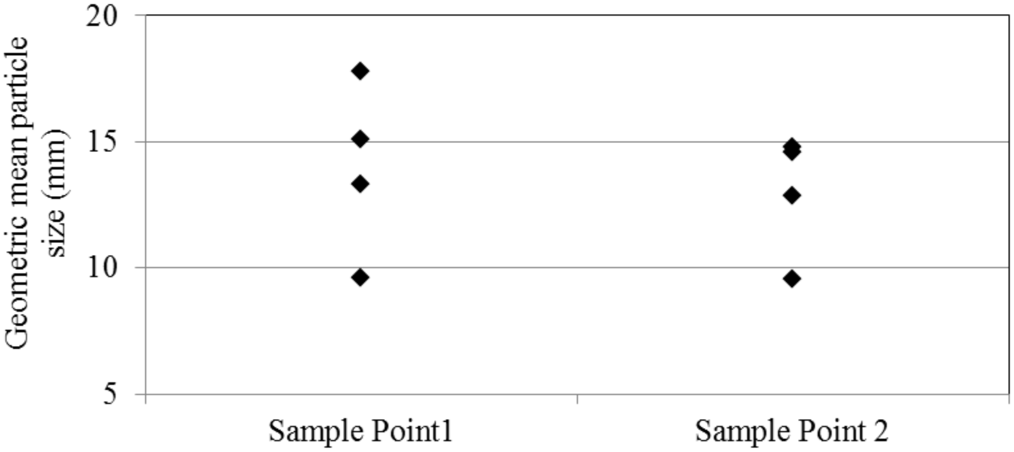


Figure 12.–Lower Slate Creek geometric mean of each spawning substrate sample at each sample point.

The average spawning substrate geometric mean at both sample points has increased each year since 2011 (Table 9).

Table 9.–Lower Slate Creek average substrate geometric mean in mm.

	2011	2012	2013
Sample Point 1	10.1	10.6	13.9
Sample Point 2	10.9	11.0[1]	12.9

[1] In 2012, the geometric mean for sample point 2 was recorded as 10.9. It is 11 and is corrected in this report.

Adult Salmon Counts

We surveyed Lower Slate Creek for adult pink and chum salmon between July 15 and September 16, 2013. We did not observe pink or chum salmon during the first survey. Figure 13 presents the adult pink salmon count for each survey in Lower Slate Creek in 2013, and Figure 14 presents the distribution of pink salmon. We counted 3,337 live adult pink salmon in Lower Slate Creek, and one live adult chum salmon on August 12.

We surveyed Lower Slate Creek for adult coho salmon between September 18 and October 15 on foot using a GoPro® Hero3 to probe pools and log jams.[rr] We documented 26 adult coho salmon, most in the upper portion of the creek between 600 and 900 m.

We present our 2011–2013 adult salmon counts in Lower Slate Creek in Table 10.

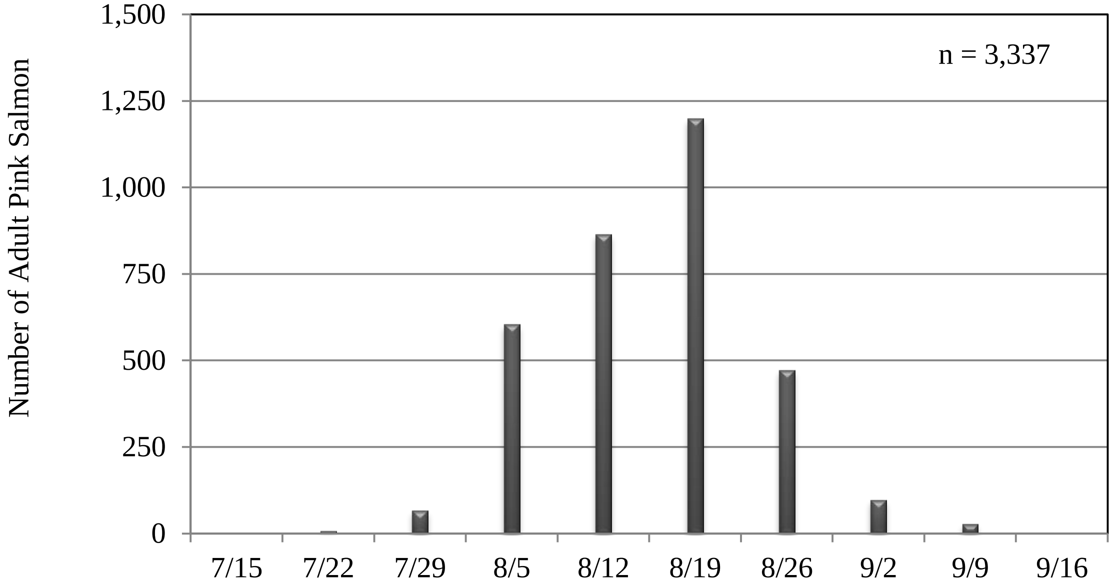


Figure 13.–Lower Slate Creek 2013 weekly adult pink salmon counts.

[rr] We did not survey during the week of October 8 as we were enrolled in mandatory Mine Safety and Health Administration training, so our series of counts is incomplete.

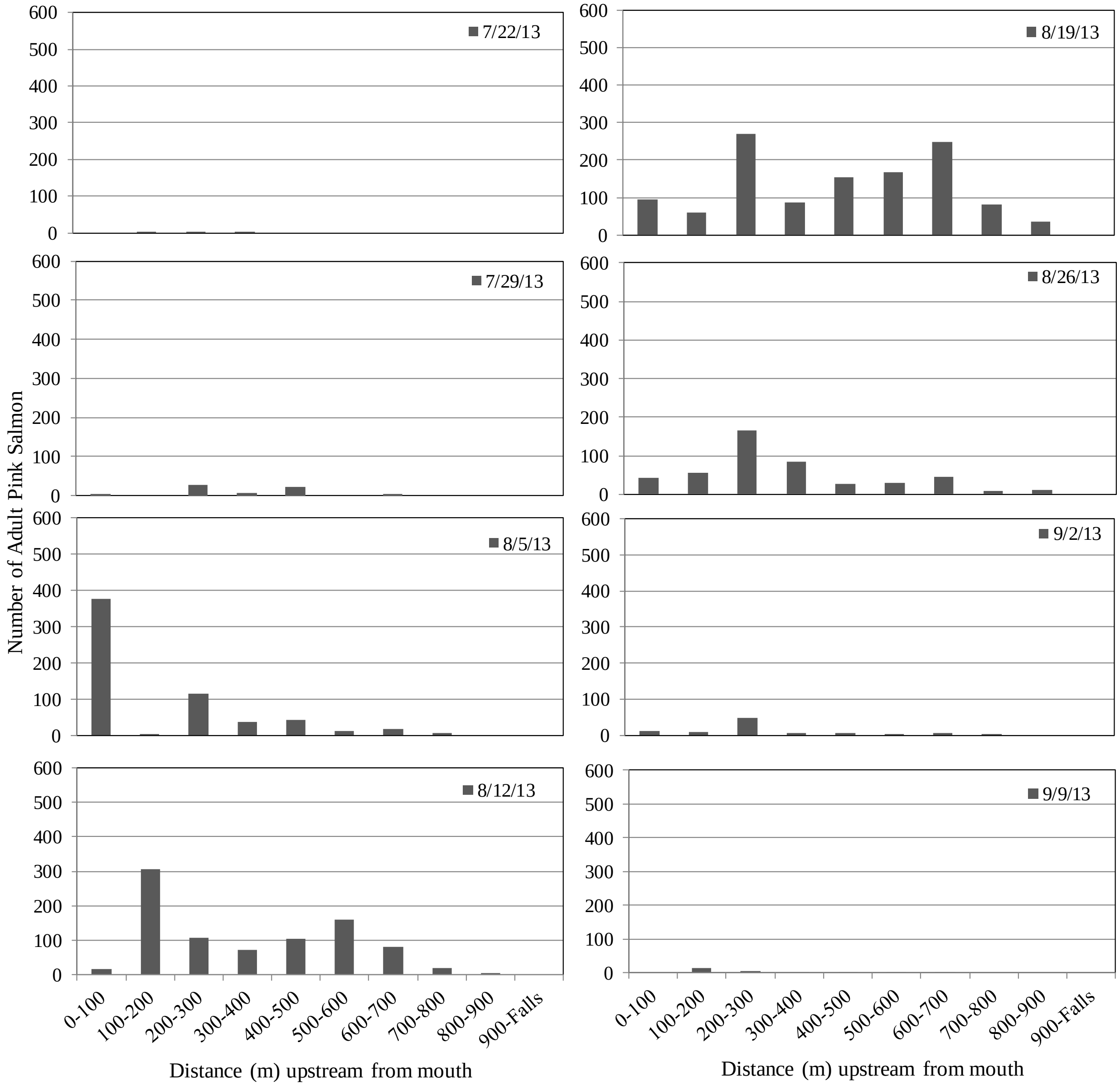


Figure 14.–Lower Slate Creek weekly adult pink salmon distribution.

Table 10.–Lower Slate Creek adult salmon counts.

	2011	2012	2013
Pink	6,275	7,272	3,337
Chum	61	1	1
Coho	0	0	26

East Fork Slate Creek

Upper Slate Lake discharge is intercepted at a dam and routed through a diversion pipeline around the TTF discharging into East Fork Slate Creek.[ss] Treated water from the TTF wastewater treatment plant began discharging into East Fork Slate Creek in December 2010. Most sampling in East Fork Slate Creek occurs between 250 m and 300 m downstream of the plunge pool.

Periphyton Community Composition and Biomass

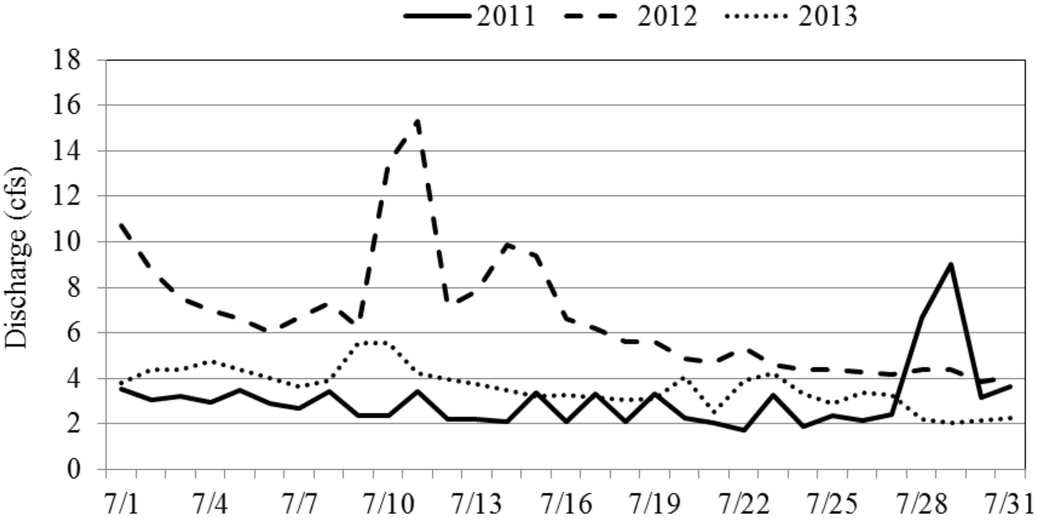


Figure 15.–East Fork Slate Creek July discharge.

Note: Discharge calculated using Parshall Flume flow data and TTF WTP discharge data.

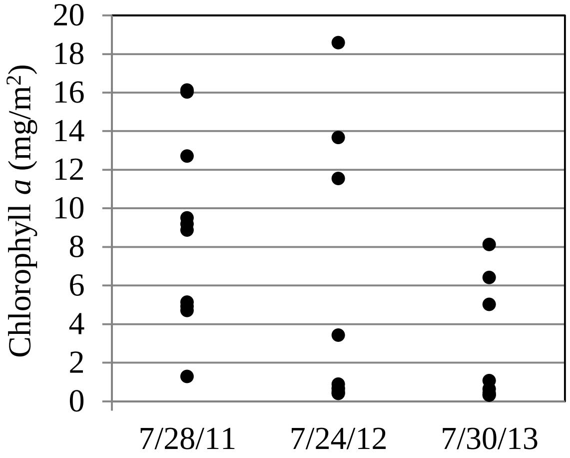
July 2013 mean daily discharge in East Fork Slate Creek was higher than in 2011, the year of the bloom in the TTF, and lower than in 2012 (Figure 15). Water level was stable for three weeks prior to sampling.

We collected periphyton in East Fork Slate Creek on July 30, 2013, and present three years of late-July chlorophylls *a*, *b*, and *c* mean density data in Table 11. The chlorophyll *a* density for each sample each year is shown in Figure 16, and the proportion of chlorophylls *a*, *b*, and *c* each year is presented in Figure 17.

Table 11.–East Fork Slate Creek chlorophylls *a*, *b*, and *c* mean density.

Sample Date	Chlorophyll *a* (mg/m^2)	Chlorophyll *b* (mg/m^2)	Chlorophyll *c* (mg/m^2)
July 29, 2011	8.84	1.56	0.24
July 24, 2012	5.08	0.57	0.18
July 30, 2013	2.25	0.06	0.20

[ss] Gordon Willson-Naranjo, Habitat Biologist, ADF&G Habitat Division, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Kensington Gold Mine: Diversion Pipeline Fish Passage Trip Report; dated 12/12/2012.



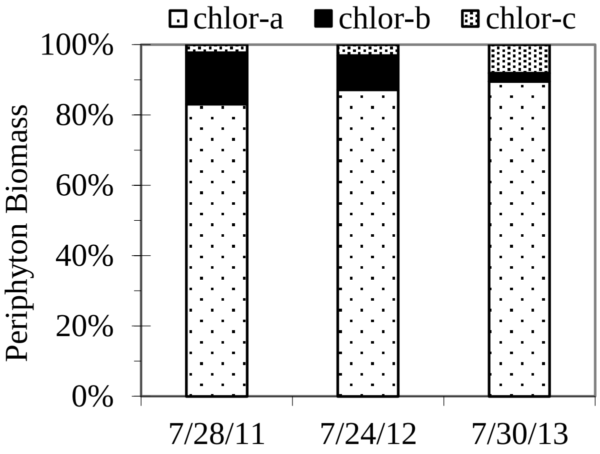


Figure 16.–East Fork Slate Creek chlorophyll *a* sample densities.

Figure 17.–East Fork Slate Creek chlorophylls *a*, *b*, and *c* proportion.

There are significant differences ($p \leq 0.05$) between the 2011 and 2013 mean ranks for chlorophylls *a* and *b* density.

Benthic Macroinvertebrate Composition and Abundance

Among the April 29, 2013 samples we collected, we identified 33 taxa and we estimate benthic macroinvertebrate density at 9,407 insects per m^2, of which 2.5% were EPT (Figure 18). The Shannon Diversity score was 0.57 and Evenness score was 0.47. The dominant taxa were Ostracoda (seed shrimp) representing 56% of the samples, and Bivalvia: Sphaeriidae *Pisidium*, (pea clams), representing 24% of the samples. Pea clams were the dominant organisms in our 2012 samples representing about 45% of the samples. This is the first year we observed seed shrimp as dominant organisms.

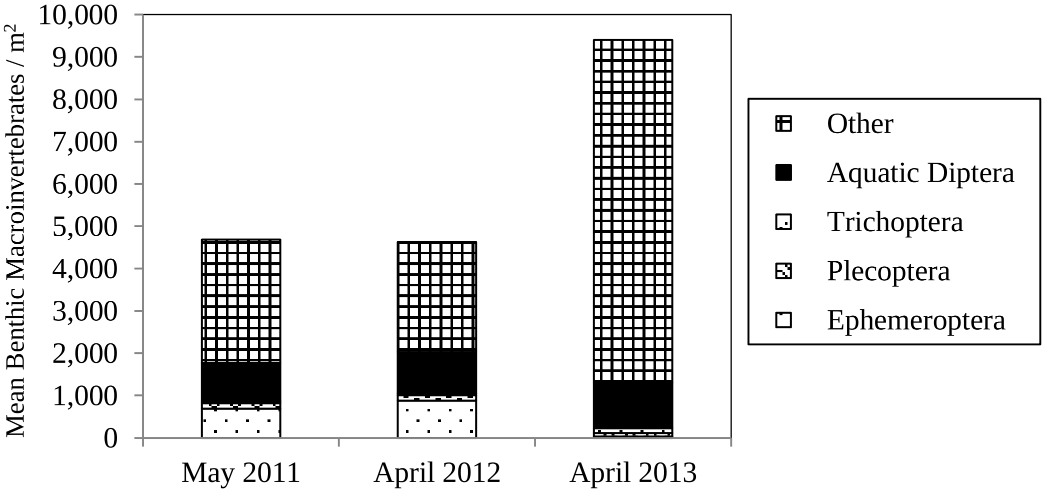


Figure 18.–East Fork Slate Creek benthic macroinvertebrates.

Resident Fish Population and Condition

We did not capture any resident fish in our East Fork Slate Creek sampling on August 28 or in November. The 2013 Dolly Varden char population estimate was 0 fish (Figures 19 and 20). During sampling, stream flow was variable due to maintenance at the tailing treatment facility water treatment plant. Effluent discharge accounted for about 90% of stream flow.

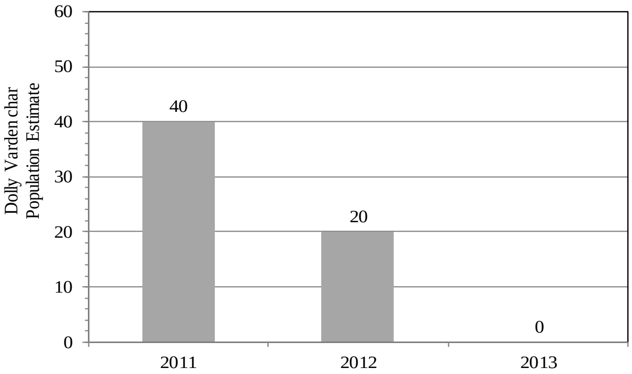


Figure 19.–East Fork Slate Creek resident fish population estimates.

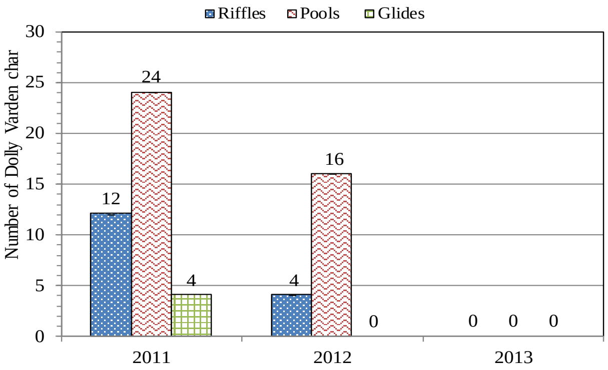


Figure 20.–East Fork Slate Creek resident fish population estimates by habitat type.

Resident Fish Metals Concentrations

We did not capture any Dolly Varden char in East Fork Slate Creek in August or November to test for whole body metals concentrations.

Sediment Metals Concentrations

Sediment metals, As, and Se concentrations for the 2013 East Fork Slate Creek sample we collected on August 1, 2013, are shown in Figure 21. Figure 22 shows the 2011–2013 sediment metals concentrations. The 2013 sample contained greater concentrations of As and Se compared to samples collected in 2011 and 2012, while the Al, Cd, Cu, Ni, and Zn concentrations were lower. Concentrations of Ag, Cr, Hg, and Pb were within the range of values observed in 2011 and 2012.

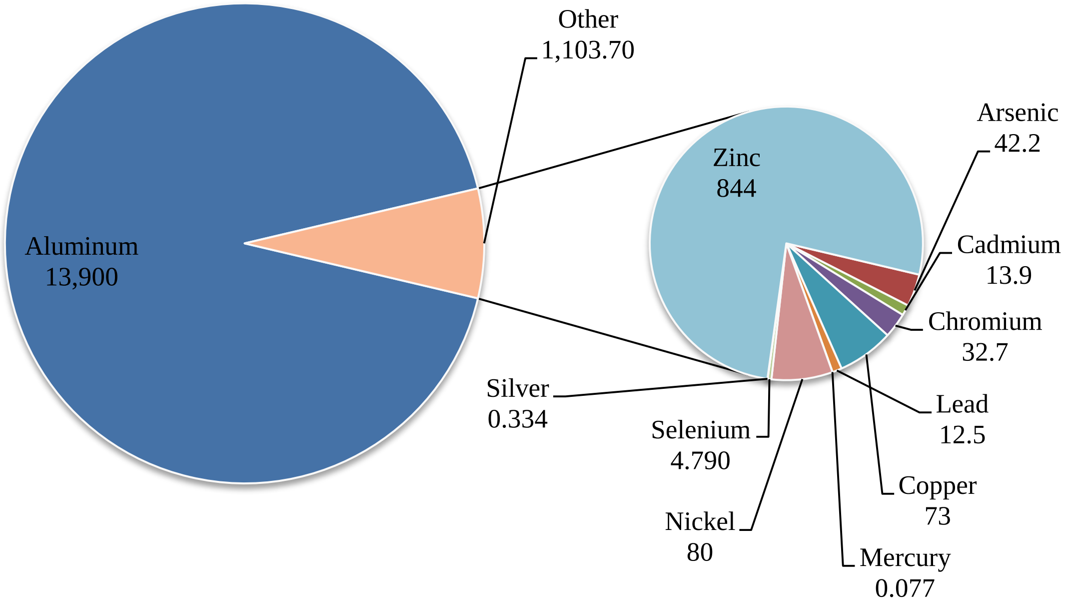


Figure 21.–East Fork Slate Creek sediment metals concentrations.

Note: 2013 data presented in parts per million (mg/kg).

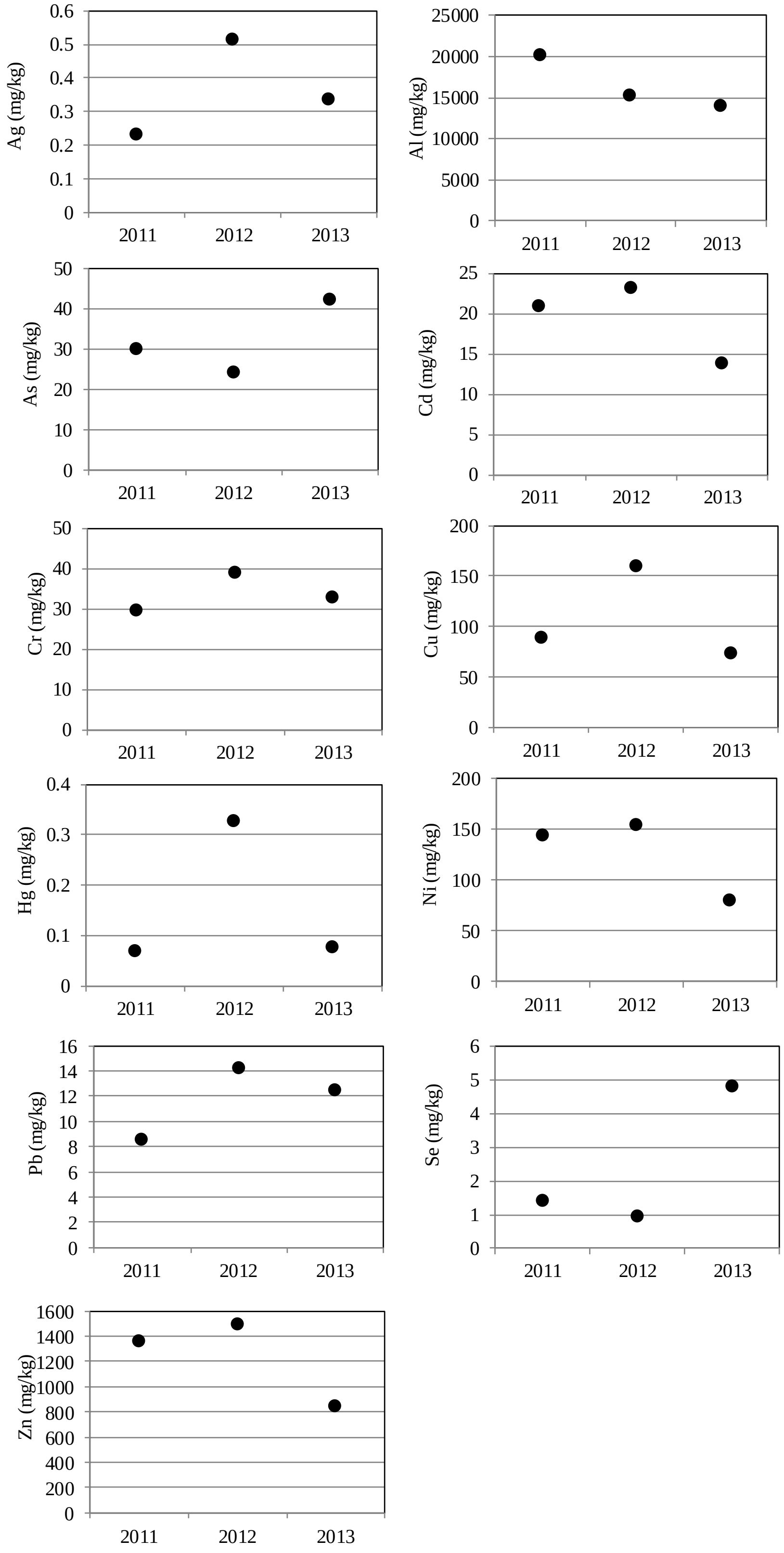


Figure 22.–East Fork Slate Creek sediment metals concentrations, 2011–2013.

Sediment Toxicity

There were no significant differences in growth or survival of *Chironomus dilutus* or *Hyalella azteca* between the East Fork Slate Creek sediment sample and the laboratory control.

West Fork Slate Creek

Periphyton Community Composition and Biomass

We collected periphyton in West Fork Slate Creek on July 31, 2013, and present three years of late-July chlorophylls *a*, *b,* and *c* mean density data in Table 12. The chlorophyll *a* density for each sample each year is shown in Figure 23, and the proportion of chlorophylls *a*, *b,* and *c* each year is presented in Figure 24.

Table 12.–West Fork Slate Creek chlorophylls *a*, *b*, and *c* mean density.

Sample Date	Chlorophyll *a* (mg/m^2)	Chlorophyll *b* (mg/m^2)	Chlorophyll *c* (mg/m^2)
July 29, 2011	3.92	0.00	0.27
July 25, 2012	1.01	0.00	0.10
July 31, 2013	4.22	0.00	0.61

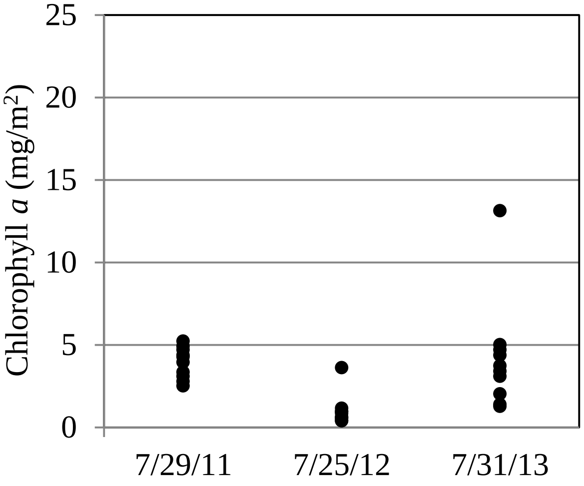


Figure 23.–West Fork Slate Creek chlorophyll *a* sample densities.

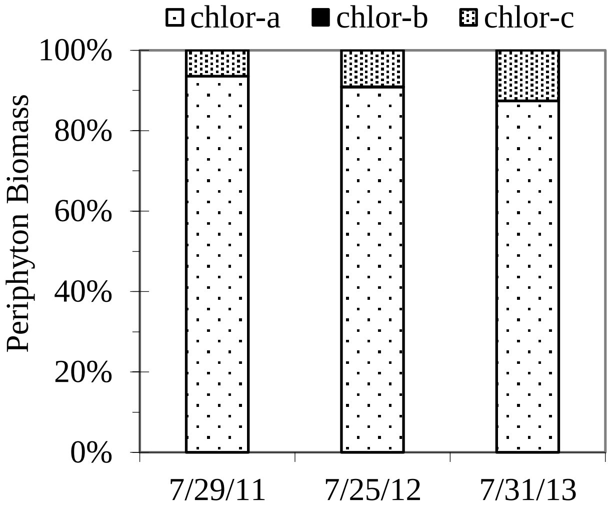


Figure 24.–West Fork Slate Creek chlorophylls *a*, *b*, and *c* proportion.

There are significant differences ($p \leq 0.05$) between the 2012 and 2013 mean ranks for chlorophylls *a* and *c* density.

Benthic Macroinvertebrate Composition and Abundance

Among the April 30 samples we collected, we identified 28 taxa and estimate benthic macroinvertebrate density at 2,446 insects per m^2, of which 90% were EPT (Figure 25). The Shannon Diversity score was 0.73 and Evenness score was 0.61. The dominant organisms were Ephemeroptera: Cinygmula (mayflies) representing 48% of the samples.

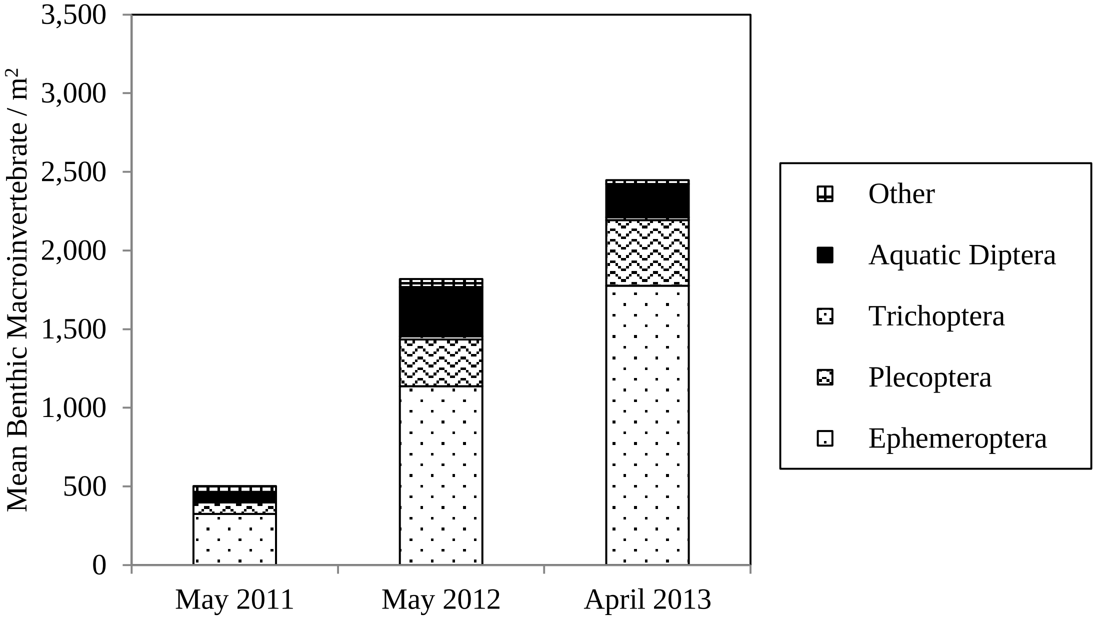


Figure 25.–West Fork Slate Creek benthic macroinvertebrates.

Sediment Metals Concentrations

Sediment metals, As, and Se concentrations for the 2013 West Fork Slate Creek sample are shown in Figure 26.

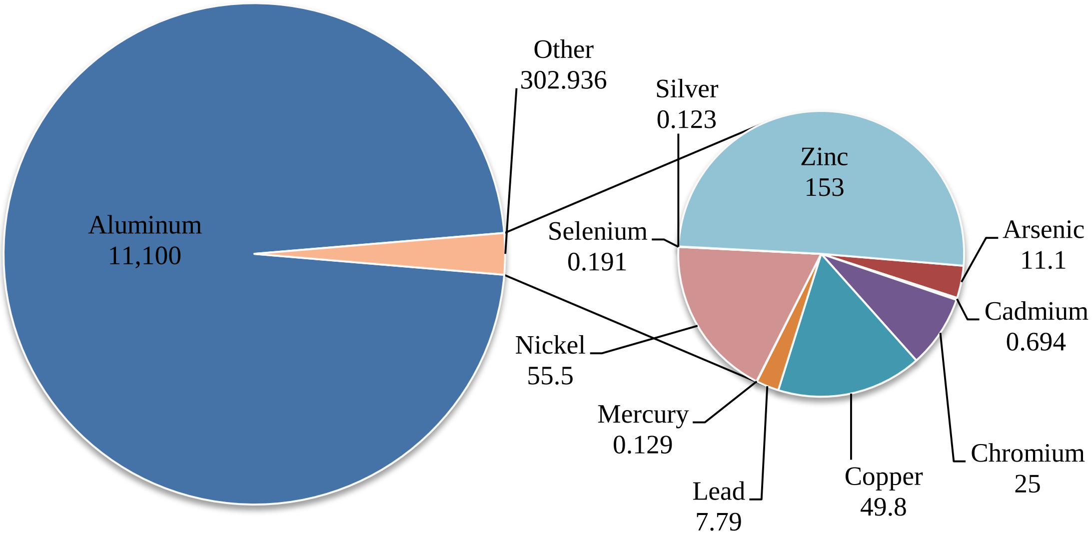


Figure 26.–West Fork Slate Creek sediment metals concentrations.

Note: 2013 data presented in parts per million (mg/kg).

Upper Slate Creek

Periphyton Community Composition and Biomass

We collected periphyton in Upper Slate Creek on July 30, 2013, and present three years of late-July chlorophylls *a*, *b*, and *c* mean density data in Table 13. The chlorophyll *a* density for each sample each year is shown in Figure 27, and the proportion of chlorophylls *a*, *b*, and *c* each year is presented in Figure 28.

Table 13.–Upper Slate Creek chlorophylls *a*, *b*, and *c* mean density.

Sample Date	Chlorophyll *a* (mg/m^2)	Chlorophyll *b* (mg/m^2)	Chlorophyll *c* (mg/m^2)
July 29, 2011	0.87	0.00	0.05
July 24, 2012	1.26	0.00	0.07
July 30, 2013	2.13	0.00	0.13

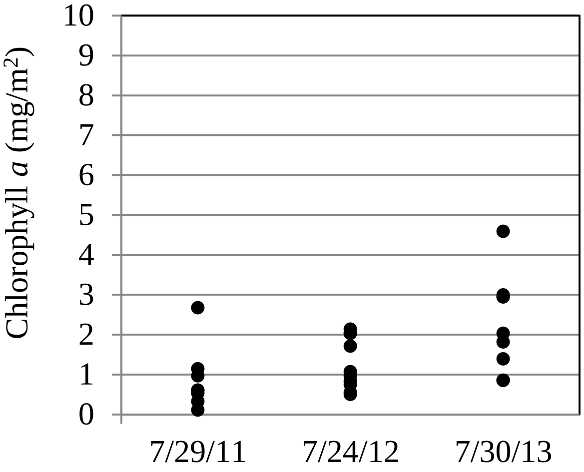


Figure 27.–Upper Slate Creek chlorophyll *a* sample densities.

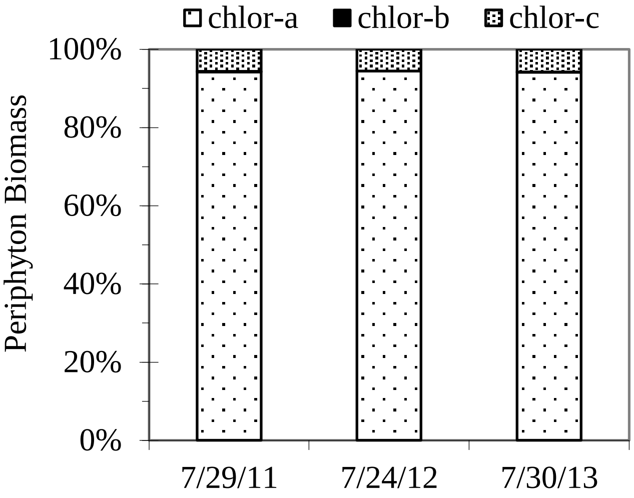


Figure 28.–Upper Slate Creek chlorophylls *a*, *b*, and *c* proportion.

There is a significant difference ($p \leq 0.05$) between the 2013 mean rank for chlorophyll *a* density and the 2011 mean rank.

Benthic Macroinvertebrate Composition and Abundance

Among the April 29, 2013 samples we collected, we identified 34 taxa and estimate benthic macroinvertebrate density at 2,880 insects per m^2, of which 72% were EPT (Figure 4). The Shannon Diversity score was 1.02 and Evenness score was 0.78. The dominant organisms were Diptera: Chironomidae (nonbiting midges) representing 19% of the samples, and Plecoptera: Despaxia (stoneflies) representing 17% of the samples (Figure 29).

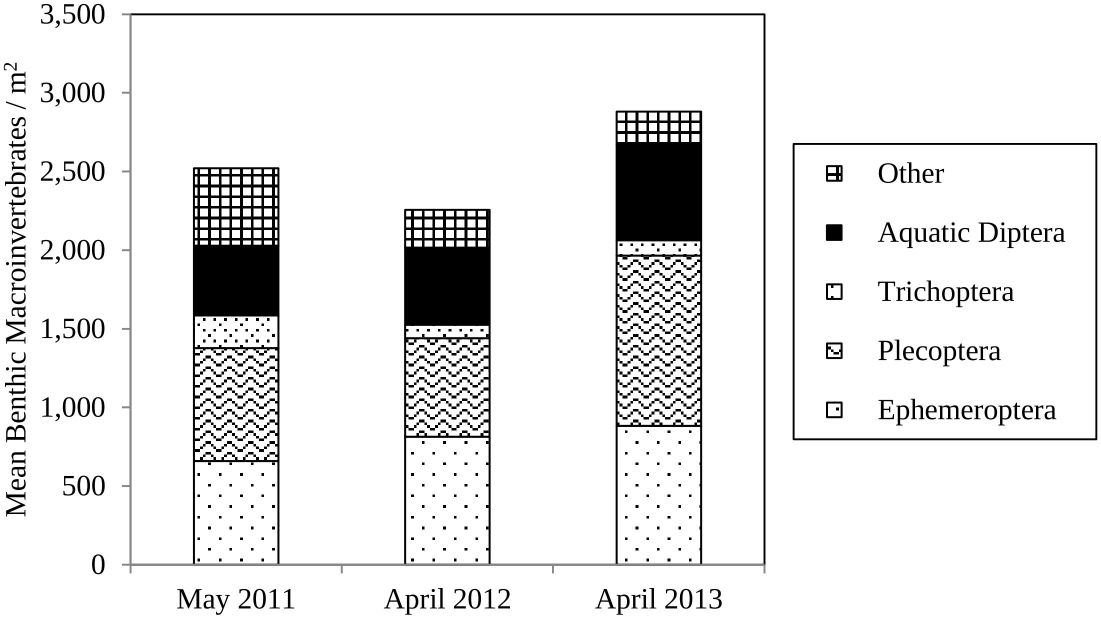


Figure 29.–Upper Slate Creek benthic macroinvertebrates.

Resident Fish Population and Condition

We sampled resident fish in Upper Slate Creek August 27, 2013. The 2013 Dolly Varden char population estimate for Upper Slate Creek was 120±0 fish[tt], similar to the 2011 population estimate and significantly different ($p \leq 0.05$) than the 2012 population estimate (Figure 30). We captured more Dolly Varden char in pools than riffles or glides (Figure 31). Resident fish length and frequency is shown in Figure 32 and mean condition was 1.02 g/mm^3, similar to 2011 and 2012.

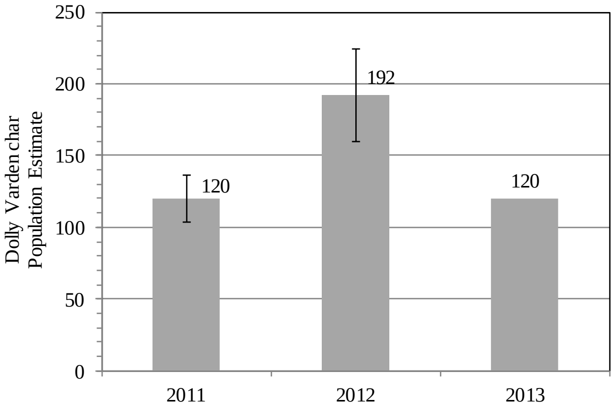


Figure 30.–Upper Slate Creek resident fish population estimates.

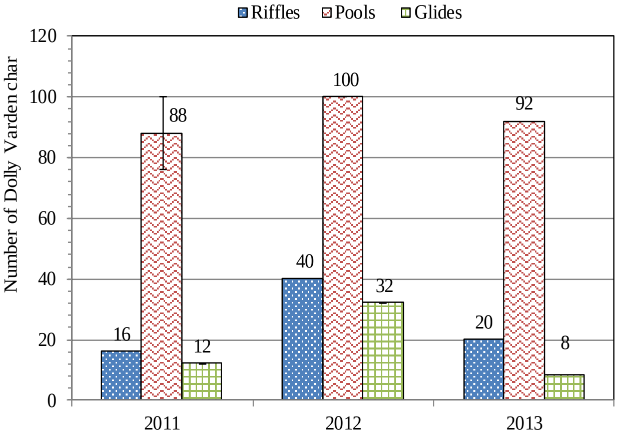


Figure 31.–Upper Slate Creek resident fish population estimates by habitat type.

[tt] The goodness of fit X^2 test indicates we achieved equal capture probability between passes.

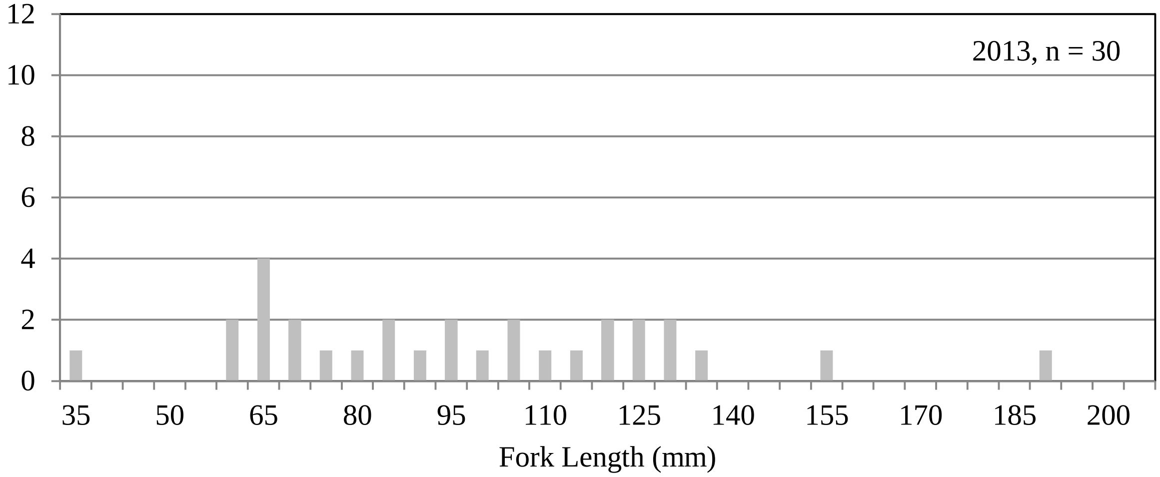


Figure 32.–Upper Slate Creek resident fish length frequency.

Resident Fish Metals Concentrations

On August 27, 2013, we captured six Dolly Varden char in Upper Slate Creek. We shipped the samples to ALS Environmental in Kelso, Washington, for laboratory analyses on October 15 and received the results November 19, 2013. Among the six Dolly Varden char we collected in Upper Slate Creek, Hg and Zn concentrations were greater in the 2013 samples than values observed in the 2012 samples and the 2011 homogenized fish sample, while the other metals and Se concentrations were less than or similar to the 2011–2012 data (Figure 33). Ag was undetected at the method reporting limit (0.02 mg/kg) in four samples and Pb was undetected at the method reporting limit (0.02mg/kg) in two samples.

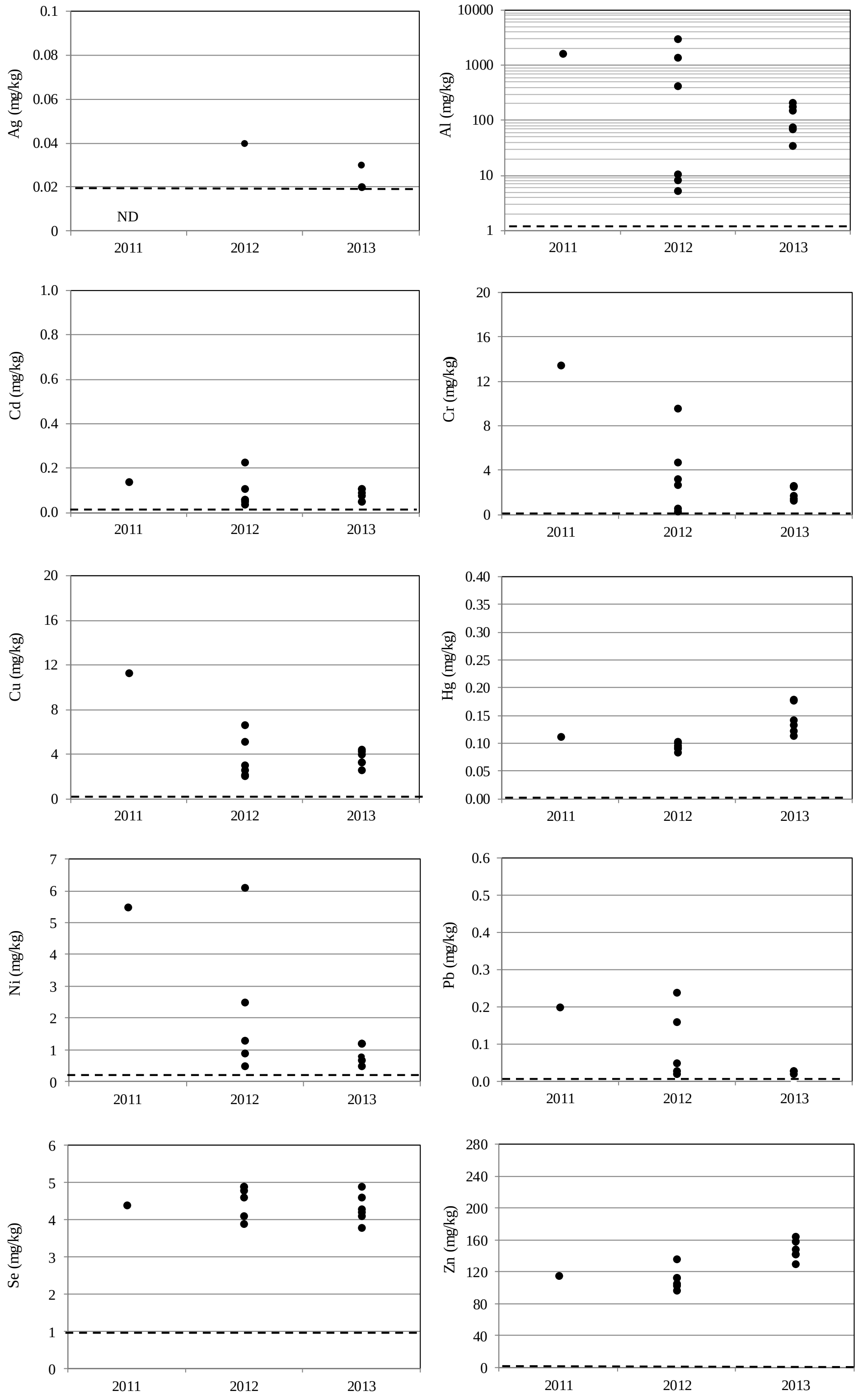


Figure 33.–Upper Slate Creek whole body metals concentrations.

Note: 2011, 2013 and 2013 juvenile Dolly Varden char.
Note: Dashed lines represent the method reporting limit.
Note: ND indicates the metal was not detected at the method reporting limit.

Sediment Metals Concentrations

Sediment metals, As, and Se concentrations for the 2013 Upper Slate Creek sample we collected on July 1, 2013 are shown in Figure 34. Figure 35 presents the 2011-2013 sediment metals concentrations. The 2013 sample contained greater concentration of Se compared to samples collected in 2011 and 2012, while the Al, Cr, Ni, Pb, and Zn concentrations were lower. Concentrations of Ag, As, Cd, Cu, and Hg were within the range of values observed in 2011 and 2012.

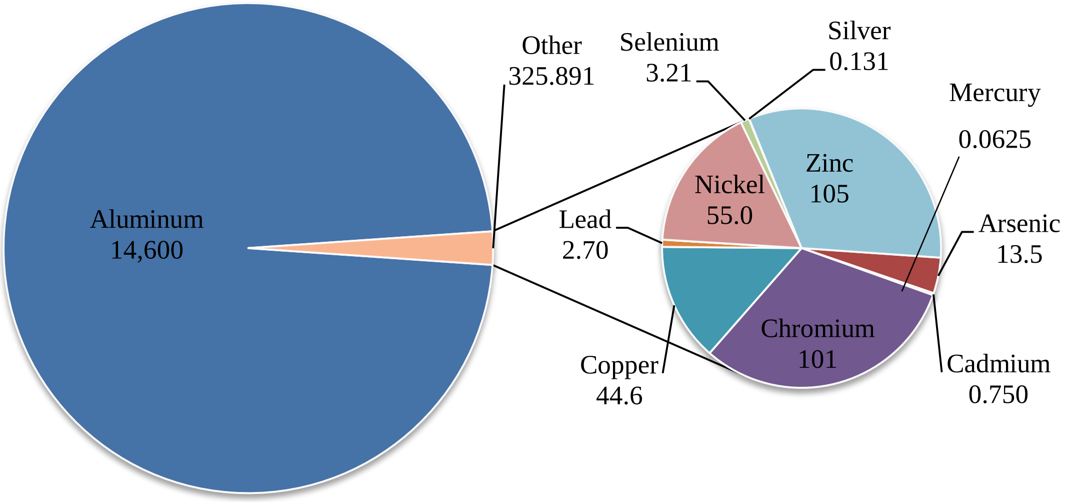


Figure 34.–Upper Slate Creek sediment metals concentrations.

Note: 2013 data presented in parts per million (mg/kg).

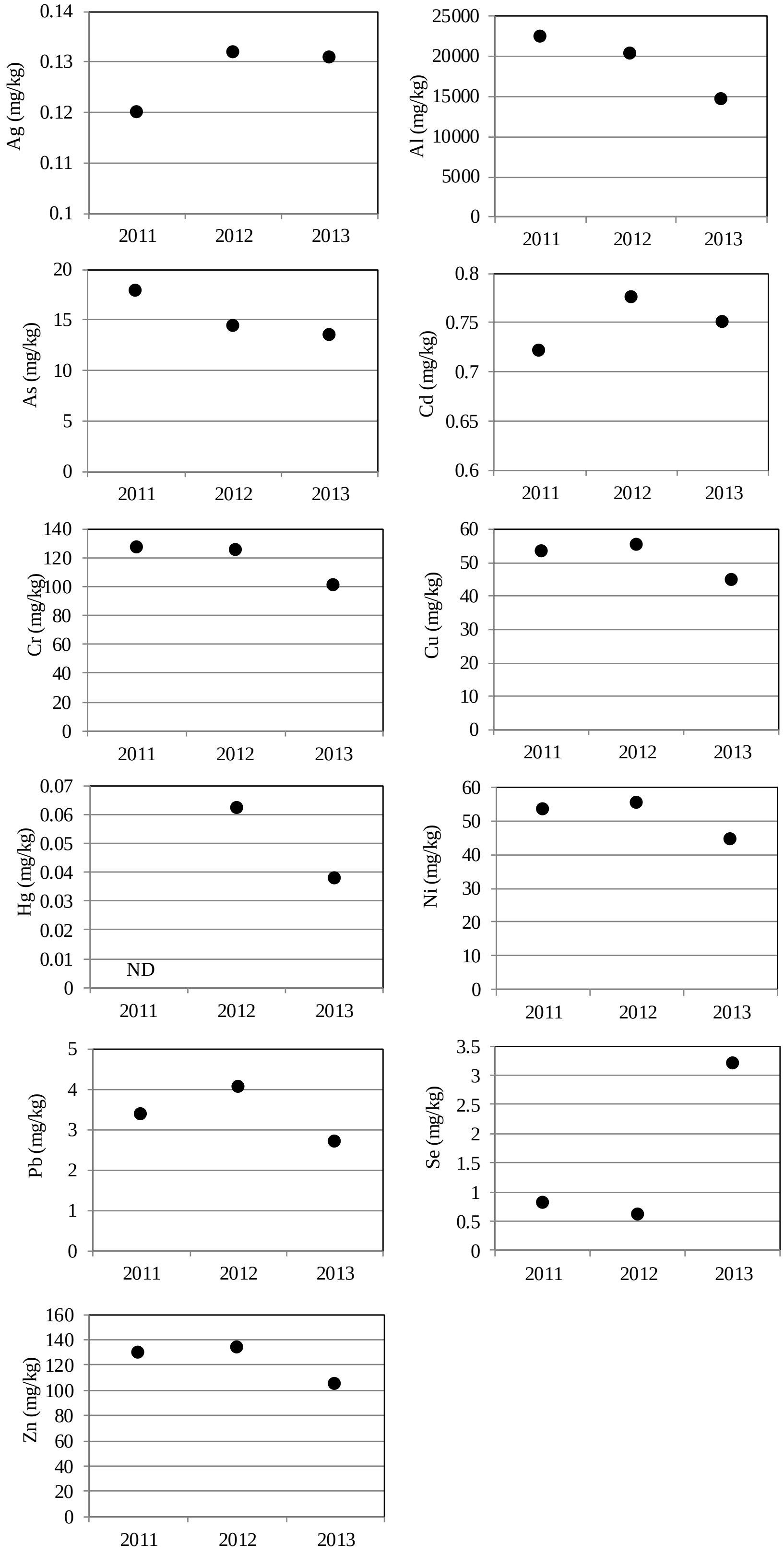


Figure 35.–Upper Slate Creek sediment metals concentrations, 2011–2013.

Note: ND indicates not detected.

Sediment Toxicity

There were no significant differences in growth or survival of *Chironomus dilutus* or *Hyalella azteca* between the Upper Slate Creek sediment sample and the laboratory control.

JOHNSON CREEK

Lower Johnson Creek

Sediment Metals Concentrations

Sediment metals, As, and Se concentrations for the 2013 Lower Johnson Creek sample we collected on July 1, 2013 are shown in Figure 36. Figure 37 shows the 2011–2013 sediment metals concentrations. The 2013 sample contained greater concentrations of Cd, Se, and Zn compared to samples collected in 2011 and 2012, while the Al, As, Cr, Cu, Ni, and Pb concentrations were lower. Ag and Hg concentrations were within the range of values observed in 2011 and 2012.

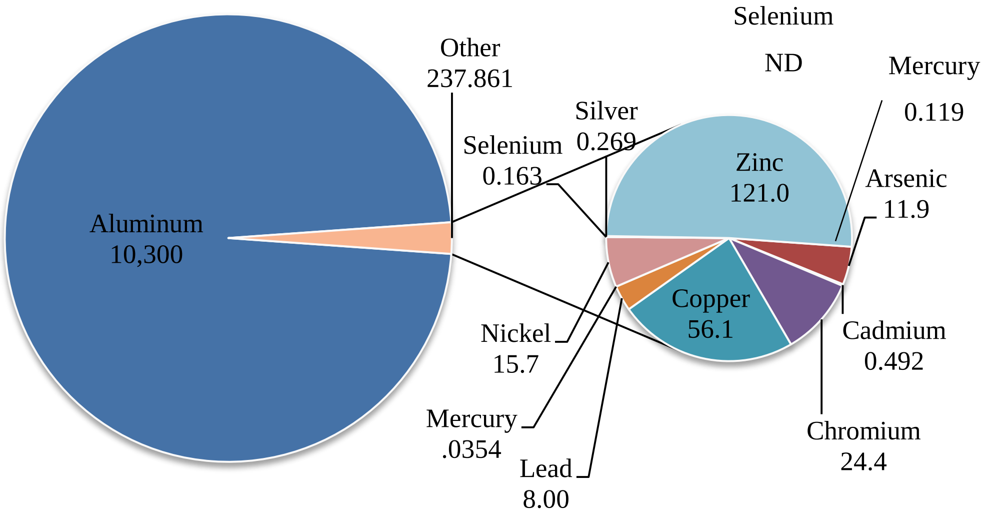


Figure 36.–Lower Johnson Creek sediment metals concentrations.

Note: 2013 data presented in parts per million (mg/kg).

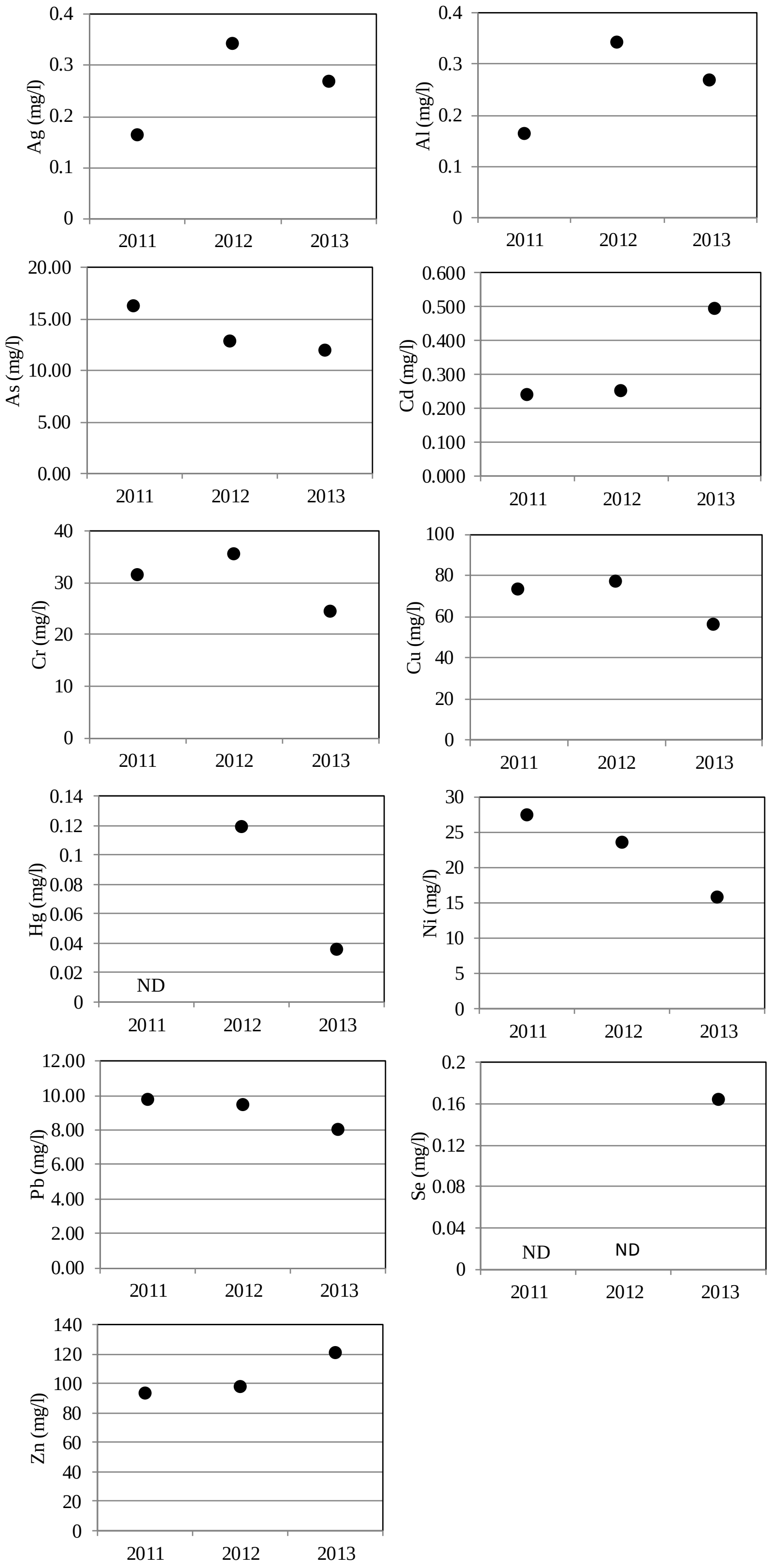


Figure 37.–Lower Johnson Creek sediment metals concentrations, 2011–2013.

Note: ND indicates not detected.

Sediment Toxicity

There were no significant differences in growth or survival of *Chironomus dilutus* or *Hyalella azteca* between the Lower Johnson Creek sediment sample and the laboratory control.

Adult Salmon Counts

We surveyed Lower Johnson Creek by helicopter for adult pink and chum salmon between July 17 and September 10, 2013, verifying three aerial counts by foot on August 6, August 13, and August 20, 2013. Figure 38 presents our adult pink salmon count for each survey, and the weekly distribution of pink salmon in Lower Johnson Creek is presented in Figure 39. We counted 20,451 live adult pink salmon in Lower Johnson Creek. We counted 40 live chum salmon between July 24 and August 20, which were more common between Site No. 4 and the Powerhouse.

We surveyed Lower Johnson Creek for coho salmon between September 23 and October 22 by snorkeling.[uu] We counted 66 live adult coho salmon and observed most coho salmon between Site No. 4 and Site No. 15 in Lower Johnson Creek. Our 2011–2013 adult salmon counts in Lower Johnson Creek are in Table 14.

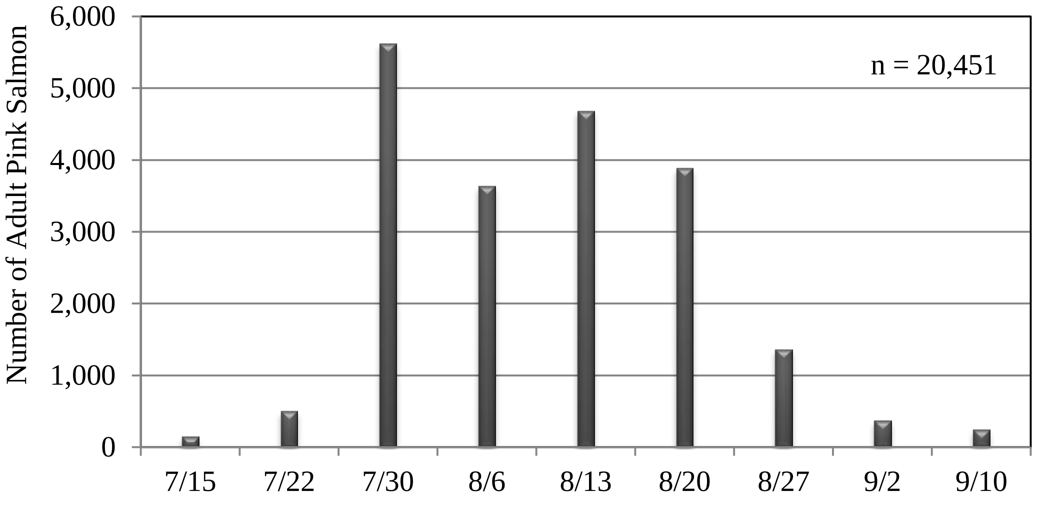


Figure 38.–Lower Johnson Creek weekly adult pink salmon counts.

[uu] We did not survey during the week of October 8 as we were enrolled in mandatory Mine Safety and Health Administration training, so our series of counts is incomplete.

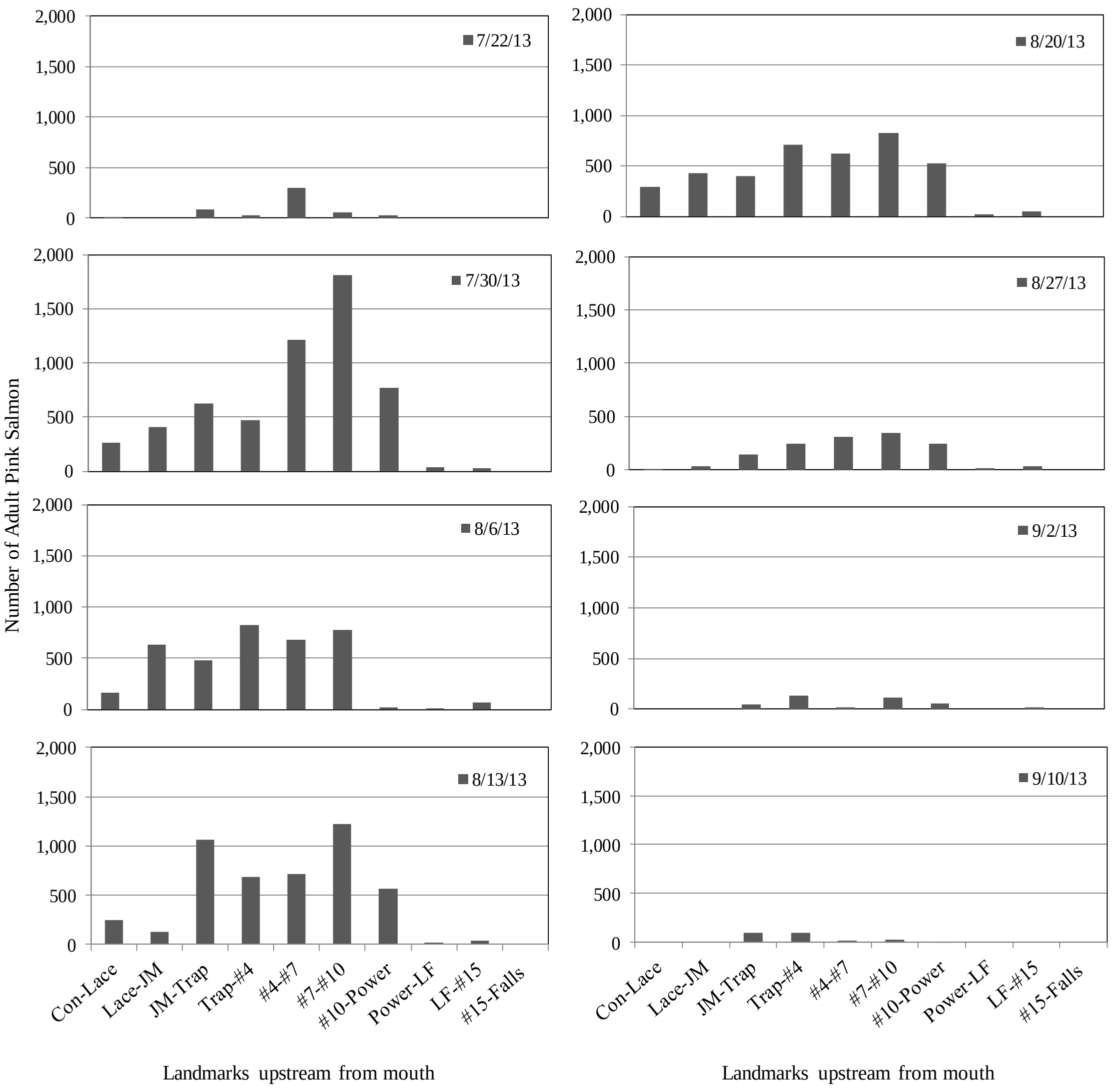


Figure 39.–Lower Johnson Creek weekly adult pink salmon distribution.

Table 14.–Lower Johnson Creek adult salmon counts.

	2011	2012	2013
Pink	44,181	12,533	20,451
Chum	51	248	40
Coho	33	90	64

Upper Johnson Creek

Benthic Macroinvertebrate Composition and Abundance

Among the April 29, 2013 samples we collected, we identified 34 taxa and estimate benthic macroinvertebrate density at 5,265 insects per m^2, of which 65% were EPT (Figure 40). The Shannon Diversity score was 0.74 and Evenness score was 0.59. The dominant organisms were Ephemeroptera: Baetis (mayflies) representing 39% of the samples, and Diptera: Chironomidae (nonbiting midges) representing 27% of the samples.

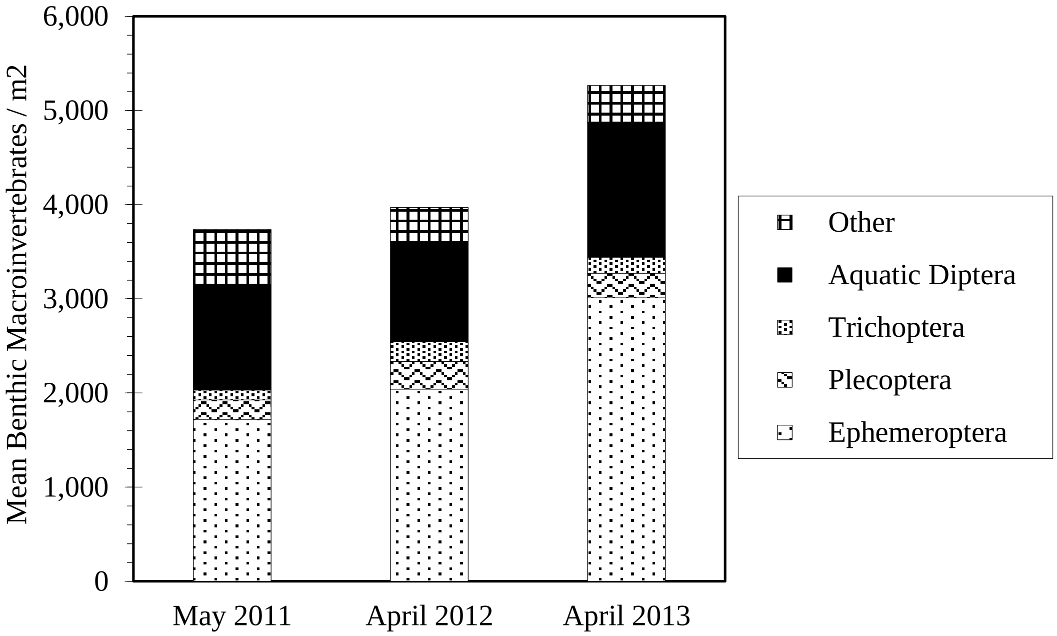


Figure 40.–Upper Johnson Creek benthic macroinvertebrates.

SHERMAN CREEK

Lower Sherman Creek

Periphyton Community Composition and Biomass

Sample Points 1 and 2

We collected periphyton in Lower Sherman Creek Sample Points 1 and 2 on July 29, 2013, and present three years of late-July chlorophylls *a*, *b*, and *c* mean density data in Tables 15 and 16. The chlorophyll *a* density for each sample each year is shown in Figures 41 and 42, and the proportion of chlorophylls *a*, *b*, and *c* each year is presented in Figures 43 and 44.

Table 15.–Lower Sherman Creek Point 1 chlorophylls *a*, *b*, and *c* mean density.

Sample Date	Chlorophyll *a* (mg/m^2)	Chlorophyll *b* (mg/m^2)	Chlorophyll *c* (mg/m^2)
July 28, 2011	7.60	0.69	0.49
July 26, 2012	2.54	0.93	0.08
July 29, 2012	3.66	0.00	0.51

Table 16.–Lower Sherman Creek Point 2 chlorophylls *a*, *b*, and *c* mean density.

Sample Date	Chlorophyll *a* (mg/m^2)	Chlorophyll *b* (mg/m^2)	Chlorophyll *c* (mg/m^2)
July 28, 2011	5.61	0.02	0.32
July 26, 2012	0.67	0.01	0.09
July 29, 2012	2.87	0.00	0.33

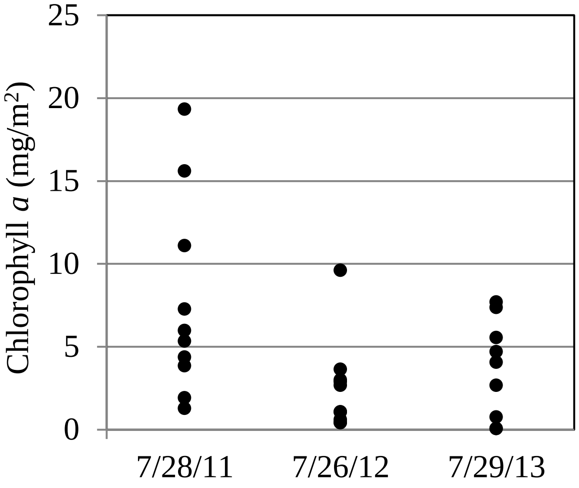


Figure 41.–Lower Sherman Creek Point 1 chlorophyll *a* sample densities.

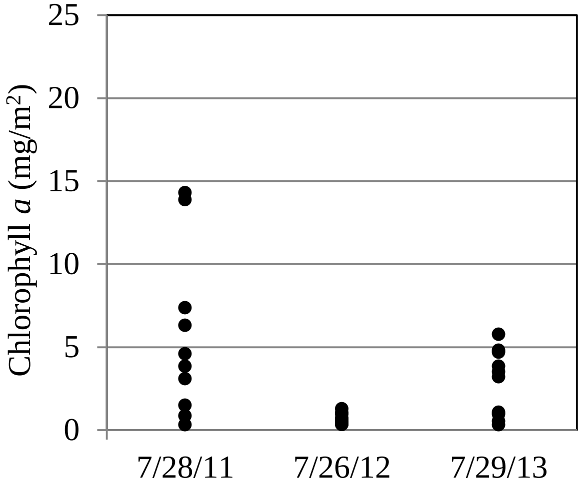


Figure 42.–Lower Sherman Creek Point 2 chlorophyll *a* sample densities.

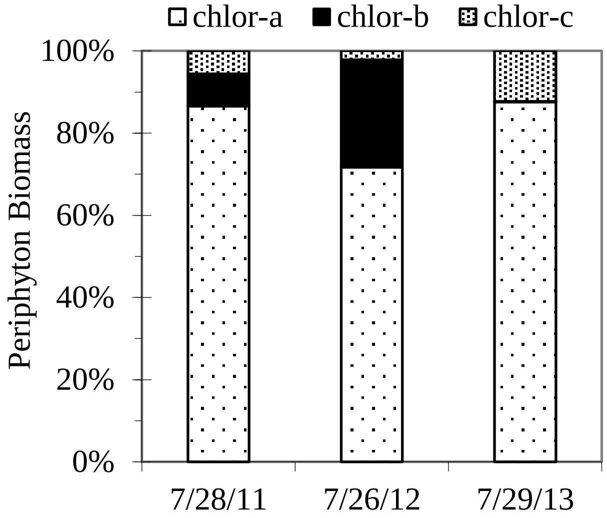


Figure 43.–Lower Sherman Creek Point 1 chlorophylls *a*, *b*, and *c* proportion.

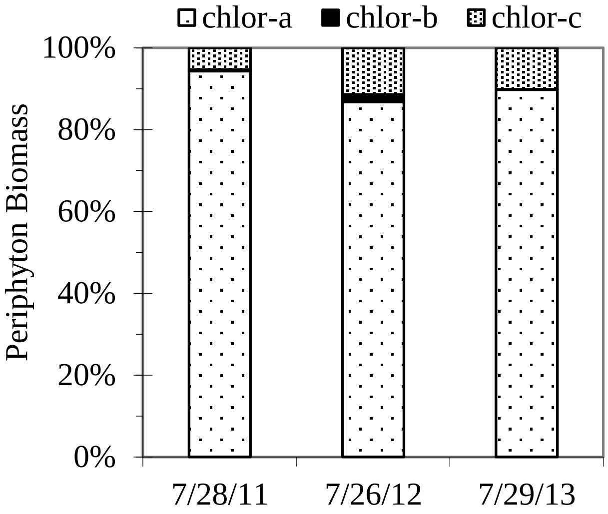


Figure 44.–Lower Sherman Creek Point 2 chlorophylls *a*, *b*, and *c* proportion.

In Lower Sherman Creek, there is a significant difference ($p \leq 0.05$) between the 2012 and 2013 mean ranks for at both Sample Points 1 and 2.

Benthic Macroinvertebrate Composition and Abundance

Sample Point 1

Among the May 1, 2013 samples we collected, we identified 28 taxa and estimate benthic macroinvertebrate density at 1,796 insects per m^2, of which 64% were EPT (Figure 45). The Shannon Diversity score was 0.85 and Evenness score was 0.71. The dominant organisms were Ephemeroptera: Baetis (mayflies), representing 31% of the samples, and Annelida: Oligochaeta (worms) representing 20% of the samples.

Sample Point 2

Among the May 1, 2013 samples we collected, we identified 39 taxa and estimate benthic macroinvertebrate density at 3,385 insects per m^2, of which 72% were EPT (Figure 45). The Shannon Diversity score was 0.84 and Evenness score was 0.65. The dominant organisms were Ephemeroptera: Baetis, representing 37% of the samples.

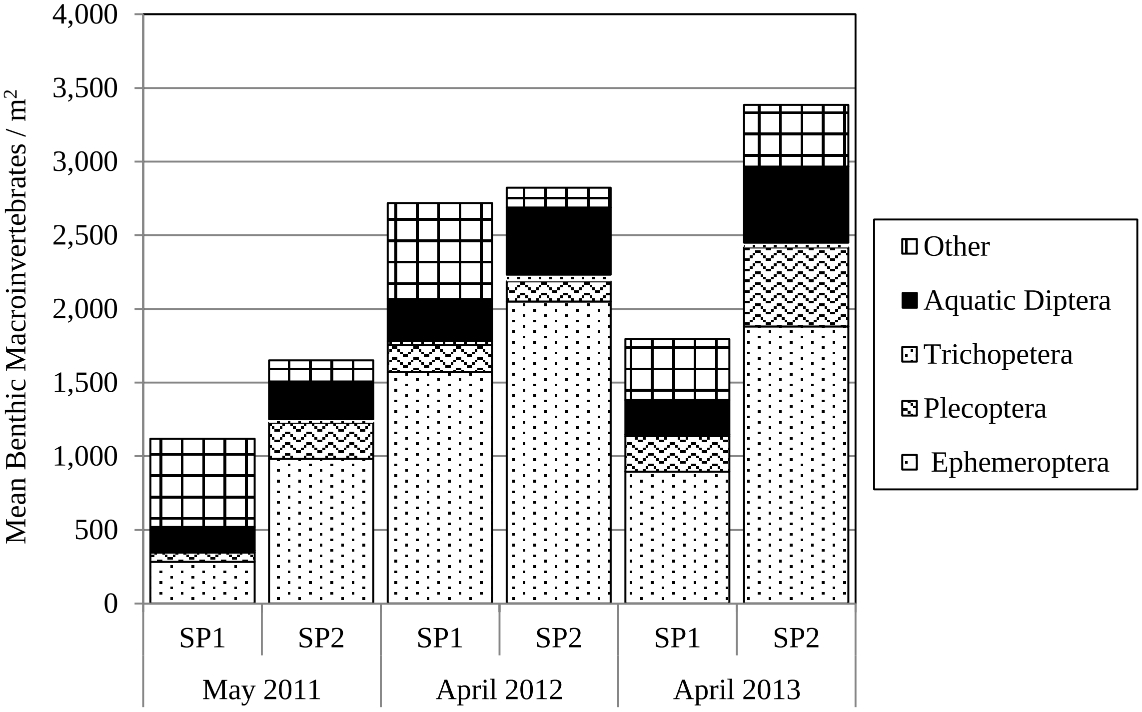


Figure 45.–Lower Sherman Creek Sample Point 1 and 2 benthic macroinvertebrate densities.

Sediment Metals Concentrations

Sediment metals, As, and Se concentrations for the 2013 Lower Sherman Creek sample we collected on July 1, 2013 are shown in Figure 46. Figure 47 shows the 2011-2013 sediment metals concentrations. The 2013 sample contained a greater concentration of Ag compared to samples collected in 2011 and 2012, while the Al, Cr, Cu, and Ni concentrations were lower. Se was detected for the first time since 2010 (Flory 2011) at a concentration similar to values observed 2005–2009 (Flory 2006–2009b). Concentrations of As, Cd, Hg, Pb, and Zn were within the range of values observed in 2011 and 2012.

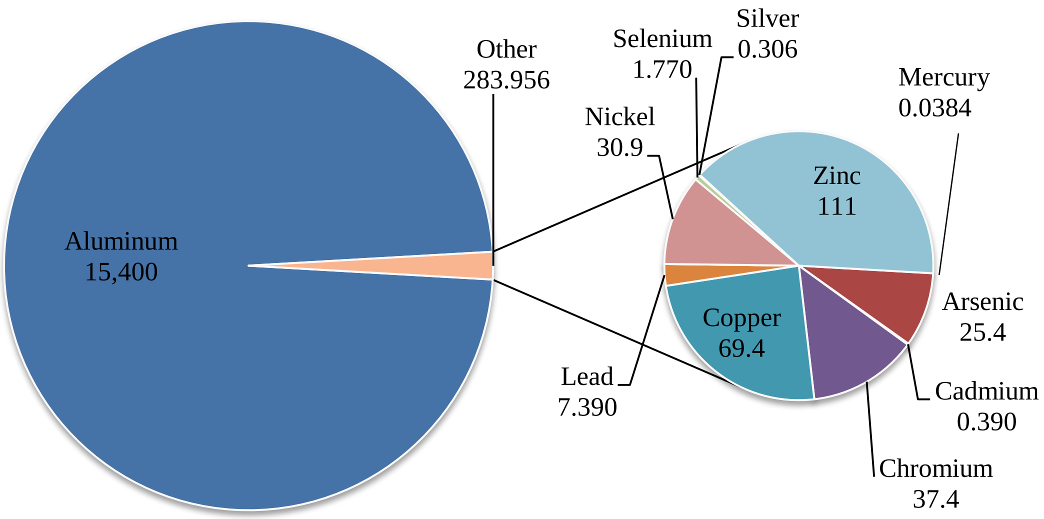


Figure 46.–Lower Sherman Creek sediment metals concentrations.

Note: 2013 data presented in parts per million (mg/kg).

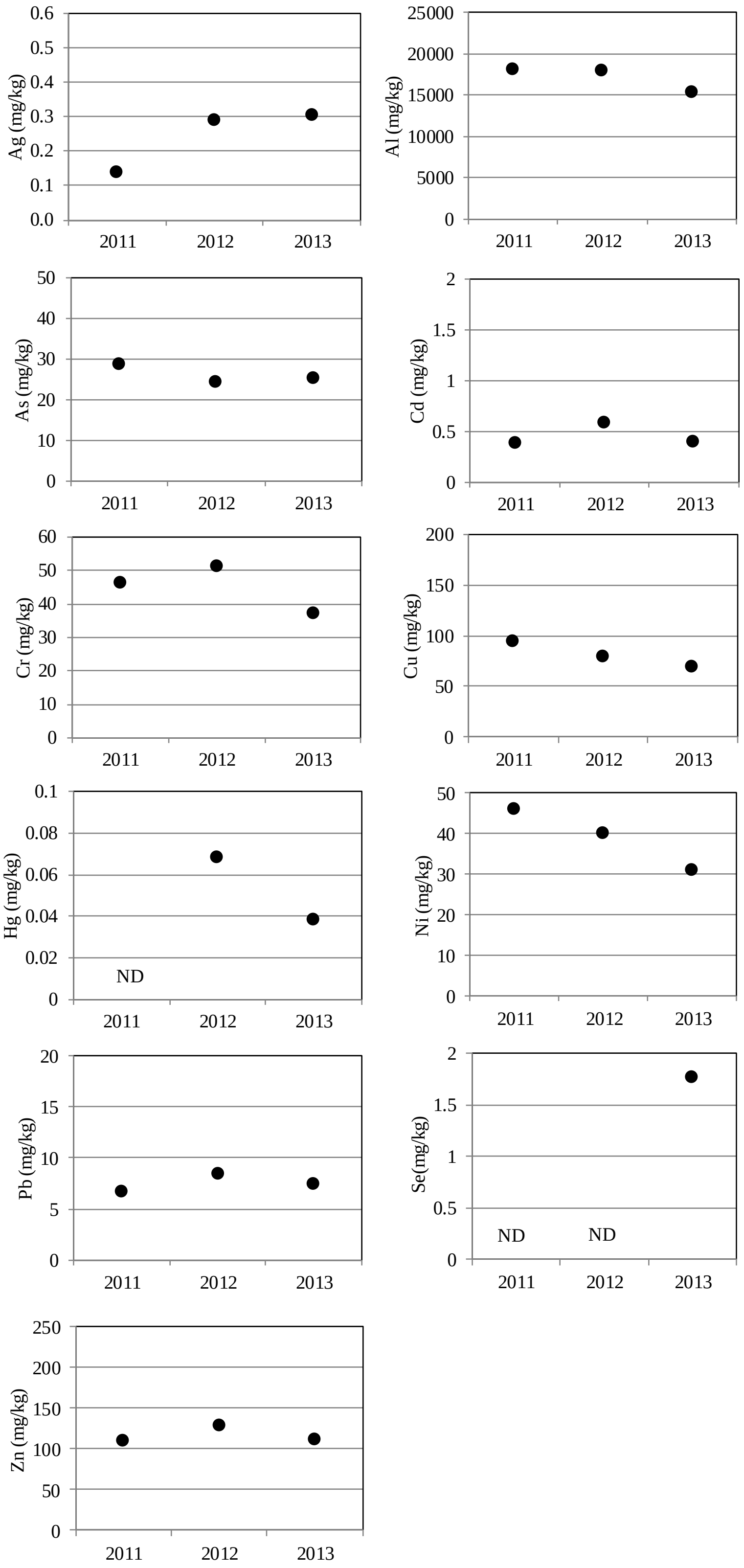


Figure 47.–Lower Sherman Creek sediment metals concentrations, 2011–2013.

Note: ND indicates not detected.

Sediment Toxicity

There were no significant differences in growth or survival of *Chironomus dilutus* or *Hyalella azteca* between the Lower Sherman Creek sediment sample and the laboratory control.

Adult Salmon Counts

We surveyed Lower Sherman Creek for adult pink salmon and chum salmon between July 15 and September 16. Figure 48 presents the adult pink salmon count for each survey, and the weekly distribution of pink salmon in Lower Sherman Creek is presented in Figure 49. We counted 4,981 live adult pink salmon in Lower Sherman Creek, and 12 live adult chum salmon. Adult chum salmon have not been reported in Sherman Creek since 2006 (Flory 2007). Coho salmon do not use Sherman Creek so we did not survey later in the year. Our 2011–2013 adult salmon counts in Lower Sherman Creek is shown in Table 17.

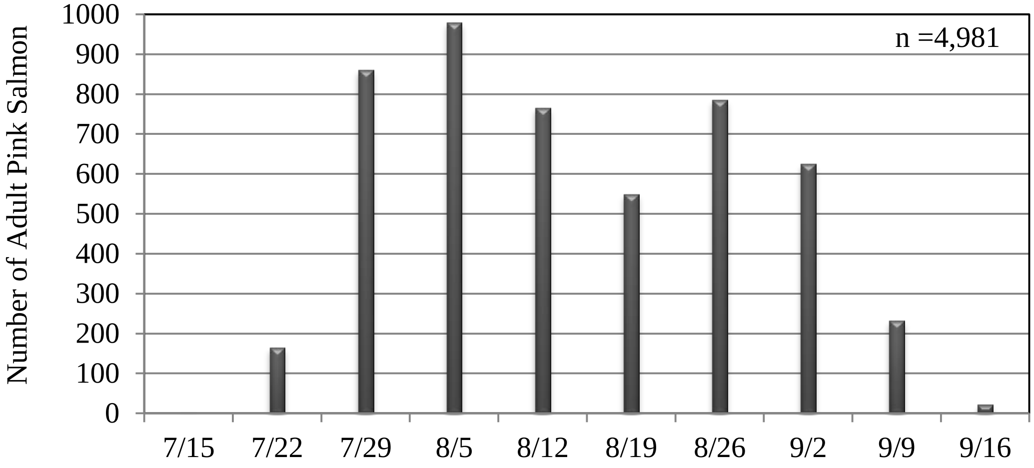


Figure 48.–Lower Sherman Creek weekly adult pink salmon counts.

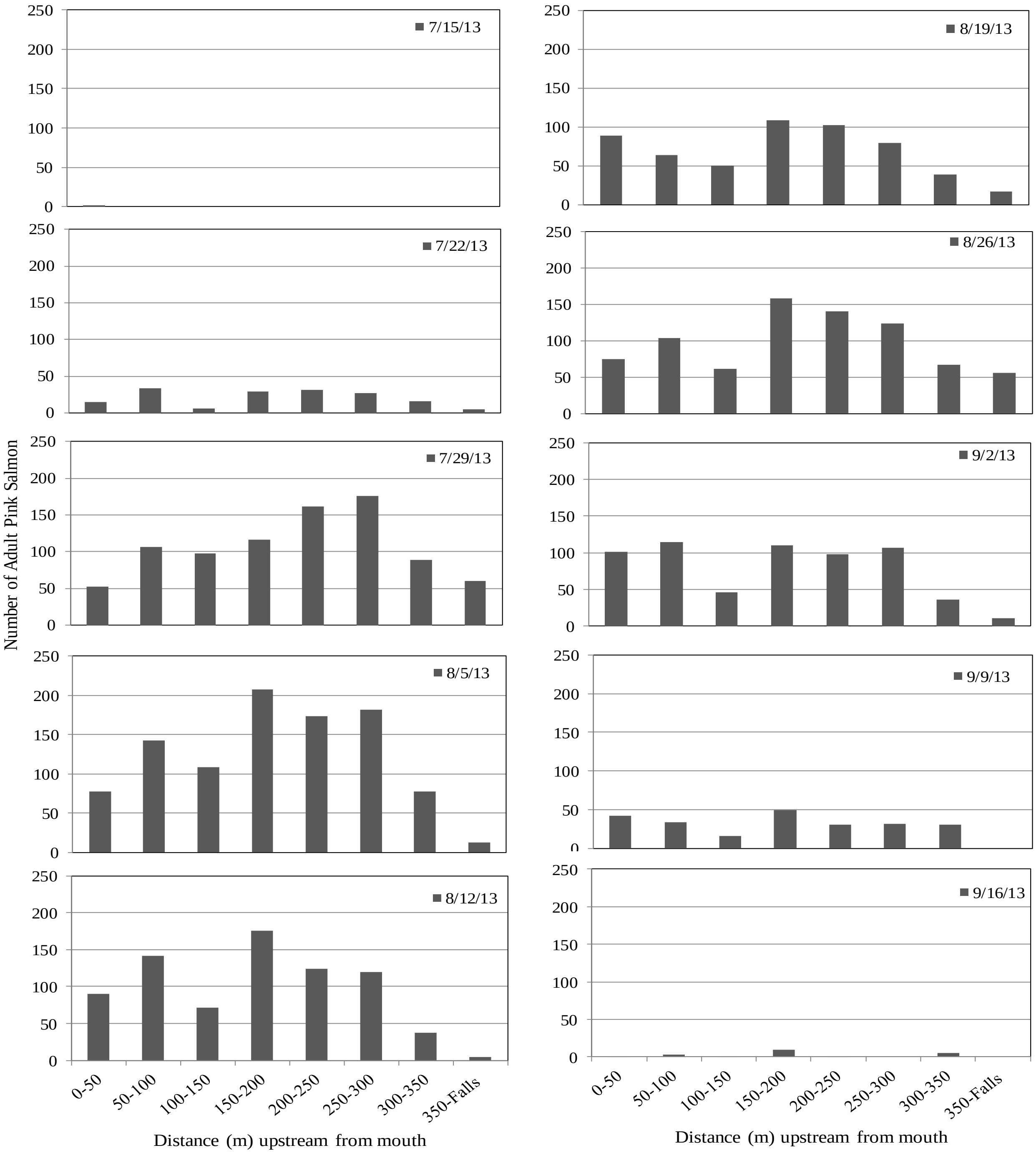


Figure 49.–Lower Sherman Creek weekly adult pink salmon distribution.

Table 17.–Lower Sherman Creek adult salmon counts.

	2011	2012	2013
Pink	4,624	1,608	4,981
Chum	0	0	12

Upper Sherman Creek

Sediment Metals Concentrations

Sediment metals, As, and Se concentrations for the 2013 Upper Sherman Creek sample are shown in Figure 50.

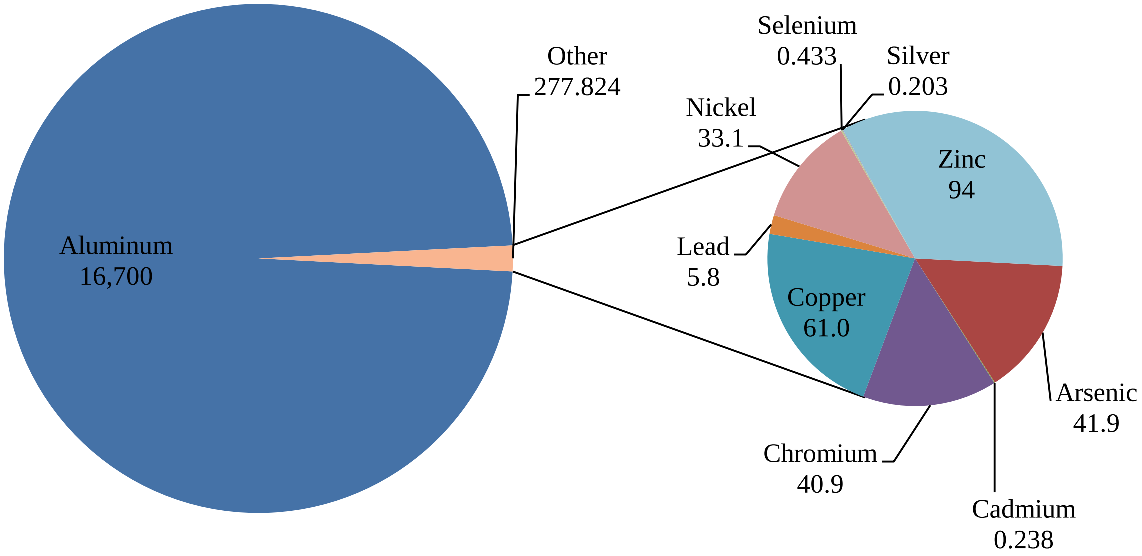


Figure 50.–Upper Sherman Creek sediment metals concentrations.

Note: 2013 data presented in parts per million (mg/kg).

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[vv] This publication is actually the resident fish survey report.

[ww] This publication is actually the invertebrate tissue analysis.

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APPENDIX A: PERIPHYTON DATA

Appendix A.–Periphyton data for samples collected near Kensington Gold Mine, 2011-2013.

	July 2011			October 2011			February 2012			April/May 2012		
mg/m²	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
Upper Slate Creek												
	-	0.00	0.00	6.62	0.00	0.25	0.32	0.00	0.02	0.96	0.00	0.10
	0.32	0.00	0.04	0.46	0.00	0.02	0.75	0.00	0.06	0.53	0.00	0.01
	0.96	0.01	0.07	0.75	0.00	0.05	0.33	0.00	0.02	0.83	0.00	0.05
	0.11	0.00	0.00	0.53	0.00	0.04	1.14	0.00	0.01	**0.34**	-	-
	2.67	0.00	0.26	0.55	0.00	0.02	**0.07**	-	-	**0.34**	-	-
	-	0.00	0.00	1.47	0.00	0.03	1.15	0.00	0.04	0.45	0.01	0.04
	0.60	0.00	0.12	0.14	0.01	0.05	1.71	0.00	0.10	**0.34**	-	-
	1.14	0.00	0.01	-	0.00	0.15	0.21	0.00	0.03	0.60	0.00	0.02
	0.53	0.00	0.00	0.64	0.00	0.11	**0.07**	-	-	**0.34**	-	-
	0.60	0.00	0.02	-	-	-	0.64	0.00	0.01	2.24	0.00	0.15
mean	0.87	0.00	0.05	1.40	0.00	0.08	0.64	0.00	0.04	0.70	0.00	0.06
max	2.67	0.01	0.26	6.62	0.01	0.25	1.71	0.00	0.10	2.24	0.01	0.15
min	0.11	0.00	0.00	0.14	0.00	0.02	0.07	0.00	0.01	0.34	0.00	0.01
East Fork Slate Creek												
	9.51	2.16	0.24	18.90	7.97	1.11	0.53	0.00	0.00	7.80	0.74	0.34
	9.18	0.02	0.20	10.68	1.30	0.36	0.96	0.11	0.00	**0.34**	-	-
	1.28	0.03	0.00	2.99	0.79	0.12	1.34	0.37	0.09	5.23	0.00	0.16
	5.13	1.15	0.11	6.73	1.88	0.64	-	0.03	0.00	4.81	1.56	0.19
	16.02	0.18	0.44	22.53	5.43	0.99	1.07	0.09	0.00	7.48	0.00	0.50
	8.86	1.94	0.70	-	-	-	0.50	0.08	0.00	1.33	0.00	0.08
	4.70	0.70	0.13	-	-	-	6.41	2.04	0.09	2.78	0.00	0.09
	16.13	5.35	0.28	-	-	-	**0.07**	-	-	4.59	0.00	0.33
	4.91	0.49	0.12	-	-	-	5.55	1.44	0.19	4.59	0.00	0.17
	12.71	3.59	0.15	-	-	-	1.92	0.14	0.07	9.72	0.00	0.47
mean	8.84	1.56	0.24	12.37	3.47	0.64	2.04	0.48	0.05	4.87	0.26	0.26
max	16.13	5.35	0.70	22.53	7.97	1.11	6.41	2.04	0.19	9.72	1.56	0.50
min	1.28	0.02	0.00	2.99	0.79	0.12	0.07	0.00	0.00	0.34	0.00	0.08
West Fork Slate Creek												
	2.52	0.00	0.19	-	-	-	-	-	-	-	-	-
	4.70	0.00	0.43	-	-	-	-	-	-	-	-	-
	2.78	0.00	0.26	-	-	-	-	-	-	-	-	-
	3.35	0.00	0.04	-	-	-	-	-	-	-	-	-
	4.27	0.00	0.25	-	-	-	-	-	-	-	-	-
	4.91	0.00	0.42	-	-	-	-	-	-	-	-	-
	3.95	0.00	0.27	-	-	-	-	-	-	-	-	-
	3.10	0.00	0.25	-	-	-	-	-	-	-	-	-
	4.38	0.00	0.39	-	-	-	-	-	-	-	-	-
	5.23	0.00	0.20	-	-	-	-	-	-	-	-	-
mean	3.92	0.00	0.27	-	-	-	-	-	-	-	-	-
max	5.23	0.00	0.43	-	-	-	-	-	-	-	-	-
min	2.52	0.00	0.04	-	-	-	-	-	-	-	-	-
Lower Slate Creek												
	0.21	0.05	0.00	6.41	0.00	0.87	2.56	0.01	0.16	0.56	0.00	0.06
	1.28	0.02	0.11	11.85	1.30	0.99	2.46	0.00	0.21	0.46	0.00	0.07
	0.85	0.01	0.07	2.99	0.15	0.13	-	-	-	0.85	0.00	0.10
	3.31	0.08	0.25	2.10	0.00	0.21	2.14	0.04	0.14	0.50	0.00	0.13
	11.85	3.11	0.30	5.23	0.03	0.63	-	-	-	1.32	0.00	0.25
	18.05	0.42	0.91	1.50	0.00	0.18	0.41	0.04	0.04	2.15	0.00	0.20
	-	0.13	0.00	0.32	0.00	0.00	0.90	0.11	0.05	0.41	0.00	0.00
	0.43	0.05	0.00	8.22	0.25	0.77	2.23	0.10	0.10	1.60	0.16	0.13
	8.54	0.39	0.58	2.24	0.00	0.23	3.10	0.00	0.30	1.07	0.00	0.11
	6.30	0.03	0.38	5.87	0.00	0.85	0.00	0.03	0.05	0.69	0.00	0.07
mean	5.65	0.43	0.26	4.67	0.17	0.48	1.72	0.04	0.13	0.96	0.02	0.11
max	18.05	3.11	0.91	11.85	1.30	0.99	3.10	0.11	0.30	2.15	0.16	0.25
min	0.21	0.01	0.00	0.32	0.00	0.00	0.00	0.00	0.04	0.41	0.00	0.00

Note: Bolded values are the spectrophotometer error detection limit, *chlor-a* not detected.

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	July 2012			October 2012			February 2013			April 2013		
mg/m²	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
Upper Slate Creek												
	2.03	0.00	0.14	**0.34**	-	-	1.24	0.00	0.03	0.64	0.00	0.00
	0.96	0.00	0.09	0.70	0.00	0.00	0.53	0.04	0.09	0.64	0.00	0.00
	0.75	0.00	0.00	0.84	0.00	0.00	2.14	0.00	0.07	0.85	0.00	0.01
	0.50	0.00	0.03	0.96	0.00	0.10	0.50	0.00	0.03	0.53	0.00	0.02
	2.03	0.00	0.14	2.67	0.00	0.23	0.79	0.00	0.09	1.17	0.00	0.13
	1.07	0.00	0.14	0.37	0.00	0.11	1.06	0.00	0.09	0.53	0.00	0.02
	0.55	0.00	0.02	0.32	0.00	0.01	**0.06**	-	-	0.21	0.00	0.00
	1.71	0.00	0.06	0.96	0.00	0.00	0.32	0.06	0.05	0.32	0.00	0.02
	2.14	0.00	0.12	**0.34**	-	-	0.69	0.00	0.00	-	-	-
	0.83	0.00	0.00	**0.34**	-	-	1.39	0.00	0.00	0.96	0.00	0.27
mean	1.26	0.00	0.08	0.78	0.00	0.06	0.87	0.01	0.05	0.65	0.00	0.05
max	2.14	0.00	0.14	2.67	0.00	0.23	2.14	0.06	0.09	1.17	0.00	0.27
min	0.50	0.00	0.00	0.32	0.00	0.00	0.06	0.00	0.00	0.21	0.00	0.00
East Fork Slate Creek												
	11.53	3.24	0.28	0.60	0.00	0.02	0.53	0.02	0.09	2.03	0.07	0.05
	0.41	0.04	0.04	0.73	0.00	0.07	**0.06**	-	-	3.84	0.00	0.19
	0.88	0.00	0.05	**0.34**	-	-	3.31	0.59	0.15	2.88	0.00	0.24
	0.50	0.00	0.03	1.50	0.00	0.16	0.50	0.00	0.03	2.03	0.00	0.10
	3.42	0.00	0.11	0.85	0.00	0.03	1.60	0.00	0.16	**0.06**	-	-
	0.64	0.08	0.05	0.64	0.00	0.07	**0.06**	-	-	1.82	0.00	0.02
	18.58	0.00	0.66	0.75	0.00	0.02	5.34	0.77	0.23	0.96	0.00	0.06
	13.67	2.32	0.57	1.34	0.00	0.02	1.92	0.28	0.00	1.07	0.00	0.06
	0.69	0.00	0.00	0.41	0.00	0.08	2.67	0.38	0.08	**0.06**	-	-
	0.43	0.00	0.00	0.64	0.00	0.07	**0.06**	-	-	1.92	0.00	0.15
mean	5.08	0.57	0.18	0.78	0.00	0.06	1.61	0.29	0.11	1.67	0.01	0.11
max	18.58	3.24	0.66	1.50	0.00	0.16	5.34	0.77	0.23	3.84	0.07	0.24
min	0.41	0.00	0.00	0.34	0.00	0.02	0.06	0.00	0.00	0.06	0.00	0.02
West Fork Slate Creek												
	1.15	0.00	0.04	-	-	-	-	-	-	-	-	-
	0.41	0.00	0.08	-	-	-	-	-	-	-	-	-
	0.53	0.00	0.02	-	-	-	-	-	-	-	-	-
	0.64	0.00	0.16	-	-	-	-	-	-	-	-	-
	3.62	0.00	0.24	-	-	-	-	-	-	-	-	-
	0.85	0.00	0.14	-	-	-	-	-	-	-	-	-
	0.96	0.01	0.07	-	-	-	-	-	-	-	-	-
	0.41	0.00	0.08	-	-	-	-	-	-	-	-	-
	0.60	0.00	0.12	-	-	-	-	-	-	-	-	-
	0.96	0.00	0.06	-	-	-	-	-	-	-	-	-
mean	1.01	0.00	0.10	-	-	-	-	-	-	-	-	-
max	3.62	0.01	0.24	-	-	-	-	-	-	-	-	-
min	0.41	0.00	0.02	-	-	-	-	-	-	-	-	-
Lower Slate Creek												
	1.60	0.13	0.07	0.96	0.00	0.08	1.28	0.00	0.05	0.55	0.00	0.02
	4.06	0.00	0.39	2.03	0.00	0.21	**0.06**	-	-	**0.06**	-	-
	2.03	0.00	0.18	0.75	0.00	0.05	1.06	0.00	0.09	7.80	0.00	1.47
	0.96	0.00	0.04	**0.34**	-	-	1.92	0.00	0.19	**0.06**	-	-
	2.56	0.04	0.22	1.92	0.00	0.20	0.82	0.08	0.00	1.50	0.12	0.03
	0.92	0.00	0.01	1.42	0.00	0.24	0.41	0.00	0.00	**0.06**	-	-
	1.49	0.13	0.13	4.06	0.00	0.33	4.81	0.00	0.29	0.64	0.00	0.01
	2.35	0.12	0.19	0.96	0.00	0.00	1.71	0.00	0.05	**0.06**	-	-
	6.19	0.05	0.54	**0.34**	-	-	5.02	0.00	0.39	0.53	0.00	0.00
	0.96	0.00	0.06	**0.34**	-	-	0.43	0.00	0.07	1.28	0.00	0.10
mean	2.31	0.05	0.18	1.31	0.00	0.16	1.75	0.01	0.13	1.25	0.02	0.27
max	6.19	0.13	0.54	4.06	0.00	0.33	5.02	0.08	0.39	7.80	0.12	1.47
min	0.92	0.00	0.01	0.34	0.00	0.00	0.06	0.00	0.00	0.06	0.00	0.00

Note: Bolded values are the spectrophotometer error detection limit, *chlor-a* not detected.

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	July 2013			October 2013		
mg/m²	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
Upper Slate Creek						
	1.82	0.00	0.27	1.50	0.00	0.04
	0.85	0.01	0.07	2.14	0.00	0.12
	2.94	0.00	0.13	0.85	0.00	0.05
	1.39	0.00	0.12	2.78	0.00	0.14
	2.99	0.00	0.11	0.85	0.00	0.04
	4.59	0.00	0.20	2.14	0.00	0.10
	0.85	0.00	0.01	1.71	0.00	0.12
	2.03	0.00	0.20	1.71	0.00	0.10
	0.85	0.00	0.00	**0.06**	-	-
	2.94	0.00	0.20	**0.06**	-	-
mean	2.13	0.00	0.13	1.38	0.00	0.09
max	4.59	0.01	0.27	2.78	0.00	0.14
min	0.85	0.00	0.00	0.06	0.00	0.04
East Fork Slate Creek						
	8.12	0.00	0.67	3.95	0.93	0.07
	0.06	-	-	0.43	0.26	0.05
	1.07	0.03	0.07	0.32	0.04	0.04
	0.32	0.07	0.00	0.32	0.14	0.02
	0.64	0.10	0.00	**0.06**	-	-
	5.02	0.16	0.35	1.17	0.00	0.14
	0.43	0.00	0.03	0.75	0.26	0.00
	6.41	0.11	0.50	0.32	0.14	0.02
	0.32	0.00	0.00	2.24	0.38	0.06
	0.06	-	-	0.43	0.14	0.02
mean	2.25	0.06	0.20	1.00	0.25	0.05
max	8.12	0.16	0.67	3.95	0.93	0.14
min	0.06	0.00	0.00	0.06	0.00	0.00
West Fork Slate Creek						
	4.70	0.00	0.74	-	-	-
	1.39	0.00	0.16	-	-	-
	13.14	0.00	2.19	-	-	-
	4.38	0.00	0.47	-	-	-
	1.28	0.00	0.11	-	-	-
	3.10	0.00	0.50	-	-	-
	3.74	0.00	0.53	-	-	-
	2.03	0.00	0.33	-	-	-
	5.02	0.00	0.67	-	-	-
	3.40	0.00	0.36	-	-	-
mean	4.22	0.00	0.61	-	-	-
max	13.14	0.00	2.19	-	-	-
min	1.28	0.00	0.11	-	-	-
Lower Slate Creek						
	14.10	0.00	1.56	0.85	0.00	0.09
	20.72	0.00	3.11	1.28	0.00	0.20
	10.89	0.00	1.01	1.92	0.00	0.26
	17.84	0.00	2.66	10.57	0.00	1.43
	2.14	0.00	0.24	10.47	0.00	1.31
	6.09	0.00	0.95	2.03	0.00	0.33
	15.49	0.00	1.99	0.32	0.00	0.03
	12.71	0.00	1.58	0.96	0.00	0.09
	11.32	0.00	1.87	10.89	0.00	1.96
	14.63	0.00	1.46	**0.06**	-	-
mean	12.59	0.00	1.64	3.94	0.00	0.63
max	20.72	0.00	3.11	10.89	0.00	1.96
min	2.14	0.00	0.24	0.06	0.00	0.03

Note: Bolded values are the spectrophotometer error detection limit, *chlor-a* not detected.

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	July 2011			July 2012			July 2013		
mg/m^2	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
Sherman Creek Sample Site 1									
	1.28	0.00	0.05	1.07	0.00	0.14	4.06	0.00	0.38
	5.34	0.00	0.36	2.88	0.87	0.16	5.55	0.00	0.73
	5.98	0.00	0.54	0.41	0.04	0.04	**0.06**	-	-
	3.84	0.10	0.48	2.67	1.27	0.00	4.70	0.00	0.55
	15.59	3.98	0.17	0.60	0.00	0.12	7.69	0.00	0.89
	11.11	2.64	0.28	1.07	0.00	0.11	7.37	0.00	0.62
	19.33	0.00	1.65	3.63	1.56	0.03	**0.06**	-	-
	7.26	0.00	0.74	9.61	4.12	0.08	2.67	0.00	0.35
	1.92	0.04	0.19	2.99	1.43	0.02	0.75	0.03	0.08
	4.38	0.17	0.44	0.43	0.00	0.06	-	-	-
mean	7.60	0.69	0.49	2.54	0.93	0.08	3.66	0.00	0.51
max	19.33	3.98	1.65	9.61	4.12	0.16	7.69	0.03	0.89
min	1.28	0.00	0.05	0.41	0.00	0.00	0.06	0.00	0.08
Sherman Creek Sample Site 2									
	3.10	0.00	0.26	1.05	0.04	0.12	1.07	0.00	0.14
	6.30	0.19	0.62	0.64	0.00	0.11	3.84	0.00	0.34
	4.59	0.00	0.38	0.73	0.00	0.07	0.96	0.00	0.15
	0.32	0.00	0.00	0.50	0.07	0.10	4.81	0.00	0.49
	13.88	0.00	0.54	**0.34**	-	-	5.77	0.00	0.78
	7.37	0.00	0.46	0.51	0.00	0.06	0.32	0.02	0.10
	1.50	0.00	0.09	0.96	0.00	0.16	4.70	0.00	0.44
	14.31	0.00	0.59	0.37	0.00	0.00	3.52	0.00	0.35
	0.85	0.00	0.01	1.28	0.00	0.09	0.53	0.00	0.02
	3.84	0.00	0.25	**0.34**	-	-	3.20	0.00	0.44
mean	5.61	0.02	0.32	0.67	0.01	0.09	2.87	0.00	0.33
max	14.31	0.19	0.62	1.28	0.07	0.16	5.77	0.02	0.78
min	0.32	0.00	0.00	0.34	0.00	0.00	0.32	0.00	0.02

Note: Bolded values are the spectrophotometer error detection limit, *chlor-a* not detected.

APPENDIX B: BENTHIC MACROINVERTEBRATE DATA

Appendix B.–Macroinvertebrate data collected near Kensington Gold Mine, 2011-2013.

Lower Slate Creek Sample Point 1 Benthic Macroinvertebrate Sample Data

	May 2011	May 2012	April 2013	October 2013
Total Aquatic Insect Taxa Counted	29	32	27	30
Total Ephemeroptera	85	387	400	49
Total Plecoptera	70	274	203	419
Total Trichoptera	2	8	6	12
Total Aquatic Diptera	862	975	503	399
Total Other	129	116	88	196
% Ephemeroptera	7.4%	22%	33%	4.6%
% Plecoptera	6.1%	16%	17%	39%
% Trichoptera	0.2%	0.5%	0.5%	1.1%
% Aquatic Diptera	75%	55%	42%	37%
% Other	11%	6.6%	7.7%	18%
% EPT	14%	38%	51%	45%
% Chironomidae	72%	53%	35%	33%
Shannon Diversity Score (H)	0.51	0.69	0.85	0.91
Evenness Score (E)	0.48	0.58	0.70	0.72
Total Aquatic Insects Counted	1,148	1,760	1,200	1,075
Total Terrestrial Insects Counted	0	4	0	4
Total Insects Counted	1,148	1,764	1,200	1,079
% Sample Aquatic	100%	99.8%	100%	99.6%
% Sample Terrestrial	0%	0.2%	0%	0.4%
Total Sample Area (m^2)	0.558	0.558	0.558	0.558
Mean # Aquatic Insects / Sample	191	293	240	179
1 StDev	97	172	51	93
Estimated Mean # Aquatic Insects / m^2	2,057	3,154	2,581	1,927
1 StDev	1,046	1,849	551	1,004
Juvenile Fish	1	0	0	4

Lower Slate Creek Sample Point 2 Benthic Macroinvertebrate Sample Data

	April 2013
Total Aquatic Insect Taxa Counted	24
Total Ephemeroptera	311
Total Plecoptera	156
Total Trichoptera	4
Total Aquatic Diptera	189
Total Other	84
% Ephemeroptera	42%
% Plecoptera	21%
% Trichoptera	0.5%
% Aquatic Diptera	25%
% Other	11%
% EPT	63%
% Chironomidae	22%
Shannon Diversity Score (H)	0.93
Evenness Score (E)	0.78
Total Aquatic Insects Counted	744
Total Terrestrial Insects Counted	2
Total Insects Counted	746
% Sample Aquatic	99.7%
% Sample Terrestrial	0.3%
Sample Area (m^2)	0.279
Mean # Aquatic Insects / Sample	124
1 StDev	43
Estimated Mean # Aquatic Insects / m^2	1,333
1 StDev	460
Juvenile Fish	0

East Fork Slate Creek Benthic Macroinvertebrate Sample Data

	May 2011	April 2012	April 2013	June 2013	October 2013
Total Aquatic Insect Taxa Counted	27	33	33	28	27
Total Ephemeroptera	387	490	19	6	14
Total Plecoptera	70	73	45	9	35
Total Trichoptera	28	23	66	18	56
Total Aquatic Diptera	507	547	598	253	2,009
Total Other	1,624	1,451	4,521	2,056	1,933
% Ephemeroptera	15%	19%	0.4%	0.3%	0.3%
% Plecoptera	2.7%	2.8%	0.9%	0.4%	0.9%
% Trichoptera	1.1%	0.9%	1.3%	0.8%	1.4%
% Aquatic Diptera	19%	21%	11%	11%	50%
% Other	62%	56%	86%	88%	48%
% EPT	19%	23%	2.5%	1.4%	2.6%
% Chironomidae	17%	15%	9.6%	8.8%	47%
Shannon Diversity Score (H)	0.64	0.78	0.57	0.62	0.60
Evenness Score (E)	0.54	0.61	0.47	0.56	0.50
Total Aquatic Insects Counted	2,616	2,585	5,249	2,342	4,047
Total Terrestrial Insects Counted	3	1	0	11	2
Total Insects Counted	2,619	2,586	5,249	2,353	4,049
% Sample Aquatic	99.9%	99.96%	100%	99.5%	99.95%
% Sample Terrestrial	0.1%	0.04%	0%	0.5%	0.05%
Total Sample Area (m^2)	0.558	0.558	0.558	0.558	0.558
Mean # Aquatic Insects / Sample	436	431	875	390	675
1 StDev	101	123	356	381	319
Estimated Mean # Aquatic Insects / m^2	4,688	4,633	9,407	4,197	7,253
1 StDev	1,081	1,325	3,830	4,095	3,430
Juvenile Fish	0	0	0	0	0

Upstream East Fork Slate Creek Benthic Macroinvertebrate Sample Data	
	June 2013
Total Aquatic Insect Taxa Counted	17
Total Ephemeroptera	3
Total Plecoptera	0
Total Trichoptera	2
Total Aquatic Diptera	62
Total Other	161
% Ephemeroptera	1.3%
% Plecoptera	0.0%
% Trichoptera	0.9%
% Aquatic Diptera	27%
% Other	71%
% EPT	2.2%
% Chironomidae	19%
Shannon Diversity Score (H)	0.86
Evenness Score (E)	0.80
Total Aquatic Insects Counted	228
Total Terrestrial Insects Counted	21
Total Insects Counted	249
% Sample Aquatic	91.6%
% Sample Terrestrial	8.4%
Sample Area (m^2)	0.279
Mean # Aquatic Insects / Sample	76
1 StDev	25
Estimated Mean # Aquatic Insects / m^2	817
1 StDev	271
Juvenile Fish	0

Downstream East Fork Slate Creek Benthic Macroinvertebrate Sample Data	
	June 2013
Total Aquatic Insect Taxa Counted	22
Total Ephemeroptera	7
Total Plecoptera	6
Total Trichoptera	15
Total Aquatic Diptera	187
Total Other	1148
% Ephemeroptera	0.5%
% Plecoptera	0.4%
% Trichoptera	1.1%
% Aquatic Diptera	14%
% Other	84%
% EPT	2.1%
% Chironomidae	9.4%
Shannon Diversity Score (H)	0.67
Evenness Score (E)	0.56
Total Aquatic Insects Counted	1,363
Total Terrestrial Insects Counted	7
Total Insects Counted	1,370
% Sample Aquatic	99.5%
% Sample Terrestrial	0.5%
Sample Area (m2)	0.279
Mean # Aquatic Insects / Sample	454
1 StDev	323
Estimated Mean # Aquatic Insects / m^2	4,885
1 StDev	3,472
Juvenile Fish	0

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West Fork Slate Creek Benthic Macroinvertebrate Sample Data

	May 2011	May 2012	April 2013
Total Aquatic Insect Taxa Counted	21	31	28
Total Ephemeroptera	181	634	991
Total Plecoptera	41	166	233
Total Trichoptera	3	11	10
Total Aquatic Diptera	35	175	118
Total Other	20	29	13
% Ephemeroptera	65%	63%	73%
% Plecoptera	15%	16%	17%
% Trichoptera	1.1%	1.1%	0.7%
% Aquatic Diptera	13%	17%	8.6%
% Other	7.1%	2.9%	1.0%
% EPT	80%	80%	90%
% Chironomidae	10%	15%	7.2%
Shannon Diversity Score (H)	0.63	0.84	0.73
Evenness Score (E)	0.78	0.71	0.61
Total Aquatic Insects Counted	280	1,015	1,365
Total Terrestrial Insects Counted	2	0	0
Total Insects Counted	282	1,015	1,365
% Sample Aquatic	99%	100%	100%
% Sample Terrestrial	1%	0%	0%
Total Sample Area (m^2)	0.558	0.558	0.558
Mean # Aquatic Insects / Sample	47	169	228
1 StDev	38	94	72
Estimated Mean # Aquatic Insects / m^2	502	1,819	2,446
1 StDev	410	1,009	777
Juvenile Fish	0	0	0

Upper Slate Creek Benthic Macroinvertebrate Sample Data

	May 2011	April 2012	April 2013
Total Aquatic Insect Taxa Counted	33	39	34
Total Ephemeroptera	368	454	492
Total Plecoptera	401	349	604
Total Trichoptera	116	48	55
Total Aquatic Diptera	248	273	338
Total Other	275	135	118
% Ephemeroptera	26%	36%	31%
% Plecoptera	29%	28%	38%
% Trichoptera	8.2%	3.8%	3.4%
% Aquatic Diptera	18%	22%	21%
% Other	20%	11%	7.3%
% EPT	63%	68%	72%
% Chironomidae	15%	20%	19%
Shannon Diversity Score (H)	0.97	1.04	1.02
Evenness Score (E)	0.76	0.79	0.78
Total Aquatic Insects Counted	1,408	1,259	1,607
Total Terrestrial Insects Counted	1	0	0
Total Insects Counted	1,409	1,259	1,607
% Sample Aquatic	99.9%	100%	100%
% Sample Terrestrial	0.1%	0%	0%
Total Sample Area (m^2)	0.558	0.558	0.558
Mean # Aquatic Insects / Sample	235	210	268
1 StDev	109	123	98
Estimated Mean # Aquatic Insects / m^2	2,523	2,256	2,880
1 StDev	1,173	1,321	1,049
Juvenile Fish	0	0	0

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Upper Johnson Creek Benthic Macroinvertebrate Sample Data			
	May 2011	April 2012	April 2013
Total Aquatic Insect Taxa Counted	24	28	34
Total Ephemeroptera	962	1,139	1,680
Total Plecoptera	114	163	147
Total Trichoptera	59	118	95
Total Aquatic Diptera	619	586	799
Total Other	330	208	217
% Ephemeroptera	46%	51%	57%
% Plecoptera	5.5%	7.4%	5.0%
% Trichoptera	2.8%	5.3%	3.2%
% Aq. Diptera	30%	27%	27%
% Other	16%	9.4%	7.4%
% EPT	55%	64%	65.4%
% Chironomidae	29%	26%	27.0%
Shannon Diversity Score (H)	0.76	0.81	0.74
Evenness Score (E)	0.66	0.68	0.59
Total Aquatic Insects Counted	2,084	2,214	2,938
Total Terrestrial Insects Counted	1	1	1
Total Insects Counted	2,085	2,215	2,939
% Sample Aquatic	99.95%	99.95%	99.97%
% Sample Terrestrial	0.05%	0.05%	0.03%
Total Sample Area (m^2)	0.558	0.558	0.558
Mean # Aquatic Insects / Sample	347	369	490
1 StDev	178	214	234
Estimated Mean # Aquatic Insects / m^2	3,735	3,968	5,265
1 StDev	1,918	2,305	2,512
Juvenile Fish	0	0	0

Lower Sherman Creek Sample Point 1 Benthic Macroinvertebrate Sample Data

	May 2011	April 2012	May 2013
Total Aquatic Insect Taxa Counted	26	31	28
Total Ephemeroptera	157	876	499
Total Plecoptera	36	103	135
Total Trichoptera	7.0	14	6
Total Aquatic Diptera	89	160	131
Total Other	335	363	231
% Ephemeroptera	25%	58%	50%
% Plecoptera	5.8%	6.8%	13%
% Trichoptera	1.1%	0.9%	0.6%
% Aquatic Diptera	14%	11%	13%
% Other	54%	24%	23%
% EPT	32%	66%	64%
% Chironomidae	6%	8%	12%
Shannon Diversity Score (H)	0.76	0.74	0.85
Evenness Score (E)	0.71	0.62	0.71
Total Aquatic Insects Counted	624	1,525	1,002
Total Terrestrial Insects Counted	1	0	14
Total Insects Counted	625	1,525	1,016
% Sample Aquatic	99.8%	100%	99%
% Sample Terrestrial	0.2%	0%	1%
Total Sample Area (m^2)	0.558	0.558	0.558
Mean # Aquatic Insects / Sample	104	254	167
1 StDev	93	131	23
Estimated Mean # Aquatic Insects / m^2	1,118	2,733	1,796
1 StDev	1,000	1,410	247
Juvenile Fish	10	12	0

Lower Sherman Creek Sample Point 2 Benthic Macroinvertebrate Sample Data

	May 2011	April 2012	May 2013
Total Aquatic Insect Taxa Counted	30	37	39
Total Ephemeroptera	548	1,143	1,049
Total Plecoptera	137	77	299
Total Trichoptera	14	26	18
Total Aquatic Diptera	143	254	289
Total Other	79	75	234
% Ephemeroptera	60%	73%	56%
% Plecoptera	15%	4.9%	16%
% Trichoptera	1.5%	1.7%	1.0%
% Aquatic Diptera	16%	16%	15%
% Other	8.6%	4.8%	12%
% EPT	76%	79%	72%
% Chironomidae	11%	15%	14%
Shannon Diversity Score (H)	0.93	0.70	0.84
Evenness Score (E)	0.76	0.57	0.65
Total Aquatic Insects Counted	921	1,573	1,889
Total Terrestrial Insects Counted	1	2	18
Total Insects Counted	922	1,575	1,907
% Sample Aquatic	99.9%	99.9%	99.1%
% Sample Terrestrial	0.1%	0.1%	0.9%
Total Sample Area (m^2)	0.558	0.558	0.558
Mean # Aquatic Insects / Sample	154	263	315
1 StDev	86	109	137
Estimated Mean # Aquatic Insects / m^2	1,651	2,823	3,385
1 StDev	927	1,174	1,471
Juvenile Fish	0	0	14

APPENDIX C: RESIDENT FISH POPULATION & CONDITION DATA

Appendix C1.–East Fork Slate Creek and Upper Slate Creek resident fish capture data and population estimates by reach, 2011–2013.

Site	Year	Species	FL (mm)	Number of Fish Captured				MLE	95% CI	Precision	Power
				Set 1	Set 2	Set 3	Total				
East Fork Slate Creek	2011	DV	105-140	6	2	2	10	40	---	n/a	---
	2012	DV	165-175	2	1	2	5	20	---	n/a	n/a
	2013	DV	---	0	0	0	0	0	---	---	---
Upper Slate Creek	2011	DV	35-145	14	12	2	28	120	104-136	13%	---
	2012	DV	60-164	23	14	6	43	192	160-224	17%	0.44
	2013	DV	35-190	21	7	2	30	120	---	---	---

Note: In 2013, we corrected the 2012 Upper Slate Creek 95% confidence interval in this table.

Appendix C2.–Resident fish capture data and population estimates by reach and habitat type, 2011-2013.

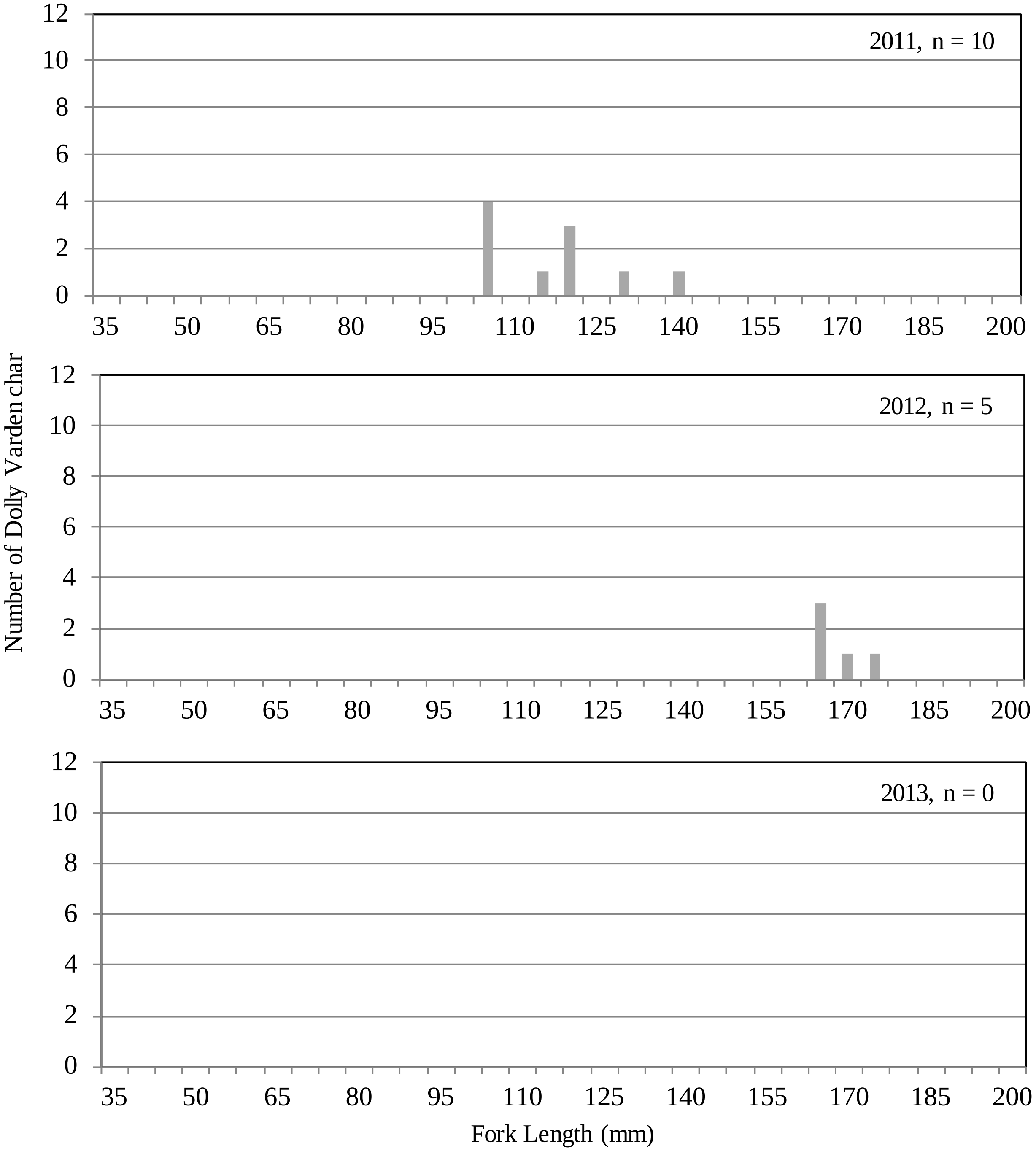
Site	Year	Species	Habitat Type	Number of Fish Captured				MLE	95% CI
				Set 1	Set 2	Set 3	Total		
East Fork Slate Creek	2011	DV	Riffle	3	0	0	3	12	---
East Fork Slate Creek	2011	DV	Pool	3	1	2	6	24	---
East Fork Slate Creek	2011	DV	Glide	0	1	0	1	4	---
East Fork Slate Creek	2012	DV	Riffle	0	0	1	1	4	---
East Fork Slate Creek	2012	DV	Pool	2	1	1	4	16	---
East Fork Slate Creek	2012	DV	Glide	0	0	0	0	0	---
East Fork Slate Creek	2013	DV	Riffle	0	0	0	0	0	---
East Fork Slate Creek	2013	DV	Pool	0	0	0	0	0	---
East Fork Slate Creek	2013	DV	Glide	0	0	0	0	0	---
Upper Slate Creek	2011	DV	Riffle	2	2	0	4	16	---
Upper Slate Creek	2011	DV	Pool	11	9	1	22	88	76-100
Upper Slate Creek	2011	DV	Glide	1	1	1	3	12	---
Upper Slate Creek	2012	DV	Riffle	2	4	4	10	40	---
Upper Slate Creek	2012	DV	Pool	20	3	2	25	100	100-100
Upper Slate Creek	2012	DV	Glide	1	7	0	8	32	---
Upper Slate Creek	2013	DV	Riffle	4	1	0	5	20	---
Upper Slate Creek	2013	DV	Pool	17	5	1	23	92	---
Upper Slate Creek	2013	DV	Glide	0	1	1	2	8	---

Note: In 2013, we corrected the 2012 Upper Slate Creek Glide MLE in this table.

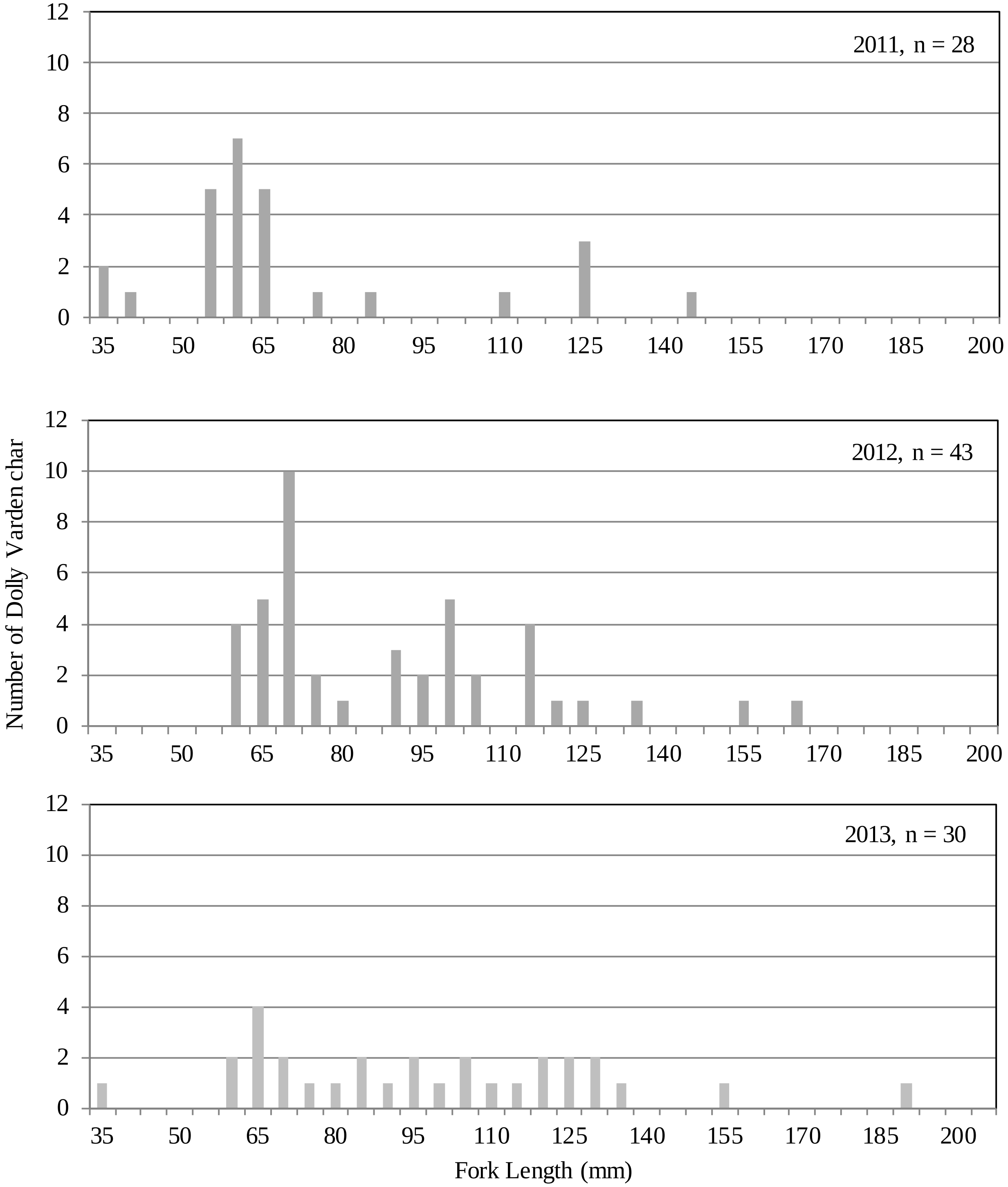
Appendix C3.–2013 Upper Slate Creek captured fish length, weight, and condition factor (K) data.

Upper Slate Creek				
Pass #	Species	FL (mm)	Weight (g)	K
1	DV	125	18.6	0.95
1	DV	116	13.9	0.89
1	DV	110	14.1	1.06
1	DV	114	13.2	0.89
1	DV	91	8.4	1.11
1	DV	92	8.9	1.14
1	DV	116	17.1	1.10
1	DV	125	20	1.02
1	DV	132	22.9	1.00
1	DV	127	21	1.03
1	DV	84	6.1	1.03
1	DV	70	3.5	1.02
1	DV	101	10.9	1.06
1	DV	96	9.2	1.04
1	DV	85	5.1	0.83
1	DV	62	2.5	1.05
1	DV	86	6.4	1.01
1	DV	76	3.7	0.84
1	DV	65	2.9	1.06
1	DV	67	3.7	1.23
1	DV	60	2.1	0.97
2	DV	35	0.4	0.93
2	DV	62	2.3	0.97
2	DV	105	12.1	1.05
2	DV	56	1.8	1.02
2	DV	74	4.4	1.09
2	DV	61	2.8	1.23
2	DV	190	51.7	0.75
3	DV	126	24.2	1.21
3	DV	151	32.7	0.95
			Mean K =	1.02

Appendix C4.–Length frequency diagrams for Dolly Varden char captured at East Fork Slate Creek, 2011–2013.



Appendix C5.–Length frequency diagrams for Dolly Varden char captured at Upper Slate Creek, 2011–2013.



APPENDIX D: RESIDENT FISH METALS CONCENTRATIONS LAB REPORT

November 19, 2013 Analytical Report for Service Request No: K1311197

Kate Kanouse
Alaska Department of Fish and Game
Division of Habitat
P.O. Box 110024
Juneau, AK 99811

RE: Kensington Gold Mine Biomonitoring 2013/Coeur Alaska Mining

Dear Kate:

Enclosed are the results of the samples submitted to our laboratory on October 16, 2013. For your reference, these analyses have been assigned our service request number K1311197.

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 call if you have any questions. My extension is 3363. You may also contact me via Email at Lisa.Domenighini@alsglobal.com.

Respectfully submitted,

ALS Group USA Corp. dba ALS Environmental

Lisa Domenighini
Project Manager

LD/mj

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	2286
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L12-28
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Georgia DNR	http://www.gaepd.org/Documents/techguide_pcb.html#cel	881
Hawaii DOH	Not available	-
Idaho DHW	http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx	-
Indiana DOH	http://www.in.gov/isdh/24859.htm	C-WA-01
ISO 17025	http://www.pjlabs.com/	L12-27
Louisiana DEQ	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	3016
Maine DHS	Not available	WA0035
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	053-999-368
Montana DPHHS	http://www.dphhs.mt.gov/publichealth/	CERT0047
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA35
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	WA200001
South Carolina DHEC	http://www.scdhec.gov/environment/envserv/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	4704427-08-TX
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C1203
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.caslab.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.

ALS ENVIRONMENTAL

Client:	Alaska Department of Fish and Game	**Service Request No.:**	K1311197
Project:	Kensington Gold Mine Biomonitoring 2013/ Coeur Alaska Mining	**Date Received:**	10/16/13
Sample Matrix:	Animal Tissue		

Case Narrative

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

Sample Receipt

Eighteen animal tissue samples were received for analysis at ALS Environmental on 10/16/13. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored frozen at –20ºC upon receipt at the laboratory.

Total Metals

Matrix Spike Recovery Exceptions:
The control criteria for matrix spike recovery of Aluminum for sample West Fork Slate Creek Sample #1 were not applicable. The analyzed concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

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

Approved by____

ALS Environmental

CHAIN OF CUSTODY

SR# K1311197

1317 South 13th Ave., Kelso, WA 98626 | 360.577.7222 | 800.695.7222 | 360.636.1068 (fax)

PAGE ______ OF ______ COC# ______

PROJECT NAME Kensington Gold Mine Biomonitoring 2013
PROJECT NUMBER Coeur Alaska Mine
PROJECT MANAGER Kate Kanouse ADFG Habitat
COMPANY NAME Alaska Department of Fish and Game Habitat
ADDRESS 802 West 3rd Street DM 133
CITY/STATE/ZIP Douglas, AK, 99824
E-MAIL ADDRESS Kate.Kanouse@alaska.gov
PHONE # 907-465-6160 FAX # 907-465-4459
SAMPLER'S SIGNATURE Benji Brewster

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS		Semivolatile Organics by GC/MS 625☐ 8270☐ 8270LL☐ SIM PAH☐	Volatile Organics 624☐ 8260☐ 8021☐ BTEX☐	Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐	Oil & Grease/TRPH 1664 HEM☐ 1664 SGT☐	PCBs Aroclors☐ Congeners☐	Pesticides/Herbicides 608☐ 8081☐ 8141☐ 8151☐	Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐	Metals, Total or Dissolved (See List below)	Cyanide☐ Hex-Chrom☐	(circle) pH, Cond., Cl, SO4, PO4, F, NO2, NO3, BOD, TSS, TDS, Turb.	(circle) NH3-N, COD, TKN, TOC, DOC, NO2+NO3, T-Phos	TOX 9020☐ AOX 1650☐ 506☐	Alkalinity☐ CO3☐ HCO3☐	Dioxins/Furans 1613☐ 8290☐	Dissolved Gases RSK 175☐ CO2☐ Methane☐ Ethane☐ Ethene☐	Total Mercury (631)			REMARKS
See attached list of					18									X								X			
juvenile fish whole																									
body samples																									

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
X II. Report Dup., MS, MSD as required
___ III. CLP Like Summary (no raw data)
___ IV. Data Validation Report
___ V. EDD

INVOICE INFORMATION

P.O. # Coeur Alaska
Bill To: Kevin Eppers
3031 Clinton Dr. Ste
202, Juneau AK, 99801

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 day
X Standard (15 working days)
___ Provide FAX Results

______
Requested Report Date

Circle which metals are to be analyzed:

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

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

***INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: ______ (CIRCLE ONE)**

SPECIAL INSTRUCTIONS/COMMENTS:

Dry weight basis. Report % solids
Send ecopy to Kate Kanouse ADFG Habitat
Kate.Kanouse@alaska.gov

☐ Sample Shipment contains USDA regulated soil samples (check box if applicable)

RELINQUISHED BY:
Signature Benji Brewster Date/Time 10/15/13
Printed Name Benjamin Brewster Firm ADFG

RECEIVED BY:
Signature K Smith Date/Time 10/16/13 1000
Printed Name K Smith Firm ALS

RELINQUISHED BY:
Signature ______ Date/Time ______
Printed Name ______ Firm ______

RECEIVED BY:
Signature ______ Date/Time ______
Printed Name ______ Firm ______

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Greens Creek Biomonitoring 2013

Juvenile Fish for Whole Body Metals

Basis, all samples: Dry Weight, Report %Solids

Requested Analysis: Ag,Cd,Cu,Hg,Pb,Se,Zn

Matrix	Collector	Date Collected	Sample Number	Sample Location	Analysis Requested	FK Length (mm)	Weight (g)
Whole Body	ADF&G	9/9/2013	Lower Slate Creek sample # 1	Lower Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	125	17.9
Whole Body	ADF&G	9/9/2013	Lower Slate Creek sample # 2	Lower Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	110	8.5
Whole Body	ADF&G	9/9/2013	Lower Slate Creek sample # 3	Lower Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	120	19
Whole Body	ADF&G	9/9/2013	Lower Slate Creek sample # 4	Lower Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	110	15.8
Whole Body	ADF&G	9/9/2013	Lower Slate Creek sample # 5	Lower Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	105	11.8
Whole Body	ADF&G	9/9/2013	Lower Slate Creek sample # 6	Lower Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	105	9.9
Whole Body	ADF&G	9/9/2013	West Fork Slate Creek sample # 1	West Fork Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	125	24.7
Whole Body	ADF&G	9/9/2013	West Fork Slate Creek sample # 2	West Fork Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	120	18.1
Whole Body	ADF&G	9/9/2013	West Fork Slate Creek sample # 3	West Fork Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	120	19.5
Whole Body	ADF&G	9/9/2013	West Fork Slate Creek sample # 4	West Fork Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	105	12.4
Whole Body	ADF&G	9/9/2013	West Fork Slate Creek sample # 5	West Fork Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	110	11.9
Whole Body	ADF&G	9/16/2013	West Fork Slate Creek sample # 6	West Fork Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	90	[redacted] 46
Whole Body	ADF&G	8/27/2013	Upper Slate Creek sample # 1	Upper Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	125	18.8
Whole Body	ADF&G	8/27/2013	Upper Slate Creek sample #2	Upper Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	110	14
Whole Body	ADF&G	8/27/2013	Upper Slate Creek sample # 3	Upper Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	115	14.2
Whole Body	ADF&G	8/27/2013	Upper Slate Creek sample # 4	Upper Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	105	13.3
Whole Body	ADF&G	8/27/2013	Upper Slate Creek sample # 5	Upper Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	100	8.9
Whole Body	ADF&G	8/27/2013	Upper Slate Creek sample # 6	Upper Slate Creek	Ag,Al,Cd,Cr,Cu,Hg,Ni,Pb,Se,Zn	100	8.7

ALS

PC [illegible]

Cooler Receipt and Preservation Form

Client / Project: Alaska DFWG Service Request K13 11197

Received: 10/16/13 Opened: 10/16/13 By: KD Unloaded: 10/16/13 By: KD

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? 1, Front

   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
3.3	3.3	—	—	0	319		8037 3696 7110	

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

Notes, Discrepancies, & Resolutions: ______

Page ____ *of* ____

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1311197
Project:	Kensington Gold Mine Biomonitoring 2013/Coeur Alaska Mining	**Date Collected:**	08/27-09/16/13
Sample Matrix:	Animal tissue	**Date Received:**	10/16/13

Mercury, Total

Prep Method:	METHOD	Units:	ng/g
Analysis Method:	1631E	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Lower Slate Creek Sample #1	K1311197-001	4.9	100	11/14/13	11/17/13	234	
Lower Slate Creek Sample #2	K1311197-002	4.9	100	11/14/13	11/17/13	263	
Lower Slate Creek Sample #3	K1311197-003	4.9	100	11/14/13	11/17/13	169	
Lower Slate Creek Sample #4	K1311197-004	5.0	100	11/14/13	11/17/13	265	
Lower Slate Creek Sample #5	K1311197-005	4.9	100	11/14/13	11/17/13	361	
Lower Slate Creek Sample #6	K1311197-006	5.0	100	11/14/13	11/17/13	255	
West Fork Slate Creek Sample #1	K1311197-007	4.9	100	11/14/13	11/17/13	177	
West Fork Slate Creek Sample #2	K1311197-008	4.8	100	11/14/13	11/17/13	158	
West Fork Slate Creek Sample #3	K1311197-009	4.9	100	11/14/13	11/17/13	245	
West Fork Slate Creek Sample #4	K1311197-010	5.0	100	11/14/13	11/17/13	137	
West Fork Slate Creek Sample #5	K1311197-011	4.9	100	11/14/13	11/17/13	276	
West Fork Slate Creek Sample #6	K1311197-012	5.0	100	11/14/13	11/17/13	129	
Upper Slate Creek Sample #1	K1311197-013	4.9	100	11/14/13	11/17/13	178	
Upper Slate Creek Sample #2	K1311197-014	5.0	100	11/14/13	11/17/13	143	
Upper Slate Creek Sample #3	K1311197-015	4.9	100	11/14/13	11/17/13	123	
Upper Slate Creek Sample #4	K1311197-016	4.8	100	11/14/13	11/17/13	180	
Upper Slate Creek Sample #5	K1311197-017	5.0	100	11/14/13	11/17/13	134	
Upper Slate Creek Sample #6	K1311197-018	5.0	100	11/14/13	11/17/13	115	
Method Blank 1	K1311197-MB1	5.0	20	11/14/13	11/17/13	ND	
Method Blank 2	K1311197-MB2	5.0	20	11/14/13	11/17/13	ND	
Method Blank 3	K1311197-MB3	5.0	20	11/14/13	11/17/13	ND	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1311197
Project:	Kensington Gold Mine Biomonitoring 2013/Coeur Alaska Mining	**Date Collected:**	09/09/13
Sample Matrix:	Animal tissue	**Date Received:**	10/16/13
		Date Extracted:	11/14/13
		Date Analyzed:	11/17/13

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name: West Fork Slate Creek Sample #1

Units: ng/g

Lab Code: K1311197-007MS, K1311197-007MSD

Basis: Dry

Test Notes:

									Percent Recovery					
											CAS	**Relative**	
	Prep	**Analysis**		**Spike Level**		**Sample**	**Spike Result**				**Acceptance**	**Percent**	**Result**
Analyte	**Method**	**Method**	**MRL**	**MS**	**DMS**	**Result**	**MS**	**DMS**	**MS**	**DMS**	**Limits**	**Difference**	**Notes**
Mercury	METHOD	1631E	4.9	240	244	177	390	368	89	78	70-130	13	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1311197
Project:	Kensington Gold Mine Biomonitoring 2013/Coeur Alaska Mining	**Date Collected:**	08/27/13
Sample Matrix:	Animal tissue	**Date Received:**	10/16/13
		Date Extracted:	11/14/13
		Date Analyzed:	11/17/13

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name:	Upper Slate Creek Sample #3		Units:	ng/g
Lab Code:	K1311197-015MS	K1311197-015MSD	Basis:	Dry
Test Notes:				

Analyte	**Prep Method**	**Analysis Method**	**MRL**	**Spike Level MS**	**Spike Level DMS**	**Sample Result**	**Spike Result MS**	**Spike Result DMS**	**Percent Recovery MS**	**Percent Recovery DMS**	**Percent Recovery CAS Acceptance Limits**	**Relative Percent Difference**	**Result Notes**
Mercury	METHOD	1631E	5.0	248	249	123	371	349	100	91	70-130	10	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1311197
Project:	Kensington Gold Mine Biomonitoring 2013/Coeur Alaska Mining	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	11/17/13

Ongoing Precision and Recovery (OPR) Sample Summary

Total Metals

Sample Name:	Ongoing Precision and Recovery (Initial)	Units:	ng/g
		Basis:	NA

Test Notes:

Analyte	**Prep Method**	**Analysis Method**	**True Value**	**Result**	**Percent Recovery**	**CAS Percent Recovery Acceptance Limits**	**Result Notes**
Mercury	METHOD	1631E	5.00	6.10	122	70-130	

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1311197
Project:	Kensington Gold Mine Biomonitoring 2013/Coeur Alaska Mining	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	11/17/13

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final)

Units: ng/g
Basis: NA

Test Notes:

Analyte	**Prep Method**	**Analysis Method**	**True Value**	**Result**	**Percent Recovery**	**CAS Percent Recovery Acceptance Limits**	**Result Notes**
Mercury	METHOD	1631E	5.00	3.74	75	70-130	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1311197
Project:	Kensington Gold Mine Biomonitoring 2013/Coeur Alaska Mining	**Date Collected:**	NA
LCS Matrix:	Animal tissue	**Date Received:**	NA
		Date Extracted:	11/14/13
		Date Analyzed:	11/17/13

Quality Control Sample (QCS) Summary
Total Metals

Sample Name:	Quality Control Sample	Units:	ng/g
Lab Code:		Basis:	Dry
Test Notes:			

Source: TORT-2

Analyte	**Prep Method**	**Analysis Method**	**True Value**	**Result**	**Percent Recovery**	**CAS Percent Recovery Acceptance Limits**	**Result Notes**
Mercury	METHOD	1631E	270	251	93	70-130	

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

Analytical Report

Client: Alaska Department of Fish and Game
Project: Kensington Gold Mine Biomonitoring 2013/Coeur Alaska Mining
Sample Matrix: Tissue

Service Request: K1311197
Date Collected: 08/27-09/16/13
Date Received: 10/16/13

Moisture

Prep Method: NONE
Analysis Method: Freeze Dry
Test Notes:

Units: PERCENT
Basis: Wet

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
Lower Slate Creek Sample #1	K1311197-001	10/23/13	78.9	
Lower Slate Creek Sample #2	K1311197-002	10/23/13	79.3	
Lower Slate Creek Sample #3	K1311197-003	10/23/13	76.9	
Lower Slate Creek Sample #4	K1311197-004	10/23/13	82.2	
Lower Slate Creek Sample #5	K1311197-005	10/23/13	78.7	
Lower Slate Creek Sample #6	K1311197-006	10/23/13	79.5	
West Fork Slate Creek Sample #1	K1311197-007	10/23/13	74.1	
West Fork Slate Creek Sample #2	K1311197-008	10/23/13	76.6	
West Fork Slate Creek Sample #3	K1311197-009	10/23/13	77.1	
West Fork Slate Creek Sample #4	K1311197-010	10/23/13	73.3	
West Fork Slate Creek Sample #5	K1311197-011	10/23/13	76.6	
West Fork Slate Creek Sample #6	K1311197-012	10/23/13	74.5	
Upper Slate Creek Sample #1	K1311197-013	10/23/13	78.0	
Upper Slate Creek Sample #2	K1311197-014	10/23/13	76.9	
Upper Slate Creek Sample #3	K1311197-015	10/23/13	77.4	
Upper Slate Creek Sample #4	K1311197-016	10/23/13	78.3	
Upper Slate Creek Sample #5	K1311197-017	10/23/13	77.8	
Upper Slate Creek Sample #6	K1311197-018	10/23/13	76.9	

COLUMBIA ANALYTICAL SERVICES, INC.

Now part of the ALS Group

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1311197
Project:	Kensington Gold Mine Biomonitoring 2013/Coeur Alaska Mining	**Date Collected:**	09/09/13
Sample Matrix:	Tissue	**Date Received:**	10/16/13
		Date Extracted:	NA
		Date Analyzed:	10/23/13

Duplicate Summary

Sample Name:	West Fork Slate Creek Sample #1	Units:	PERCENT
Lab Code:	K1311197-007D	Basis:	Wet
Test Notes:			

Analyte	Prep Method	Analysis Method	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Moisture	NA	Freeze Dry	74.1	72.5	73.3	2	

ALS Group USA, Corp.
dba ALS Environmental

- Cover Page -
INORGANIC ANALYSIS DATA PACKAGE

Client: Alaska Department of Fish and Game
Project Name: Kensington Gold Mine Biomonitoring 2013
Project No.: Coeur Alaska Mining

Service Request: K1311197

Sample Name:	Lab Code:
Lower Slate Creek Sample #1	K1311197-001
Lower Slate Creek Sample #2	K1311197-002
Lower Slate Creek Sample #3	K1311197-003
Lower Slate Creek Sample #4	K1311197-004
Lower Slate Creek Sample #5	K1311197-005
Lower Slate Creek Sample #6	K1311197-006
West Fork Slate Creek Sample #1	K1311197-007
West Fork Slate Creek Sample #1D	K1311197-007D
West Fork Slate Creek Sample #1S	K1311197-007S
West Fork Slate Creek Sample #2	K1311197-008
West Fork Slate Creek Sample #3	K1311197-009
West Fork Slate Creek Sample #4	K1311197-010
West Fork Slate Creek Sample #5	K1311197-011
West Fork Slate Creek Sample #6	K1311197-012
Upper Slate Creek Sample #1	K1311197-013
Upper Slate Creek Sample #2	K1311197-014
Upper Slate Creek Sample #2D	K1311197-014D
Upper Slate Creek Sample #2S	K1311197-014S
Upper Slate Creek Sample #3	K1311197-015
Upper Slate Creek Sample #4	K1311197-016
Upper Slate Creek Sample #5	K1311197-017
Upper Slate Creek Sample #6	K1311197-018
Method Blank	K1311197-MB

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Alaska Department of Fish and Ga	**Service Request:**	K1311197
Project No.:	Coeur Alaska Mining	**Date Collected:**	09/09/13
Project Name:	Kensington Gold Mine Biomonitori	**Date Received:**	10/16/13
Matrix:	TISSUE	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: **Lower Slate Creek Sample #1** **Lab Code:** **K1311197-001**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	2.0	5.0	10/30/13	11/06/13	367		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.47		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	4.3		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	5.6		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.07		
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	2.2		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	3.8		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.07		
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	235		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Alaska Department of Fish and Ga

Service Request: K1311197

Project No.: Coeur Alaska Mining

Date Collected: 09/09/13

Project Name: Kensington Gold Mine Biomonitori

Date Received: 10/16/13

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: **Lower Slate Creek Sample #2**

Lab Code: **K1311197-002**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	2.0	5.0	10/30/13	11/06/13	212		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.39		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	1.0		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	3.6		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.08		
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	0.6		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	4.0		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.03		
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	216		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Alaska Department of Fish and Ga

Service Request: K1311197

Project No.: Coeur Alaska Mining

Date Collected: 09/09/13

Project Name: Kensington Gold Mine Biomonitori

Date Received: 10/16/13

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: **Lower Slate Creek Sample #3**

Lab Code: **K1311197-003**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	2.0	5.0	10/30/13	11/06/13	33.7		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.36		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	1.5		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	3.2		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.02	U	
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	0.7		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	3.4		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.02		
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	215		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Alaska Department of Fish and Ga	**Service Request:**	K1311197
Project No.:	Coeur Alaska Mining	**Date Collected:**	09/09/13
Project Name:	Kensington Gold Mine Biomonitori	**Date Received:**	10/16/13
Matrix:	TISSUE	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: **Lower Slate Creek Sample #4** **Lab Code:** **K1311197-004**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	2.0	5.0	10/30/13	11/06/13	305		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.74		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	2.2		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	16.7		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.15		
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	1.3		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	3.9		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.34		
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	262		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Alaska Department of Fish and Ga	**Service Request:**	K1311197
Project No.:	Coeur Alaska Mining	**Date Collected:**	09/09/13
Project Name:	Kensington Gold Mine Biomonitori	**Date Received:**	10/16/13
Matrix:	TISSUE	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: **Lower Slate Creek Sample #5** **Lab Code:** **K1311197-005**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	1.9	5.0	10/30/13	11/06/13	25.1		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.28		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	1.1		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	3.4		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.11		
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	0.6		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	4.3		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.03		
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	221		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Alaska Department of Fish and Ga	**Service Request:**	K1311197
Project No.:	Coeur Alaska Mining	**Date Collected:**	09/09/13
Project Name:	Kensington Gold Mine Biomonitori	**Date Received:**	10/16/13
Matrix:	TISSUE	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: **Lower Slate Creek Sample #6** **Lab Code:** **K1311197-006**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	2.0	5.0	10/30/13	11/06/13	23.8		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.44		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	0.7		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	4.3		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.04		
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	0.4		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	3.9		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.05		
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	215		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Alaska Department of Fish and Ga	**Service Request:**	K1311197
Project No.:	Coeur Alaska Mining	**Date Collected:**	09/09/13
Project Name:	Kensington Gold Mine Biomonitori	**Date Received:**	10/16/13
Matrix:	TISSUE	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: **West Fork Slate Creek Sample #1** **Lab Code:** **K1311197-007**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	38.6	100.0	10/30/13	11/07/13	5200		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.29		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	45.9		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	13.2		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	1.55		
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	24.4		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	2.5		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.05		
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	175		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Alaska Department of Fish and Ga

Service Request: K1311197

Project No.: Coeur Alaska Mining

Date Collected: 09/09/13

Project Name: Kensington Gold Mine Biomonitori

Date Received: 10/16/13

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: **West Fork Slate Creek Sample #2** **Lab Code:** **K1311197-008**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	2.0	5.0	10/30/13	11/06/13	87.2		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.17		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	2.4		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	5.0		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.06		
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	1.1		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	3.1		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.07		
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	196		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Alaska Department of Fish and Ga **Service Request:** K1311197

Project No.: Coeur Alaska Mining **Date Collected:** 09/09/13

Project Name: Kensington Gold Mine Biomonitori **Date Received:** 10/16/13

Matrix: TISSUE **Units:** mg/Kg

Basis: DRY

Sample Name: **West Fork Slate Creek Sample #3** **Lab Code:** **K1311197-009**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	2.0	5.0	10/30/13	11/06/13	190		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.18		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	2.3		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	4.1		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.06		
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	1.3		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	3.7		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.04		
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	182		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Alaska Department of Fish and Ga	**Service Request:**	K1311197
Project No.:	Coeur Alaska Mining	**Date Collected:**	09/09/13
Project Name:	Kensington Gold Mine Biomonitori	**Date Received:**	10/16/13
Matrix:	TISSUE	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: **West Fork Slate Creek Sample #4** **Lab Code:** **K1311197-010**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	39.4	100.0	10/30/13	11/07/13	5800		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.20		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	37.9		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	11.9		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.92		
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	20.7		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	2.3		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.04		
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	173		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Alaska Department of Fish and Ga
Service Request: K1311197
Project No.: Coeur Alaska Mining
Date Collected: 09/09/13
Project Name: Kensington Gold Mine Biomonitori
Date Received: 10/16/13
Matrix: TISSUE
Units: mg/Kg
Basis: DRY

Sample Name: **West Fork Slate Creek Sample #5** **Lab Code:** **K1311197-011**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	38.4	100.0	10/30/13	11/07/13	4270		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.27		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	18.5		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	8.7		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.65		
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	11.4		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	3.2		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.04		
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	200		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Alaska Department of Fish and Ga	**Service Request:**	K1311197
Project No.:	Coeur Alaska Mining	**Date Collected:**	09/16/13
Project Name:	Kensington Gold Mine Biomonitori	**Date Received:**	10/16/13
Matrix:	TISSUE	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: **West Fork Slate Creek Sample #6** **Lab Code:** **K1311197-012**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	2.0	5.0	10/30/13	11/06/13	45.1		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.16		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	0.2	U	
Copper	200.8	0.1	5.0	10/30/13	11/06/13	3.1		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.03		
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	0.2	U	
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	3.3		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.03		
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	138		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Alaska Department of Fish and Ga	**Service Request:**	K1311197
Project No.:	Coeur Alaska Mining	**Date Collected:**	08/27/13
Project Name:	Kensington Gold Mine Biomonitori	**Date Received:**	10/16/13
Matrix:	TISSUE	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: **Upper Slate Creek Sample #1** **Lab Code:** **K1311197-013**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	2.0	5.0	10/30/13	11/06/13	178		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.09		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	2.6		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	2.6		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.03		
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	1.2		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	4.1		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.02	U	
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	143		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Alaska Department of Fish and Ga	**Service Request:**	K1311197
Project No.:	Coeur Alaska Mining	**Date Collected:**	08/27/13
Project Name:	Kensington Gold Mine Biomonitori	**Date Received:**	10/16/13
Matrix:	TISSUE	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: **Upper Slate Creek Sample #2** **Lab Code:** **K1311197-014**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	2.0	5.0	10/30/13	11/06/13	70.8		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.08		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	1.7		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	4.3		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.02	U	
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	0.8		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	4.6		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.03		
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	148		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Alaska Department of Fish and Ga

Project No.: Coeur Alaska Mining

Project Name: Kensington Gold Mine Biomonitori

Matrix: TISSUE

Service Request: K1311197

Date Collected: 08/27/13

Date Received: 10/16/13

Units: mg/Kg

Basis: DRY

Sample Name: **Upper Slate Creek Sample #3** **Lab Code:** **K1311197-015**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	2.0	5.0	10/30/13	11/06/13	212		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.05		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	2.6		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	3.3		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.03		
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	1.2		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	3.8		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.02	U	
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	164		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Alaska Department of Fish and Ga	**Service Request:**	K1311197
Project No.:	Coeur Alaska Mining	**Date Collected:**	08/27/13
Project Name:	Kensington Gold Mine Biomonitori	**Date Received:**	10/16/13
Matrix:	TISSUE	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: **Upper Slate Creek Sample #4** **Lab Code:** **K1311197-016**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	2.0	5.0	10/30/13	11/06/13	35.4		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.05		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	2.5		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	4.5		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.02	U	
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	1.2		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	4.3		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.02		
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	159		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Alaska Department of Fish and Ga	**Service Request:**	K1311197
Project No.:	Coeur Alaska Mining	**Date Collected:**	08/27/13
Project Name:	Kensington Gold Mine Biomonitori	**Date Received:**	10/16/13
Matrix:	TISSUE	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: **Upper Slate Creek Sample #5** **Lab Code:** **K1311197-017**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	2.0	5.0	10/30/13	11/06/13	151		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.11		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	1.5		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	4.0		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.02		
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	0.7		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	4.9		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.02	U	
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	142		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Alaska Department of Fish and Ga	**Service Request:**	K1311197
Project No.:	Coeur Alaska Mining	**Date Collected:**	08/27/13
Project Name:	Kensington Gold Mine Biomonitori	**Date Received:**	10/16/13
Matrix:	TISSUE	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: **Upper Slate Creek Sample #6** **Lab Code:** **K1311197-018**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	1.9	5.0	10/30/13	11/06/13	76.2		
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.11		
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	1.3		
Copper	200.8	0.1	5.0	10/30/13	11/06/13	3.3		
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.02		
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	0.5		
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	4.2		
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.02	U	
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	130		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Alaska Department of Fish and Ga

Service Request: K1311197

Project No.: Coeur Alaska Mining

Date Collected:

Project Name: Kensington Gold Mine Biomonitori

Date Received:

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: **Method Blank**

Lab Code: **K1311197-MB**

Analyte	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	200.8	2.0	5.0	10/30/13	11/06/13	2.0	U	
Cadmium	200.8	0.02	5.0	10/30/13	11/06/13	0.02	U	
Chromium	200.8	0.2	5.0	10/30/13	11/06/13	0.2	U	
Copper	200.8	0.1	5.0	10/30/13	11/06/13	0.1	U	
Lead	200.8	0.02	5.0	10/30/13	11/06/13	0.02	U	
Nickel	200.8	0.2	5.0	10/30/13	11/06/13	0.2	U	
Selenium	200.8	1.0	5.0	10/30/13	11/06/13	1.0	U	
Silver	200.8	0.02	5.0	10/30/13	11/06/13	0.02	U	
Zinc	200.8	0.5	5.0	10/30/13	11/06/13	0.5	U	

Comments:

Metals
- 5A -
SPIKE SAMPLE RECOVERY

Client: Alaska Department of Fish and Ga

Service Request: K1311197

Project No.: Coeur Alaska Mining

Units: MG/KG

Project Name: Kensington Gold Mine Biomonitori

Basis: DRY

Matrix: TISSUE

Sample Name: **West Fork Slate Creek Samp**

Lab Code: **K1311197-007S**

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum		5603.8		5198.2		196.6	206.3		200.8
Cadmium	70 - 130	5.20		0.29		4.91	100.0		200.8
Chromium	70 - 130	63.1		45.9		19.7	87.3		200.8
Copper	70 - 130	36.2		13.2		24.6	93.5		200.8
Lead	70 - 130	44.01		1.55		49.15	86.4		200.8
Nickel	70 - 130	72.5		24.4		49.1	98.0		200.8
Selenium	70 - 130	19.0		2.5		16.4	100.6		200.8
Silver	70 - 130	4.89		0.05		4.91	98.6		200.8
Zinc	70 - 130	221.7		175.3		49.1	94.5		200.8

An empty field in the Control Limit column indicates the control limit is not applicable

Metals
- 5A -
SPIKE SAMPLE RECOVERY

Client: Alaska Department of Fish and Ga **Service Request:** K1311197

Project No.: Coeur Alaska Mining **Units:** MG/KG

Project Name: Kensington Gold Mine Biomonitori **Basis:** DRY

Matrix: TISSUE

Sample Name: **Upper Slate Creek Sample #** **Lab Code:** **K1311197-014S**

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum	70 - 130	294.1		70.8		197.5	113.1		200.8
Cadmium	70 - 130	5.35		0.08		4.94	106.7		200.8
Chromium	70 - 130	22.6		1.7		19.7	106.1		200.8
Copper	70 - 130	28.4		4.3		24.7	97.6		200.8
Lead	70 - 130	42.31		0.02	U	49.37	85.7		200.8
Nickel	70 - 130	51.5		0.8		49.4	102.6		200.8
Selenium	70 - 130	23.5		4.6		16.5	114.5		200.8
Silver	70 - 130	5.10		0.03		4.94	102.6		200.8
Zinc	70 - 130	201.9		147.5		49.4	110.1		200.8

An empty field in the Control Limit column indicates the control limit is not applicable

Metals

- 6 -

DUPLICATES

Client: Alaska Department of Fish and Ga **Service Request:** K1311197

Project No.: Coeur Alaska Mining **Units:** MG/KG

Project Name: Kensington Gold Mine Biomonitori **Basis:** DRY

Matrix: TISSUE

Sample Name: West Fork Slate Creek Sam **Lab Code:** K1311197-007D

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Aluminum	30	5198.2		5421.3		4.2		200.8
Cadmium	30	0.29		0.29		0.0		200.8
Chromium	30	45.9		44.0		4.2		200.8
Copper	30	13.2		14.2		7.3		200.8
Lead	30	1.55		1.58		1.9		200.8
Nickel	30	24.4		24.6		0.8		200.8
Selenium		2.5		2.5		0.0		200.8
Silver		0.05		0.04		22.2		200.8
Zinc	30	175.3		170.6		2.7		200.8

An empty field in the Control Limit column indicates the control limit is not applicable.

Metals

- 6 -

DUPLICATES

Client: Alaska Department of Fish and Ga **Service Request:** K1311197

Project No.: Coeur Alaska Mining **Units:** MG/KG

Project Name: Kensington Gold Mine Biomonitori **Basis:** DRY

Matrix: TISSUE

Sample Name: Upper Slate Creek Sample **Lab Code:** K1311197-014D

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Aluminum	30	70.8		73.0		3.1		200.8
Cadmium		0.08		0.08		0.0		200.8
Chromium	30	1.7		1.5		12.5		200.8
Copper	30	4.3		4.3		0.0		200.8
Lead		0.02	U	0.02	U			200.8
Nickel		0.8		0.8		0.0		200.8
Selenium		4.6		4.5		2.2		200.8
Silver		0.03		0.04		28.6		200.8
Zinc	30	147.5		149.5		1.3		200.8

An empty field in the Control Limit column indicates the control limit is not applicable.

Metals

-7-

LABORATORY CONTROL SAMPLE

Client: Alaska Department of Fish and Ga **Service Request:** K1311197

Project No.: Coeur Alaska Mining

Project Name: Kensington Gold Mine Biomonitori

Aqueous LCS Source: CAS MIXED **Solid LCS Source:**

	Aqueous (ug/L)			Solid (mg/kg)				
Analyte	True	Found	%R	True	Found	C	Limits	%R
Aluminum	2000.0	1956.9	97.8					
Cadmium	50.0	49.6	99.2					
Chromium	200.0	203.7	101.8					
Copper	250.0	248.7	99.5					
Lead	500.0	491.8	98.4					
Nickel	500.0	504.4	100.9					
Selenium	167.0	151.9	91.0					
Silver	50.0	51.1	102.2					
Zinc	500.0	506.9	101.4					

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Alaska Department of Fish and Game
Project: Kensington Gold Mine Biomonitoring 2013/Coeur Alaska Mining
LCS Matrix: Tissue

Service Request: K1311197
Date Collected: NA
Date Received: NA
Date Extracted: 10/30/13
Date Analyzed: 11/06/13

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1311197-SRM1
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Dorm-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	200.8	6.88	6.79	99	5.26 - 8.62	
Cadmium	PSEP Tissue	200.8	0.29	0.30	103	0.216 - 0.372	
Chromium	PSEP Tissue	200.8	1.89	1.85	98	1.38 - 2.47	
Copper	PSEP Tissue	200.8	15.5	15.0	97	11.9 - 19.4	
Lead	PSEP Tissue	200.8	0.395	0.290	73	0.276 - 0.534	
Nickel	PSEP Tissue	200.8	1.28	1.43	112	0.83 - 1.82	
Zinc	PSEP Tissue	200.8	51.3	53.8	105	38.6 - 65.3	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1311197
Project:	Kensington Gold Mine Biomonitoring 2013/Coeur Alaska Mining	**Date Collected:**	NA
LCS Matrix:	Tissue	**Date Received:**	NA
		Date Extracted:	10/30/13
		Date Analyzed:	11/06/13

Standard Reference Material Summary
Total Metals

Sample Name:	Standard Reference Material	Units:	mg/Kg (ppm)
Lab Code:	K1311197-SRM2	Basis:	Dry
Test Notes:			

Source: N.R.C.C. Tort-2

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	200.8	21.6	22.5	104	15.8-28.1	
Cadmium	PSEP Tissue	200.8	26.7	28.9	108	20.9-32.8	
Chromium	PSEP Tissue	200.8	0.77	0.63	82	0.5-1.1	
Copper	PSEP Tissue	200.8	106	103	97	77-139	
Lead	PSEP Tissue	200.8	0.35	0.35	100	0.18-0.58	
Nickel	PSEP Tissue	200.8	2.5	2.2	88	1.85-3.23	
Selenium	PSEP Tissue	200.8	5.63	6.46	115	3.97-7.56	
Zinc	PSEP Tissue	200.8	180	199	111	139-223	

APPENDIX E: SEDIMENT METALS CONCENTRATIONS & TOXICITY LAB REPORTS

Appendix E1.–Kensington Gold Mine stream sediment composition for samples collected 2011–2013.

		Particle Size Data[a]								
Site	Sample Date	% Sand	% Silt	% Clay	% Course material (> 2 mm)	Texture	% Total Solids	% Total Volatile Solids	Acid Volatile Sulfide (µmoles/g)	% Total Organic Carbon[b]
Lower Slate Creek	10/03/11	94.0	4.0	2.0	0.44	sand	78.00	3.38	<0.55	2.04
Lower Slate Creek	07/03/12	98.0	ND	2.0	0.13	sand	79.22	3.37	0.99	1.67
Lower Slate Creek	07/02/13	96.0	2.0	2.0	<0.05	sand	74.57	1.63	1.84	1.67
East Fork Slate Creek	10/03/11	86.0	4.0	10.0	1.65	loamy sand	60.17	7.81	<0.55	11.00
East Fork Slate Creek	07/10/12	26.0	34.0	40.0	ND	clay	23.72	28.54	1.10	16.70
East Fork Slate Creek	07/01/13	82.0	12.0	6.0	<0.05	loamy Sand	43.66	13.30	5.20	18.30
West Fork Slate Creek	07/02/13	96.0	2.0	2.0	0.17	sand	–	–	3.75	<0.09
Upper Slate Creek	10/06/11	94.0	2.0	4.0	ND	sand	72.10	4.12	1.39	5.46
Upper Slate Creek	07/02/12	98.0	ND	2.0	0.32	sand	79.58	2.90	1.35	3.74
Upper Slate Creek	07/01/13	96.0	ND	4.0	0.15	sand	74.21	2.73	<1.40	5.50
Lower Johnson Creek	10/03/11	96.0	2.0	2.0	ND	sand	74.28	2.01	<0.55	0.89
Lower Johnson Creek	07/02/12	92.0	ND	8.0	ND	sand	77.67	2.55	1.05	1.19
Lower Johnson Creek	07/01/13	96.0	2.0	2.0	0.28	sand	73.21	0.90	<1.40	1.08
Lower Sherman Creek	10/04/11	96.0	2.0	2.0	0.11	sand	73.15	2.75	1.50	0.54
Lower Sherman Creek	07/03/12	96.0	ND	4.0	0.09	sand	78.55	3.05	<0.55	0.82
Lower Sherman Creek	07/01/13	96.0	2.0	2.0	0.58	sand	75.66	0.75	<1.40	0.61
Middle Sherman Creek	10/03/11	96.0	2.0	2.0	0.22	sand	72.45	2.82	1.01	1.17
Middle Sherman Creek	07/03/12	96.0	ND	4.0	0.44	sand	77.09	4.10	0.93	1.05
Upper Sherman Creek	07/01/13	94.0	2.0	4.0	0.35	sand	–	–	2.29	<0.09

[a] Particle size determined by ASTM Method D422 and Modified ASA 15-5.

[b] Total Organic Carbon (dry) determined by the Walkley Black Method.

ND = not detected at the method detection limit.

Appendix E2.–Kensington Gold Mine stream sediment metals, As and Se concentrations for samples collected 2011–2013.

		Analytical Data (mg/kg dry weight)[a]										
Site	Sample Date	Al	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
Lower Slate Creek	10/03/11	13,600	0.134	16.2	1.46	29.4	56.7	0.0502	47.4	7.79	0.720	220
Lower Slate Creek	07/03/12	13,600	0.145	9.31	1.22	32.0	50.7	0.0994	43.2	8.45	<0.170	200
Lower Slate Creek	07/02/13	12,300	0.168	23.7	1.29	94.5	56.7	0.0402	73.4	9.14	1.94	205
East Fork Slate Creek	10/03/11	20,100	0.233	30.0	20.9	29.5	88.4	0.0692	143	8.50	1.41	1,360
East Fork Slate Creek	07/10/12	15,300	0.513	24.0	23.2	38.9	159.0	0.3270	153	14.2	0.934	1,490
East Fork Slate Creek	07/01/13	13,900	0.334	42.2	13.9	32.7	73.4	0.0774	79.8	12.5	4.79	844
West Fork Slate Creek	07/02/13	11,100	0.123	11.1	0.694	24.8	49.8	0.129	55.5	7.79	<0.0191	153
Upper Slate Creek	10/06/11	22,500	0.120	17.9	0.722	127	53.4	<0.0489	87.5	3.37	0.809	130
Upper Slate Creek	07/02/12	20,300	0.132	14.4	0.776	125	55.4	0.0625	78.4	4.05	0.606	134
Upper Slate Creek	07/01/13	14,600	0.131	13.5	0.750	101	44.6	<0.0380	55.0	2.70	3.21	105
Lower Johnson Creek	10/03/11	13,100	0.164	16.2	0.238	31.5	73.1	<0.0386	27.3	9.76	<0.181	93.3
Lower Johnson Creek	07/02/12	13,100	0.342	12.8	0.250	35.5	76.8	0.1190	23.4	9.45	<0.167	97.3
Lower Johnson Creek	07/01/13	10,300	0.269	11.9	0.492	24.4	56.1	<0.0354	15.7	8.00	<0.163	121
Lower Sherman Creek	10/04/11	18,200	0.137	28.9	0.389	46.2	94.0	<0.0455	45.9	6.70	<0.178	110
Lower Sherman Creek	07/03/12	17,900	0.289	24.3	0.578	51.4	79.1	0.0681	40.2	8.43	<0.174	128
Lower Sherman Creek	07/01/13	15,400	0.306	25.4	0.390	37.4	69.4	<0.0384	30.9	7.39	1.77	111
Middle Sherman Creek	10/03/11	19,000	0.633	55.7	0.175	43.4	97.1	<0.0412	44.0	17.3	<0.182	120
Middle Sherman Creek	07/03/12	18,800	0.225	56.1	0.269	48.1	87.5	0.0581	39.3	11.3	<0.170	124
Upper Sherman Creek	07/01/13	16,700	0.203	41.9	0.238	40.9	61.0	<0.0377	33.1	5.75	0.433	94.3

[a] As, Cd, Cr, Cu, Pb, Ni, Se and Ag was determined using SW-846 Method 6020, Al and Zn was determined using SW-846 Method 6010B, and Hg was determined using method SW-846 7471B.

AECOM
Environmental Toxicology
4303 West LaPorte Avenue, Fort Collins, Colorado 80521-2154
T 970.416.0916 F 970.490.2963 www.aecom.com

November 1, 2013

Kevin Eppers
Coeur Alaska Inc.
Kensington Gold Mine
3031 Clinton Drive
Suite 202
Juneau AK 99801

Subject: Results of *Chironomus dilutus* sediment toxicity test

Dear Mr. Eppers:

Attached is a copy of the report for the sediment toxicity test conducted with *Chironomus dilutus* using sediment collected from five different sites. There were no statistically significant survival or growth (ash-free dry weight) effects in any of the five sampling sites. The analytical data including total metals, total organic carbon, and grain size determination and total solids and total suspended solids are included in this report.

We greatly appreciate the opportunity to complete this study for Coeur Alaska Inc.. Please do not hesitate to call us if you have any questions.

Sincerely,

Amber Potts

Amber Potts
Data Analyst
amber.potts@aecom.com

Rami B. Naddy, Ph.D.
Study Director / Environmental Toxicologist
rami.naddy@aecom.com

Attachment:

60297514-100-(112-116)

Coeur Alaska, Inc.
Juneau, Alaska

Report of Short-Term Toxicity of Whole Sediment to *Chironomus dilutus*

Prepared by

AECOM Environment
Environmental Toxicology
Fort Collins, CO

60297514-100-(112-116)
September 2013

Report of Short-Term Toxicity of Whole Sediment to Chironomus dilutus

Project IDs: 60297514-100-(112-116)
September 2013

Sponsor and Laboratory Information

Sponsor	Coeur Alaska Inc. Kensington Gold Mine 3031 Clinton Drive Suite 202 Juneau, Alaska 99801
Project Officer	Kevin Eppers (907) 523-3328
Testing Facility	AECOM Environment Fort Collins Environmental Toxicology Laboratory 4303 West LaPorte Ave. Fort Collins, CO 80521 Fax: (970) 490-2963 State of Florida NELAP Laboratory ID: E87972
Study Director	Rami B. Naddy, Ph.D. (970) 416-0916 email: rami.naddy@aecom.com
Report Author	Amber Potts (970) 416-0916 email: amber.potts@aecom.com

Test Information

Test	Short-term chronic screening toxicity test of sediment	
Basis	USEPA (2000) and ASTM (2012)	
Test Period	September 10, 2012 @ 1350-1450 to September 20, 2013 @ 0830-1535	
Test Length	10 days	
Species	*Chironomus dilutus*	
Test Material	Whole sediment	
Sediment ID	Sample ID	AECOM Laboratory ID
	LSH	26894
	LJC	26895
	USC	26896
	EFSC	26897
	LSC	26898
Control Sediments	Silica Sand, Formulated Sediment	
Overlying water	Moderately hard reconstituted water prepared according to USEPA (2002), augmented with approximately 50 mg/L Cl^- (as NaCl)	
Test Concentrations	0 (control) and 100% of each test sediment	

- *Results described in this report apply only to the samples submitted to the laboratory and analyzed, as listed in the report*

- *Test results comply with NELAC standards. Reports are intended to be considered in their entirety; AECOM is not responsible for consequences arising from use of a partial report*

- *This report contains 8 pages plus 3 appendices*

Sediment Collection and Receipt

Sample ID	Collection Date and Time	AECOM No.	Date of Receipt	Temp. at Arrival (°C)[a]
LSH	07/01/13 @ 0900	26894	07/10/13	3.8
LJC	07/01/13 @ 1100	26895	07/10/13	
USC	07/01/13 @ 1300	26896	07/10/13	
EFSC	07/01/13 @ 1500	26897	07/10/13	
LSC	07/02/13 @ 1000	26898	07/10/13	

[a] Air temperature of cooler

Note: See Appendix A for copies of chain of custody records

Control Sediment

The primary control sediment was coarse silica sand, obtained from a local commercial supplier (manufactured by Unimin® Corporation). A second control sediment with a smaller grain size and higher organic matter content (Kemble et al. 1999) was prepared in the laboratory and used in the study. The composition of the formulated sediment is given in the following table. While the sand control was the primary control used to compare to site sediments, using two controls allows for a comparison of the potential response of the organisms.

Composition of Laboratory Formulated Sediment (Control)

Material	Source	Pre-Treatment	Weight (g)
Coarse Quartz Sand	Unimin Corporation, Emmett, ID	Rinsed with gentle mixing in deionized water until water ran clear. Dried in oven.	1242
Silt/Clay (ASP400)	Mozel, St. Louis, MO. Distributor = Englehardt	None	219
Dolomite	Grey Rock Clay Center, Ft. Collins, CO.	None	7.5
α-cellulose	Sigma	None	77.3
Humic Acid	Fluka	None	0.150
Total			**1545.95**

Initial Overlying Water Characterization

Batch No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)[c]	Cl^- (mg/L)
10831	8.1	84	58	451	<0.02	<1.0	49.2

[a] As $CaCO_3$

[b] Total residual chlorine

[c] Measured in source water

Test Sediment Preparation

Sample ID	Date Homogenized	Time Homogenized
Sand Control	September 9, 2013	1515 – 1518
Formulated Sediment		1416 - 1421
LSH		1425 – 1429
LJC		1455 – 1458
USC		1504 – 1507
EFSC		1444 – 1448
LSC		1434 – 1437

Overlying water was added to the sand control and formulated sediment during the homogenization process to wet both controls prior to placement in test chambers. Before, during, and after homogenization, any noticeable debris (including sticks and other plant material) and large stones were removed from the test sediment and discarded.

Test Conditions

Test Type	Static sediment with continuous replacement of overlying water
Test Duration	10 days
Overlying Water Delivery System	Continuous renewal (flow-through)[a]
Test Endpoints	Survival, AFDW[b] per original and surviving organism
Test Chambers	500 ml glass beakers
Test Sediment Volume	100 ml
Overlying Water Volume	175 ml
Replicates per Treatment	8
Organisms per Replicate	10[c]
Test Temperature	23 ± 1°C
Lighting	Fluorescent, 16 hours light:8 hours dark
Chamber Placement	Randomized
Test Sediment Renewal	None
Test Overlying Water Renewal	Approximately two volume additions per test chamber per day

[a] Continuous replacement via a drip system
[b] Ash-Free Dry Weight
[c] Due to technician error, 15 organisms were inadvertently added to formulated sediment control replicate D.

Test Organism

From the lot of *Chironomus dilutus* received for use in the test, 20 were collected, preserved, and used to determine head capsule widths. The mean head capsule width of lot 13-034 was 0.36 mm and the range was 0.31 to 0.42 mm. The average size of the measured organisms was in the third instar range of 0.33 to 0.45 (USEPA 2000).

Species and Lot Number	*Chironomus dilutus*, Lot 13-034
Age	3rd instar
Source	Aquatic BioSystems (ABS), Fort Collins, CO
Overlying Water	Moderately Hard Reconstituted Water with added chloride (49.2 mg/L) as NaCl, RW # 10831
Reference Toxicant Testing	Initiated September 10, 2013 using sodium chloride (NaCl)

TEST RESULTS

For each test endpoint (survival, AFDW/original organism, and AFDW/surviving organism), the sand and formulated sediment controls were compared using a *t*-test. In the past, in situations where there was not a statistical difference between controls, the results were pooled prior to comparing to field treatments. Given that there was a statistical difference between the sand and formulated sediment controls for ash-free dry weight, all comparisons were made against the sand control because they were similar in soil classification.

Biological Data – Survival and Ash-Free Dry Weights

Sample ID	Percent Survival	Ash-Free Dry Weight (mg)	
		Per original organism	Per surviving organism
Sand Control	95.0	0.863	0.888
Formulated Sediment	93.8	1.543	1.658
LSH	95.0	1.082	1.136
LJC	90.0	0.992	1.102
USC	95.0	1.236	1.304
EFSC	88.8	1.034	1.173
LSC	97.5	1.406	1.441

Note: Analyses were completed using Toxstat Version 3.5 (WEST, Inc. and Gulley 1996). See Appendix B for test data sheets

None of the field sediments had a significant reduction in response relative to the sand control endpoints.

Analytical Data

Parameter	Sample Identification						
	Sand	Form. Sed.	LSC	LSH	LJC	USC	EFSC
Metals (mg/kg-dry)[a]							
Aluminum	205 N	2,280 N	12,300 N	15,400 N	10,300 N	14,600 N	13,900 N
Chromium	5.87 J	10.0	94.5	37.4	24.4	101	32.7
Zinc	4.09 J	5.42 J	205	111	121	105	844
Arsenic	<1.25	<1.34	23.7	25.4	11.9	13.5	42.2
Cadmium	<0.085	0.118 J	1.29	0.390 J	0.492	0.750	13.9
Copper	<0.283	<0.303	56.7	69.4	56.1	44.6	73.4
Lead	0.144	2.13	9.14	7.39	8.00	2.70	12.5
Nickel	0.273	0.754	73.4	30.9	15.7	55.0	79.8
Selenium	<0.087	0.279	1.94	1.77	<0.163	3.21	4.79
Silver	<0.047	0.060 J	0.168 J	0.306	0.269	0.131 J	0.334 J
Mercury	<0.0372	<0.0406 H	0.0402 J, H	<0.0384 H	<0.0354 H	<0.0380 H	0.0774 J, H
Particle Size (%)[b]							
Clay	2.0	8.0	2.0	2.0	2.0	4.0	6.0
Sand	96.0	88.0	96.0	96.0	96.0	96.0	82.0
Silt	2.0	4.0	2.0	2.0	2.0	<0.1	12.0
Texture	Sand	Loamy sand	Sand	Sand	Sand	Sand	Loamy sand
Coarse Material (2 mm)	<0.05	<0.05	<0.05	0.58	0.28	0.15	<0.05
TOC (%-dry)[c]	<0.09	18.0	1.67	0.61	1.08	5.50	18.3
Acid Volatile Sulfide (µmoles/g)	NM	NM	1.84	<1.40	<1.40	<1.40	5.20

[a] As, Al, Cd, Cr, Pb, Ni, Se, Zn, and Ag by SW-846 Method 6020; Hg by SW-846 7471 (USEPA 1986)
[b] Particle size was determined using ASTM Method D422 and Modified ASA 15-5
[c] TOC was determined using the Walkley Black Method
N = Spike recovery outside accepted recovery limits
J = The concentration was below the reporting limit but above the method detection limit
H = Holding times for preparation or analysis exceeded
Values presented as '<' are below the MDL
NM = Parameter not measured for this sample
Note: See Appendix C for a copy of the reports from the analytical laboratory (MSE Analytical Laboratory, Butte, MT)

Total and Total Volatile Solids

Sample ID	Percent Total Solids[a]	Percent Total Volatile Solids[b]
Sand	78.73	0.076
Formulated Sediment	76.70	5.15
LSC	74.57	1.63
LJC	73.21	0.90
LSH	75.66	0.75
USC	74.21	2.73
EFSC	43.66	13.30

[a] Total solids were determined using Standard Methods 2540B (APHA 1998)

[b] Total volatile solids were determined using Standard Methods 2540E (APHA 1998)

Note: All values are means of duplicate analyses and determined at AECOM/FCETL. See Appendix C for data sheets.

Physical and Chemical Data (Min/Max)

Sample ID	pH (s.u.)	DO (mg/L)	Cond. (μS/cm)	Temp. (°C)[a]	Ammonia as N (mg/L)	Hardness (mg/L as $CaCO_3$)	Alkalinity (mg/L as $CaCO_3$)
Sand Control	7.7-8.2	4.8-6.7	499-579	22-25	<1.0-1.5	88-106	61-78
Formulated Sediment	7.3-8.0	3.4-6.3	488-656	22-25	<1.0	104-250	71-181
LSH	7.6-8.0	4.4-6.4	472-594	22-25	<1.0	104-132	68-88
LJC	7.4-7.8	4.6-6.3	435-661	22-25	<1.0	82-112	50-79
USC	7.6-7.8	4.2-6.0	482-675	22-25	<1.0-2.7	112-178	132-154
EFSC	7.5-7.7	3.4-5.9	521-610	22-25	<1.0-2.0	138-204	98-131
LSC	7.5-7.8	4.0-6.1	454-629	21-24	<1.0	104-128	57-80

[a] Temperature in test chambers

Reference Toxicant Test Results for *C. dilutus*

Organism Lot Number	Test Dates	96-Hour LC_{50}	AECOM/FCETL Historical 95% Control Limits	
			Low	High
13-034	09/10/13-09/14/13	4,855	2,976	6,672

Note: All values are expressed as mg/L chloride.

References

APHA. 1998. Standard Methods for the Examination of Water and Wastewater. Amer. Public Health Assoc., Amer. Water Works Assoc., Water Pollut. Control Fed., APHA, Washington, DC.

ASTM. 2012. Standard Test Method for Measuring the Toxicity of Sediment-Associated Contaminants with Fresh Water Invertebrates. Method E 1706-05 In *2012 Annual Book of ASTM Standards, Section 11, Water and Environmental Technology, Volume 11.06, Biological Effects and Environmental Fate; Biotechnology*. American Society of Testing and Materials. West Conshohocken, PA.

Kemble, N.E., F.J. Dwyer, C.G. Ingersoll, T.D. Dawson, and T.J. Norberg-King. 1999. Tolerance of Freshwater Test Organisms to Formulated Sediments for Use as Control Materials in Whole-Sediment Toxicity Test. *Environ. Toxicol. Chem.* 18:222-230.

USEPA. 1986. Test Methods for Evaluating Solid Waste. Third Edition. SW-846.

USEPA. 2000. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. EPA/600/R-99/064.

USEPA. 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. Fifth Edition. EPA-821-R-02-012.

WEST, Inc. and D.D. Gulley. 1996. Toxstat Version 3.5. Western EcoSystems Technology, Inc., Cheyenne, WY.

Statement of Procedural Compliance

I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge, accurate and complete.

November 1, 2013

Rami Naddy, Ph.D.
Study Director

Date

Statement of Quality Assurance

The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with standard operating procedures, and that the resulting data and report meet the requirements of the NELAC standards. This report is an accurate reflection of the raw data.

Anita Rehner

November 1, 2013

Quality Assurance Unit

Date

APPENDIX A

Chain of Custody

AECOM

CHAIN OF CUSTODY RECORD

Page 1 of 2

Client/Project Name: Coeur Alaska

Project Number: 058

Sampler (Print Name)/(Affiliation): Benjamin Brewster ADFG

Signature: Benjamin Brewster

Project Location: Fcet C/AECOM

Field Logbook No.:

Chain of Custody Tape Nos.: 43903

Send Results/Report to: kate.kanouse@alaska.gov

TAT:

Container Type
~~P – Plastic~~
~~A – Amber Glass~~
~~G – Clear Glass~~
V – VOA Vial
O – Other
E – Encore

Preservation
1 – HCl, 4°
2 – H2SO4, 4°
3 – HNO3, 4°
4 – NaOH, 4°
5 – NaOH/ZnAc, 4°
6 – Na2S2O3, 4°
7 – 4°

Matrix Codes:
DW – Drinking Water
WW – Wastewater
GW – Groundwater
SW – Surface Water
ST – Storm Water
W – Water
S – Soil
SL – Sludge
~~SD – Sediment~~
~~SO – Solid~~
~~A – Air~~
~~L – Liquid~~
P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	Total metals (Al, Cr, Ni, Ag, Zn, As, Cd, Cu, Pb, Se)	TOC (Walkley Black)	Mercury	% Coarse Material	Rapid Hydro (% clay/sand/silt)	AVS	Short term toxicity of whole sediment to C. dilutus	Short term toxicity of whole sediment to H. azteca			Lab I.D.	Remarks
#1 058 LSH	7/1/13	0900			1g	L	ice		X	X	X	X	X		X	X			26894	
#2 058 LJC	7/1/13	1100			1g	"	"		X	X	X	X	X		X	X			26895	
#3 058 USC	7/1/13	1300			1g	"	"		X	X	X	X	X		X	X			26896	
#4 058 EFSC	7/1/13	1500			1g	"	"		X	X	X	X	X		X	X			26897	
#5 058 LSC	7/2/13	1000			1g	"	"		X	X	X	X	X		X	X			26898	
LSH	7/1/13	0900			4oz	"	"							X						
LJC	7/1/13	1100			4oz	"	"							X						
USC	7/1/13	1300			4oz	"	"							X						
EFSC	7/1/13	1500			4oz	"	"							X						
LSC	7/2/13	1000			4oz	"	"							X						
WFSC	7/2/13	1400			500ml	"	"		X	X	X	X	X							
USH	7/1/13	1000			50ml	"	"		X	X	X	X	X						26899	
WFSC	7/2/13	1400			2oz	"	"							X					26900	

Relinquished by: (Print Name)/(Affiliation) Benjamin Brewster ADFG Signature: Benjamin Brewster	Date: 7/9/13 Time: 8:12	Received by: (Print Name)/(Affiliation) Kara Barnett/AECOM Signature: Kara Barnett	Date: 7/10/13 Time: 1000
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:

Analytical Laboratory (Destination):
Cooler temp 3.8 °C
AECOM Toxicology Lab
4303 W. Laporte Avenue
Fort Collins, CO 80521
(970) 416-0916
(970) 490-2963 (FAX)
(L-4)

Sample Shipped Via: UPS [✓ FedEx] Courier Other

Temp blank: Yes [✓ No]

Serial No. № 51531

APPENDIX B

Data Sheets

C. dilutus
① ~~H. azteca~~

10-day Survival and Growth, Testing Cover Page

Page 1 of 30
①: AR 10/29/13

Project Number: 60297514-100-(112-116) [058]
Protocol #: USEPA(2002) & ASTM (20~~08~~ 12 ①)
Test Substance: Sediment
Test Species: *C. dilutus**
Lot #: 13-034
Age: 2nd Instar
Supplier: ① ~~ABS~~ ARO

Test Type: Chronic, Static-Renewal
Overlying Water: Reconstituted Fresh Water (Smith et al., 1997) (RW# 10831)
Investigators: ✱/AMN/MW/RR/KZW/KB/LW/JDM
Sampling Date(s): 07/01/12 - 07/02/12
Sampling Time(s): See COC
FCETL Sample #(s): 26894 - LSH; 26895 - LJC; 26896 - USC; 26897 - EFSC; 26898 - LSC
Test Initiation Date/Time: 9/10/13 @ 1350-1450
Test Termination Date/Time: 9/20/13 @ 0830-1535

Renewal Frequency: Cont. drip, 2+ vol/day
Feeding Freq: daily
Food Type/Amount: 1.5 ml of 4 g/L Tetrafin
Test Temp: 23 +/- 1 deg C
Test Chamber Capacity: 500 ml
Test Soltn. Vol: 100 mL sed/175 mL H2O
\# Repl's/Trtmnt: 8

Test Duration: 10 days
\# Org.'s/Repl: 10
Env. Chmbr/Bath: Bath #3
Water Characterization: Minimum of Hardness, Alkalinity, & Conductivity on days 0 and 10; Ammonia on days 0, 3, 7, and 10; No TRC; pH, temperature & DO daily on overlying water
aerate if dissolved oxygen <2.5 mg/L

Test Sediment (s):
1) Coarse Sand (Cont.)
2) Form Sed. (Cont.)
3) LSH
4) LJC
5) USC
6) EFSC
7) LSC
8)
9)
10)
11)

Reference Tox. Dates: 9/10/13 - 9/14/13
Study Director Initials: ✱ for RBN
LC50: 4855 mg/L Cl
Date: 9/10/13
Hist. Limits: 2976 - 6672 mg/L Cl
Method: Probit

Overlying water added at a minimum of 2 volume additions/day; equivalent to >350 ml/day or >0.24 ml/min
* formerly known as *C. tentans*

① ✱ 9/10/13, E

RW 10831 = 70% MQ - 30% HT Moderately Hard reconstituted water with the addition of ~50mg/L ①
C

① AR for ANP 10/29/13 CF

SEDIMENT/SOIL PREPARATION

Project Number: 60297514-100-112-116 ~~(104-109)~~ ②

QA: AR 10/29/13

Artificial ~~soil~~ ① sediment	
Constituent/source	**Amount added (g)**
Coarse Silica Sand	1242
Silt/Clay (ASP 400)	219
Dolomite	7.5
α-cellulose	77.3
Humic Acid	0.15
Total	1545.95

Notes: Container was placed into tumbler for a minimum of an hour to homogenize prior to use

See TIE Sheet Daily Log for notes on the preparation of the formulated sediment

Soil/sediment	FCETL#	Homogenization			
		Date	From	To	Analyst
Sand (Cont.)	NA	9/9/13	1515	1518	
Form Sed. (Cont.)	NA	9/9/13	1416	1421	
LSH	26894	9/9/13	1425	1429	
LJC	26895	9/9/13	1455	1458	
USC	26896	9/9/13	~~1304~~ ③ 1504	1507	
EFSC	26897	9/9/13	1444	1448	
LSC	26898	9/9/13	1434	1437	

① AR 10/16/13 Cf
② AR for ANP 10/29/13 E
③ AR for ANP 10/29/13 Cf

PAGE 3 OF 30
QA: AR 10/29/13
[illegible] 10/17/13

BIOLOGICAL DATA *C. dilutus** Chronic, Static-Renewal Project No. 60297514-100-(112-116)

Sediment	Test Termination	A	B	C	D	E	F	G	H	Remarks: % survival
Coarse Sand (Cont.)	# Surviving	10	10	9	8	10	10	10	9	95%
	# Observed Dead	0	0	0	0	0	0④	0	1	
	# Not Found	0	0	1	2	0	0	0	0	
	Initials	JDM	RR	AB	JDM	W	AB	AB	W	
Form.Sed. (Cont.)	# Surviving	8	10	9	10	9	9	9	10	~~93%~~ ~~(92.5%)~~⑦
	# Observed Dead	0	0	0	0	0	0	~~0~~ 1⑥	0	⑥ 93.8
	# Not Found	2	0	③~~0~~ 1	0	1	1Δ	0	0	exclude emerged org from survival + growth
	Initials	AB	RR	JDM	W	W	AB	JDM	W	
LSH	# Surviving	10	8	10	10	9	10	9	10	95%
	# Observed Dead	0	0	0	0	0	0	0	0	
	# Not Found	0	2	0	0	1	0	①~~0~~ 1	③~~0~~ 1	
	Initials	RR	AB	RR	AB	RR	AB	RR	JDM	
LJC	# Surviving	8	9	9	10	9	9	9	9	90%
	# Observed Dead	0	0	0	0	0	0	0	0	
	# Not Found	2	1	③~~0~~ 1	0	1	1	1	③~~0~~ 1	
	Initials	AB	RR	JDM	W	AB	RR	AB	W	
USC	# Surviving	8	10	10	9	9	10	10	10	1 small one 95%
	# Observed Dead	0	0	0	0	0	0	0	0	
	# Not Found	2	0	0	1	1	0	0	0	
	Initials	RR	JDM	AB	RR	AB	W	RR	W	
EFSC	# Surviving	8	10	9	7	9	9	9	10	88.8%
	# Observed Dead	0	0	0	0	1	0	0	0	
	# Not Found	2	0	1	3	0	1	1	0	
	Initials	RR	AB	W	JDM	AB	AB	W	AB	
LSC	# Surviving	9	10	10	10	10	10	10	9	97.5%
	# Observed Dead	0	0	0	0	0	0	0	0	
	# Not Found	1	0	0	0	0	0	0	1	
	Initials	AB	JDM	W	W	AB	JDM	W	AB	
	# Surviving									
	# Observed Dead									
	# Not Found									
	Initials									
	# Surviving									
	# Observed Dead									
	# Not Found									
	Initials									
		⑤								**Key:**
	Date/Time:	9/~~19~~/13 @ 0830 - 1535								Δ Emerged (Excluded from Surv. and growth)
		20								* = Pupa (Included in Survival count,
										but excluded from growth analysis)

① RR 9/20/13 E ④ AB 9/20/13 E ⑥ AR for ANP 10/29/13 CF ⑦ AR 10/29/13 E

② W 9/20/13 E ⑤ [illegible] for ? 10/17/13, E

③ JDM

QA: AR 10/29/13
10/28/13

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CHEMICAL DATA (Composite of Overlying Water) *C. dilutus** Chronic, Static Renewal Project No. 60297514-100-(112-116)

Parameter	Sediment	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day	Meter	Date	Time	Initials
Dissolved	Coarse Sand (Cont.)	6.7	6.3	5.5	5.6	5.6	4.8	6.2	6.4	5.5	6.4	6.2	0	5	9/10/13	1335	
Oxygen	Form Sed. (Cont.)	6.3	5.9	6.1	6.0	4.0	3.4	6.0	4.0	3.5	4.8	4.6	1	6	9/11/13	1530	MW
(mg/l)	LSH	6.4	5.7	5.2	5.2	4.4	4.6	6.2	5.8	4.8	5.6	5.7	2	6	9/12/13	1045	
	LJC	6.3	5.4	5.0	4.6	4.8	5.7	5.4	5.7	4.8	5.2	5.8	3	6	9/13/13	1055	RR
	USC	6.0	5.8	4.8	5.2	4.8	4.7	5.0	5.8	4.7	5.0	5.7	4	6	9/14/13	1630	
	EFSC	5.5	5.0	4.8	5.0	4.0	3.5	5.9	4.6	3.4	4.9	5.5	5	6	9/15/13	1610	RZW
	LSC	5.6	5.6	4.6	5.2	5.4	4.0	6.1	5.2	4.2	5.6	5.2	6	6	9/16/13	1325	RR
													7	6	9/17/13	1000	
													8	6	9/18/13	0930	Am
													9	5	9/19/13	1010	
													10	5	9/20/13	0915	
	Replicate	A	B	C	D	E	F	G	H	A	B	C					
Temp	Coarse Sand (Cont.)	25	24	24	24	24	24	23	23	24	22	22	0	L13	9/10/13	1325	
	Form Sed. (Cont.)	25	24	24	24	24	23	24	23	23	22	22	1	L13	9/11/13	1535	MW
(deg C)	LSH	25	24	24	24	24	24	23	23	23	22	22	2	L13	9/12/13	1045	Am
	LJC	25	24	24	24	24	24	24	23	24	22	22	3	L13	9/13/13	1050	RR
	USC	25	24	24	24	24	24	24	23	24	22	22	4	L13	9/14/13	1630	
	EFSC	25	24	24	24	24	24	24	23	23	22	22	5	L13	9/15/13	1630	RZW
	LSC	24	24	24	24	24	24	24	24	24	21	22	6	L-13	9/16/13	1320	RR
													7	L-13	9/17/13	1000	Am
													8	L-27	9/18/13	0930	Am
													9	L-13	9/19/13	1010	
													10	L-6	9/20/13	0845	RR
	Replicate	A	B	C	D	E	F	G	H	A	B	C					
pH	Coarse Sand (Cont.)	8.2	7.6	7.7	7.8	7.8	7.8	7.8	7.9	7.7	7.7	7.8	0	FM20	9/10/13	1335	
(s.u.)	Form Sed. (Cont.)	8.0	7.6	7.7	7.8	7.7	7.8	7.9	7.6	7.3	7.5	7.6	1	FM20	9/11/13	1530	MW
	LSH	8.0	7.7	7.7	7.7	7.6	7.8	8.0	7.8	7.6	7.7	7.8	2	FM20	9/12/13	1045	
	LJC	7.7	7.4	7.5	7.5	7.5	7.8	7.4	7.6	7.5	7.7	7.7	3	FM20	9/13/13	1055	RR
	USC	7.8	7.7	7.7	7.7	7.6	7.8	7.6	7.8	7.8	7.8	7.8	4	FM20	9/14/13	1630	
	EFSC	7.6	7.5	7.6	7.7	7.4	7.7	7.7	7.6	7.5	7.7	7.7	5	FM20	9/15/13	1645	RZW
	LSC	7.5	7.5	7.5	7.5	7.	7.7	7.8	7.6	7.5	7.7	7.6	6	FM20	9/16/13	1320	RR
		~~7.8~~	~~7.6~~	~~7.8~~	~~7.7~~	~~7.8~~	①						7	FM20	9/17/13	1000	Am
													8	FM20	9/18/13	0930	Am
													9	FM20	9/19/13	1010	
	Replicate	A	B	C	D	E	F	G	H	A	B	C	10	FM20	9/20/13	0915	

① 09/20/13, E, WP

OVERLYING WATER CHARACTERIZATION   *C. dilutus**   Chronic, Static-Renewal   Project No. 60297514-100-(112-116)

10/28/13
QA: 10/29/13

	Conductivity (s/cm)		Hardness (mg/L as CaCO3)		Alkalinity (mg/l as CaCO3)		Ammonia (mg/l)			
Sediment	Day 0	Day 10	Day 0	Day 10	Day 0	Day 10	Day 0	Day 3 (*)	Day 7	Day 10
Coarse Sand (Cont.)	499	579	99	106	61	78	<1.0	NM	<1.0	1.2/1.5 *HA#1/HS#1
Form Sed. (Cont.)	498	656	104	250	71	181	<1.0	NM	<1.0	<1.0
LSH	472	594	104	132	68	88	<1.0	NM	<1.0	<1.0
LJC	435	661	82	112	50	79	<1.0	NM	<1.0	<1.0
USC	482	675	112	178	154	132	<1.0	NM	1.3/<1.0	1.4/1.7 *HA#1/HS#1
EFSC	521	610	138	204	98	131	2.0/2.0	NM	<1.0	<1.0
LSC	454	629	104	128	57	80	<1.0	NM	<1.0	<1.0
Overlying water	451		84		58		<1.0			
(RW 10831) TRC:	<0.02									
Cl-:	49.2									
pH:	8.1									
Meter #	15	15	titr	titr	titr	titr	HA#1	HA#1	HA#1	HA#1
Date:	9/10/13	9/20/13	9/10/13	9/20/13	9/10/13	② 9/~~18~~20/13	9/10/13		① ~~0950~~ 9/17/13	9/20/13
Time:	1330	0910	1400	1600	1400	1400	1400	/	0950	1700
Initials:			JDM	JDM		JDM				

(*) Due to technician error NH3 was not measured on day 3.

① 10/29/13, E
② for AMP 10/29/13 E

Page 6 of 30

AS 10/28/13

DAILY TESTING LOG C. *dilutus** Chronic, Static-Renewal Project No. 60297514-100-(112-116)

QA: AR 10/29/13

Day -1	Sediment Homogenized @ 1304-1518 Overlying water added to chambers @ 1520-1600			Initials/Date: 9/9/13 AS
Day 0	Bath CT = 24.0°C	Range = 22.6-24.4°C		9/10/13 AS/Am
	Test organisms added to chambers @ 1350 - 1450		Feeding:	Initials/Date:
Day 1	Bath CT = 24.4°C	Range = 24.2 - 24.8 °C	Feeding: 1640 Am	Initials/Date: MW 9/11/13
Day 2	Bath CT = 24.4°C	Range = 24.4- 24.8°C	Feeding: AS 1710	Initials/Date: Am 9/12/13
Day 3	Bath CT = 24.4°C	Range = 24.2-24.8°C	Feeding: MW 1530	Initials/Date: RR 9/13/13
Day 4	Bath CT = 24.4°C	Range = 24.4 -24.4 °C	Feeding: 1700 AS	Initials/Date: AS 9/14/13
Day 5	Bath CT = 24.4°C	Range = 24.0-24.8 °C	Feeding: 1700 RJW	Initials/Date: RJW 9/15/13
Day 6	Bath CT = 23.8°C	Range = 22.8-24.2 °C	Feeding: 1650 RR	Initials/Date: RR 9/16/13
Day 7	Bath CT = 24.0°C	Range = 23.4-24.4°C	Feeding: 1715 AS	Initials/Date: Am 9/17/13
Day 8	Bath CT = 24.2°C	Range = 23.8 - 24.4 °C	Feeding: AS 1635 Am	Initials/Date: Am 9/18/13
Day 9	Bath CT = 24.6 °C	Range = 24.4-24.8°C	Feeding: 1625 MT	Initials/Date: KB 9/19/13
Day 10	Bath CT = 23.6 °C	Range = 23.0-24.2 °C	Feeding: None	Initials/Date: AS 9/20/13

① Am 9/18/13 E

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FCETL QA Form No. 153.0
Revision 0
Effective 9/13
QA: AR 10/29/13
AB 10/28/13

Length / Width of Objects Using A Micrometer

Project / Study #: 60297514 - 100 (112-116)	Project Name: Cover
Study Initiation Date: 9/10/13	Species: Chironomus dilutus
Source of Organism: ARO	Organism Batch / [✓ Lot] #: 13-034
Collected By: AB	Dat~~a~~e ② Collected ~~By~~: 9/10/13
Analyzed By: AB	Date Analyzed: ② 9/25/13

Specimen #	Magnification	# of Squares	Length of One Square	Total (mm)	Remarks
1	40x	2.2	0.174	0.3828	
2	40x	2.0	0.174	0.3480	
3	40x	2.0	0.174	0.3480	
4	40x	2.0	0.174	0.3480	
5	40x	2.0	0.174	0.3480	
6	40x	1.8	0.174	0.3132	
7	40x	2.2	0.174	0.3828	
8	40x	2.3	0.174	0.4002	
9	40x	2.4	0.174	0.4176	
10	40x	2.0	0.174	0.3480	
11	40x	2.0	0.174	0.3480	
12	40x	2.0	0.174	0.3480	
13	40x	2.3	0.174	0.4002	
14	40x	2.1	0.174	0.3654	
15	40x	2.0	0.174	0.3480	
16	40x	2.3	0.174	0.4002	
17	40x	2.2	0.174	0.3828	
18	40x	2.2	0.174	0.3~~48~~ ① 828 ← 0,3828	
19	40x	2.0	0.174	0.3480	
20	40x	2.0	0.174	0.3480	
Total		42		~~6.2118~~ ① 7.308	
Mean		2.1		0.3654	

① AB 9/25/13 E
② AR 10/29/13 CF

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FCETL QA Form No.108
Revision 0
Effective 08/99
ae 10/17/13
QA: AE 10/16/13

TEST ORGANISM DRY WEIGHT AND ASH-FREE DRY WEIGHT (AFDW)

Project No: 60297514-100 (112-116)
Species: C. dilutus
Lot/Batch No.: 13-034
Analytical Balance ID: Sart #1

TARE: Date/time: 9/26/13 @ 1555 Analyst: AB
DRY GROSS: Date/time: 09/30/13 @ 1145 Analyst: JDM
ASHED GROSS: Date/time: 10/3/13 @ 1030 Analyst: AB

Dried in Oven # 3 from Date: 9/27/13 Time: 1200
Oven °C: 60-90°C to Date: 9/30/13 Time: 0800
Ashed in Furnace from Date: 10/2/13 Time: 0930
Furnace °C: 550°C (±50°C) to Date: 10/2/13 Time: 1330

Indicate mean weight is **Dry Weight** or **AFDW** (Circle one)

Boat No.	Treatment	Rep	Tare Weight (g) A	Dry Gross Weight (g) B	Dry Net Weight (g) (B-A)	Adjusted Dry Net Weight (g)¹	Ashed Gross Weight (g) (D)	AFDW (g) (B-D)	No. of Original Org.	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Org.	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
1	Sand	A	1.98761	1.99691	0.00930		1.98848 ~~2.35276~~ ②	0.00843	10			10		
2		B	2.20285	2.21138 ~~0.00930~~ ①	0.00853		2.20355	0.0078~~4~~ 3	④ 10			10		
3		C	1.88509	1.89669	0.01160		1.88842	0.00827	10			9		
4		D	2.22825	2.23935	0.01110		⊛					8		
5		E	2.35717	2.36782	0.01065		2.35777	0.01005	10			10		
6		F	1.95078	1.96345	0.01267		1.95437	0.00908	10			10		
7		G	2.03182	2.04107	0.00925		2.03242	0.00865	9	~~9~~ ⑤		9 ▲	▲During the drying process one organism was lost.	
8		H	2.22222	2.23034	0.00812		2.22298	0.00736	10			9	This organism was excluded from analysis of growth.	
9	Form. Sed	A	1.94357	1.96219	0.01862		1.94601	② 0.01618	10			8	Should have been 10 orgs.	
10		B	2.21554	2.24016	0.02462		2.22060	0.01956	10			10		
11		C	2.22986	2.24951	0.01965		2.23292	0.01659	9	~~9~~ ⑤		8 ▲	▲During the drying process one organism was lost. and	
12		D	2.35670	2.38640	0.02970		2.36263	0.02377	15			15	excluded from analysis of growth should have	
13		E	2.17960	2.19850	0.01890		2.18246	0.01604	10			9	been 9 organisms	
~~14~~ Blank			2.35274	2.35279			2.35276							

¹ Add in weight loss of blank boat, if appropriate.

⊛ Due to technician error, crucible was lost. This replicate will be excluded from analysis of AFDW.

⑤ AE 10/29/13 wp

① JDM 09/30/13 wp

② AB 10/3/13 wp ③ AB 10/3/13 ε ④ AE for AB 10/16/13 C

& 10/17/13
QA: AR 10/16/13

TEST ORGANISM DRY WEIGHT AND ASH-FREE DRY WEIGHT (AFDW)

Project No: 60297514-100-(~~110~~ 112 ④-116)
Species: C. dilutus
Lot/Batch No.: 13-034
Analytical Balance ID: Sart. #1

TARE: Date/time: 9/26/13 @1555 Analyst: AB
DRY GROSS: Date/time: 09/30/13 @1200 Analyst: JDM
ASHED GROSS: Date/time: 10/3/13@1030 Analyst: AB

Dried in Oven # 3 from Date: 9/27/13 Time: 1200
Oven °C: 60-90°C to Date: 9/30/13 Time: 0900
Ashed in Furnace from Date: 10/2/13 Time: 0930
Furnace °C: 550°C to Date: 10/2/13 Time: 1330

Indicate mean weight is **Dry Weight** or **AFDW** (Circle one)

Boat No.	Treatment	Rep	Tare Weight (g) A	Dry Gross Weight (g) B	Dry Net Weight (g) (B-A)	Adjusted Dry Net Weight (g)[1]	Ashed Gross Weight (g) (D)	AFDW (g) (B-D)	No. of Original Org.	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Org.	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
14	Form Sed	F	2.21736	2.22941	0.01205		2.21906	0.01035	9 ⊕			9		
15		G	2.29098	2.30170	0.01072		2.29219	0.00951	10			9		
16		H	1.96492	1.98534	0.02042		1.96873	0.01661	10			10		
17	LSH	A	2.29316	2.31128	0.01812		2.29981	0.01147	10			10		
18		B	2.23707	2.25034	0.01327		2.24162	0.00872	10			8		
19		C	2.11483	2.13391	0.01908		2.12141	0.01250	10			10		
20		D	2.37666	2.39434	0.01768		2.38319	0.01115	10			10		
21		E	~~2~~ ① 1.87390	1.88612	0.01222		1.87840	0.00772	10			9		
22		F	1.82798	1.84802	0.02004		1.83579	0.01223	10			10		
23		G	2.~~32537~~ 07919 ①	2.09773	0.01854		~~1.83580~~ 2.08660 ②	0.01173	10			9		
24		H	2.~~07919~~ 32537 ①	2.34288	0.01751		~~2.08660~~ 2.33162 ②	0.01126	10			10		
25	LSC	A	2.06923	~~2.08153~~ 2.09163 ②	0.01240		2.~~33162~~ 07298 ③	0.00865	10			8		
26		B	2.27471	2.28673	0.01202		2.~~07298~~ 27825 ③	0.00848	10			9		
Blank														

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[1] Add in weight loss of blank boat, if appropriate.

① AB 9/26/13 E
② JDM 09/30/13 E
③ AB 10/3/13 C
④ AR FR (?) 10/29/13 CF

⊕ 1 org emerged, exclude from survival + growth

10/17/13
QA: AR 10/16/13

TEST ORGANISM DRY WEIGHT AND ASH-FREE DRY WEIGHT (AFDW)

Project No: 60297514-100-(112-116)
Species: C. dilutus
Lot/Batch No.: 13-034
Analytical Balance ID: Sart. #1

TARE: Date/time: 9/26/13 @1555 Analyst: AB
DRY GROSS: Date/time: 09/30/13 @1215 Analyst: JDM
ASHED GROSS: Date/time: 10/3/13 @1030 Analyst: AR

Dried in Oven # 3 from Date: 9/27/13 Time: 1200
Oven °C: 60-90°C to Date: 9/30/13 Time: 0900
Ashed in Furnace from Date: 10/2/13 Time: 0930
Furnace °C: 550C to Date: 10/2/13 Time: 1330

Indicate mean weight is **Dry Weight** or **AFDW** (Circle one)

Boat No.	Treatment	Rep	Tare Weight (g) A	Dry Gross Weight (g) B	Dry Net Weight (g) (B-A)	Adjusted Dry Net Weight (g)¹	Ashed Gross Weight (g) (D)	AFDW (g) (B-D)	No. of Original Org.	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Org.	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
27	LSC	C	1.98098	1.99240	0.01142		1.98398	0.00842	10			9		
28		D	2.20989	2.22572	② 0.01583	← 0.01583	2.21459	0.01113	10			10		
29		E	2.24449	2.25888	0.01439		2.24905	0.00983 ~~0.00993~~	③ 10			9		
30		F	2.05905	2.07378	0.01473		2.06322	0.01056	10			9		
31		G	2.23136	2.24656	0.01520		2.23569	0.01087	10			9		
32		H	1.93454	1.95144	0.01690		1.93974	0.01170	10			9		
33	USC	A	2.24662	2.26170	0.01508		2.24953	0.01217	10			~~9~~ ① 8		
34		B	1.82250	1.83784	0.01534		1.82527	0.01257	10			10		
35		C	2.08140	2.09712	0.01572		2.08458	0.01254	10			10		
36		D	2.02162	2.03657	0.01495		2.02473	0.01184	10			9		
37		E	1.87745	1.88960	0.01215		1.87981	0.00979	10			9		
38		F	2.24653	2.26206	0.01553		2.24959	0.01247	10			10		
39		G	1.94756	1.96496	0.01740		1.95103	0.01393	10			10		
Blank														

¹ Add in weight loss of blank boat, if appropriate.

② ~~① JD~~

③ AR for AB 10/16/13 C

① AB 9/27/13 E
② JDM 09/30/13 E

FCETL QA Form No.108
Revision 0
Effective 08/99

*10/17/13
QA :

TEST ORGANISM DRY WEIGHT AND ASH-FREE DRY WEIGHT (AFDW)

Project No: 60297514-100-(112-116)
Species: C. dilutus
Lot/Batch No.: 13-034
Analytical Balance ID: Sart #1

TARE: Date/time: 9/26/13 Analyst: AB
DRY GROSS: Date/time: 09/30/13 @ 1220 Analyst: JDM
ASHED GROSS: Date/time: 10/3/13 @ 1030 Analyst: AB

Dried in Oven # 3 from Date: 9/27/13 Time: 1200
Oven °C: 60-70°C to Date: 9/30/13 Time: 0900
Ashed in Furnace from Date: 10/2/13 Time: 0930
Furnace °C: 550°C to Date: 10/2/13 Time: 1330

Boat No.	Treatment	Rep	Tare Weight (g) A	Dry Gross Weight (g) B	Dry Net Weight (g) (B-A)	Adjusted Dry Net Weight (g)^1	Ashed Gross Weight (g) (D)	AFDW (g) (B-D)	No. of Original Org.	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Org.	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
									Indicate mean weight is Dry Weight or AFDW (Circle one)					
40	USC	H	1.75890	1.77623	0.01733		1.76243	0.01380	10			10		
41	EFSC	A	1.88193	1.89399	0.01206		1.88351	0.01048	10			8		
42		B	1.93598	1.94877	0.01279		1.93787	0.01090	10			10		
43		C	2.21737	2.23005	0.01268		2.21911	0.01094	10			9		
44		D	2.24515	2.25457	0.00942		2.24629	0.00828	10			7	9 organisms survived	
45		E	2.24066	2.25329	0.01263		2.24203	0.01126	9	~~9~~ ①		8▲	▲During the drying process 1 of the organisms was	
46		F	1.87059	1.88038	0.00979		1.87193	0.00845	10			9	lost. This organism was excluded from	
47		G	1.87611	1.88701	0.01090		1.87770	0.00931	9			8Ⓐ	analysis of growth. Ⓐ During drying process	
48		H	1.98066	1.99362	0.01296		1.98260	0.01102	10			10	1 organism was lost and excluded from	
49	LSC	A	2.12154	2.13803	0.01649		2.12665	0.01138	10			9	analysis of growth. 9 organisms survived	
50		B	2.12998	2.14812	0.01814		2.13535	0.01277	10			10	at the test termination	
51		C	1.89563	1.91743	0.02180		1.90137	0.01606	10			10		
52		D	2.03568	2.05612	0.02044		2.04096	0.01566	10			10		
Blank														

① Ac 10/29/13 wp

[1] Add in weight loss of blank boat, if appropriate.

FCETL QA Form No.108
Revision 0
Effective 08/99

TEST ORGANISM DRY WEIGHT AND ASH-FREE DRY WEIGHT (AFDW)

*10/28/13
QA: MR 10/16/13

Project No: 60297514-100-(112-116)
Species: C. dilutus
Lot/Batch No.: 13-034
Analytical Balance ID: Sart #1

TARE: Date/time: 9/26/13 @ 1555 Analyst: AB
DRY GROSS: Date/time: 09/30/13 @ 1235 Analyst: JDM
ASHED GROSS: Date/time: 10/3/13 @ 1020 Analyst: AB

Dried in Oven # 3 from Date: 9/27/13 Time: 1200
Oven °C: 60-90°C to Date: 9/30/13 Time: 0900
Ashed in Furnace from Date: 10/2/13 Time: 0930
Furnace °C: 550°C to Date: 10/2/13 Time: 1330

Indicate mean weight is Dry Weight or AFDW (Circle one)

Boat No.	Treatment	Rep	Tare Weight (g) A	Dry Gross Weight (g) B	Dry Net Weight (g) (B-A)	Adjusted Dry Net Weight (g)[1]	Ashed Gross Weight (g) (D)	AFDW (g) (B-D)	No. of Original Org.	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Org.	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
53	LSC	E	1.94006	1.96004	0.01998		1.94594	0.01410	10			10		
54		F	2.26893	2.28859	0.01966		2.27426	0.01433	10			10		
55		G	1.85808	1.87852	0.02044		1.86439	0.01413	10			10		
56		H	2.30210	2.32101	0.01891		2.30675	0.01426	10			9		
~~57~~ ①														
~~58~~ ①														
~~59~~ ①														
~~60~~ ①														
~~61~~ ①														
~~62~~ ①														
~~63~~ ①														
~~64~~ ①														
Blank														

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[1] Add in weight loss of blank boat, if appropriate.

① AB 9/26/13 E

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10/31/13
QA: MC 11/01/13

Spreadsheet for AFDW

Test Start Date:	9/10/2013				**Test End Date:**	9/20/2013
Test Number(s):	60297514-100-(112-116)				**Test Material:**	Sediment
Species:	*C. dilutus*				**Entered by:**	Mike Wirth

Boat #	Treatment	Rep	Tare wt (dry) (g)	Gross wt (dry) (g)	Dry net wt (g)	Dry adjusted net wt (g)	Ashed gross wt (g)	AFDW (g)	Adjusted AFDW (g)	Number original organisms	Mean wt per orig (mg)	Mean wt per treatment (orig) (mg)	Number surviving	Mean wt per surviving	Mean wt per treatment (surv) (mg)
1	Sand Control	A	1.98761	1.99691	0.00930	0.00930	1.98848	0.00843	0.00840	10	0.8400	0.8631	10	0.8400	0.8878
2	Sand Control	B	2.20285	2.21138	0.00853	0.00853	2.20355	0.00783	0.00780	10	0.7800		10	0.7800	
3	Sand Control	C	1.88509	1.89669	0.01160	0.01160	1.88842	0.00827	0.00824	10	0.8240		9	0.9156	
4	Sand Control	D	2.22825	2.23935	0.01110	0.01110					-			-	
5	Sand Control	E	2.35717	2.36782	0.01065	0.01065	2.35777	0.01005	0.01002	10	1.0020		10	1.0020	
6	Sand Control	F	1.95078	1.96345	0.01267	0.01267	1.95437	0.00908	0.00905	10	0.9050		10	0.9050	
7	Sand Control	G	2.03182	2.04107	0.00925	0.00925	2.03242	0.00865	0.00862	9	0.9578		9	0.9578	
8	Sand Control	H	2.22222	2.23034	0.00812	0.00812	2.22298	0.00736	0.00733	10	0.7330		9	0.8144	
9	Form Sed Control	A	1.94357	1.96219	0.01862	0.01862	1.94601	0.01618	0.01615	10	1.6150	1.5430	8	2.0187	1.6577
10	Form Sed Control	B	2.21554	2.24016	0.02462	0.02462	2.22060	0.01956	0.01953	10	1.9530		10	1.9530	
11	Form Sed Control	C	2.22986	2.24951	0.01965	0.01965	2.23292	0.01659	0.01656	9	1.8400		8	2.0700	
12	Form Sed Control	D	2.35670	2.38640	0.02970	0.02970	2.36263	0.02377	0.02374	15	1.5827		15	1.5827	
13	Form Sed Control	E	2.17960	2.19850	0.01890	0.01890	2.18246	0.01604	0.01601	10	1.6010		9	1.7789	
14	Form Sed Control	F	2.21736	2.22941	0.01205	0.01205	2.21906	0.01035	0.01032	9	1.1467		9	1.1467	
15	Form Sed Control	G	2.29098	2.30170	0.01072	0.01072	2.29219	0.00951	0.00948	10	0.9480		9	1.0533	
16	Form Sed Control	H	1.96492	1.98534	0.02042	0.02042	1.96873	0.01661	0.01658	10	1.6580		10	1.6580	
17	LSH	A	2.29316	2.31128	0.01812	0.01812	2.29981	0.01147	0.01144	10	1.1440	1.0817	10	1.1440	1.1358
18	LSH	B	2.23707	2.25034	0.01327	0.01327	2.24162	0.00872	0.00869	10	0.8690		8	1.0862	
19	LSH	C	2.11483	2.13391	0.01908	0.01908	2.12141	0.01250	0.01247	10	1.2470		10	1.2470	
20	LSH	D	2.37666	2.39434	0.01768	0.01768	2.38319	0.01115	0.01112	10	1.1120		10	1.1120	
21	LSH	E	1.87390	1.88612	0.01222	0.01222	1.87840	0.00772	0.00769	10	0.7690		9	0.8544	
22	LSH	F	1.82798	1.84802	0.02004	0.02004	1.83579	0.01223	0.01220	10	1.2200		10	1.2200	
23	LSH	G	2.07919	2.09773	0.01854	0.01854	2.08600	0.01173	0.01170	10	1.1700		9	1.3000	
24	LSH	H	2.32537	2.34288	0.01751	0.01751	2.33162	0.01126	0.01123	10	1.1230		10	1.1230	
25	LJC	A	2.06923	2.08163	0.01240	0.01240	2.07298	0.00865	0.00862	10	0.8620	0.9925	8	1.0775	1.1023
26	LJC	B	2.27471	2.28673	0.01202	0.01202	2.27825	0.00848	0.00845	10	0.8450		9	0.9389	
27	LJC	C	1.98098	1.99240	0.01142	0.01142	1.98398	0.00842	0.00839	10	0.8390		9	0.9322	
28	LJC	D	2.20989	2.22572	0.01583	0.01583	2.21459	0.01113	0.01110	10	1.1100		10	1.1100	
29	LJC	E	2.24449	2.25888	0.01439	0.01439	2.24905	0.00983	0.00980	10	0.9800		9	1.0889	
30	LJC	F	2.05905	2.07378	0.01473	0.01473	2.06322	0.01056	0.01053	10	1.0530		9	1.1700	
31	LJC	G	2.23136	2.24656	0.01520	0.01520	2.23569	0.01087	0.01084	10	1.0840		9	1.2044	
32	LJC	H	1.93454	1.95144	0.01690	0.01690	1.93974	0.01170	0.01167	10	1.1670		9	1.2967	

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10/31/13

QA: AR 11/01/13

Spreadsheet for AFDW

Test Start Date:	9/10/2013	**Test End Date:**	9/20/2013
Test Number(s):	60297514-100-(112-116)	**Test Material:**	Sediment
Species:	*C. dilutus*	**Entered by:**	Mike Wirth

Boat #	Treatment	Rep	Tare wt (dry) (g)	Gross wt (dry) (g)	Dry net wt (g)	Dry adjusted net wt (g)	Ashed gross wt (g)	AFDW (g)	Adjusted AFDW (g)	Number original organisms	Mean wt per orig (mg)	Mean wt per treatment (orig) (mg)	Number surviving	Mean wt per surviving	Mean wt per treatment (surv) (mg)
33	USC	A	2.24662	2.26170	0.01508	0.01508	2.24953	0.01217	0.01214	10	1.2140	1.2359	8	1.5175	1.3038
34	USC	B	1.82250	1.83784	0.01534	0.01534	1.82527	0.01257	0.01254	10	1.2540		10	1.2540	
35	USC	C	2.08140	2.09712	0.01572	0.01572	2.08458	0.01254	0.01251	10	1.2510		10	1.2510	
36	USC	D	2.02162	2.03657	0.01495	0.01495	2.02473	0.01184	0.01181	10	1.1810		9	1.3122	
37	USC	E	1.87745	1.88960	0.01215	0.01215	1.87981	0.00979	0.00976	10	0.9760		9	1.0844	
38	USC	F	2.24653	2.26206	0.01553	0.01553	2.24959	0.01247	0.01244	10	1.2440		10	1.2440	
39	USC	G	1.94756	1.96496	0.01740	0.01740	1.95103	0.01393	0.01390	10	1.3900		10	1.3900	
40	USC	H	1.75890	1.77623	0.01733	0.01733	1.76243	0.01380	0.01377	10	1.3770		10	1.3770	
41	EFSC	A	1.88193	1.89399	0.01206	0.01206	1.88351	0.01048	0.01045	10	1.0450	1.0335	8	1.3062	1.1728
42	EFSC	B	1.93598	1.94877	0.01279	0.01279	1.93787	0.01090	0.01087	10	1.0870		10	1.0870	
43	EFSC	C	2.21737	2.23005	0.01268	0.01268	2.21911	0.01094	0.01091	10	1.0910		9	1.2122	
44	EFSC	D	2.24515	2.25457	0.00942	0.00942	2.24629	0.00828	0.00825	10	0.8250		7	1.1786	
45	EFSC	E	2.24066	2.25329	0.01263	0.01263	2.24203	0.01126	0.01123	9	1.2478		8	1.4037	
46	EFSC	F	1.87059	1.88038	0.00979	0.00979	1.87193	0.00845	0.00842	10	0.8420		9	0.9356	
47	EFSC	G	1.87611	1.88701	0.01090	0.01090	1.87770	0.00931	0.00928	9	1.0311		8	1.1600	
48	EFSC	H	1.98066	1.99362	0.01296	0.01296	1.98260	0.01102	0.01099	10	1.0990		10	1.0990	
49	LSC	A	2.12154	2.13803	0.01649	0.01649	2.12665	0.01138	0.01135	10	1.1350	1.4056	9	1.2611	1.4412
50	LSC	B	2.12998	2.14812	0.01814	0.01814	2.13535	0.01277	0.01274	10	1.2740		10	1.2740	
51	LSC	C	1.89563	1.91743	0.02180	0.02180	1.90137	0.01606	0.01603	10	1.6030		10	1.6030	
52	LSC	D	2.03568	2.05612	0.02044	0.02044	2.04046	0.01566	0.01563	10	1.5630		10	1.5630	
53	LSC	E	1.94006	1.96004	0.01998	0.01998	1.94594	0.01410	0.01407	10	1.4070		10	1.4070	
54	LSC	F	2.26893	2.28859	0.01966	0.01966	2.27426	0.01433	0.01430	10	1.4300		10	1.4300	
55	LSC	G	1.85808	1.87852	0.02044	0.02044	1.86439	0.01413	0.01410	10	1.4100		10	1.4100	
56	LSC	H	2.30210	2.32101	0.01891	0.01891	2.30675	0.01426	0.01423	10	1.4230		9	1.5811	
Blank	A		2.35274	2.35279	0.00005		2.35276	-0.00003							

QA: 11/01/13
dk 11/1/13

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
Summary Statistics for Survival for Sand Control and Formulated Sediment Control

 Title:  60297514-100-(112-116)
 File:       058112s.dat             Transform:            NO TRANSFORMATION

            Summary Statistics on Data              TABLE 1 of 2
 ----------------------------------------------------------------------------

         GRP  IDENTIFICATION    N      MIN        MAX        MEAN
         ---  ---------------- ----  ---------- ---------- ----------
          1    Sand Control     8    0.8000     1.0000     0.9500
          2    Form. Control    8    0.8000     1.0000     0.9375
 ----------------------------------------------------------------------------


 Title:  60297514-100-(112-116)
 File:       058112s.dat             Transform:            NO TRANSFORMATION

            Summary Statistics on Data              TABLE 2 of 2
 ----------------------------------------------------------------------------

    GRP  IDENTIFICATION      VARIANCE       SD         SEM          C.V. %
    ---  ---------------- -------------- ---------- ----------   ----------
     1    Sand Control        0.0057     0.0756     0.0267       7.9571
     2    Form. Control       0.0055     0.0744     0.0263       7.9363
 ----------------------------------------------------------------------------
```

QA: AR ~~10~~ 11/01/13
11/1/13

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
Analysis of Survival for Sand Control and Formulated Sediment Control

  Title:  60297514-100-(112-116)
  File:        058112s.dat              Transform:     ARC SINE(SQUARE ROOT(Y))

                      Shapiro - Wilk's Test for Normality
  ---------------------------------------------------------------------------

       D =    0.1902
       W =    0.7995

       Critical W  = 0.8440 (alpha = 0.01 , N = 16)
                W  = 0.8870 (alpha = 0.05 , N = 16)

  ---------------------------------------------------------------------------
  Data FAIL normality test (alpha = 0.01). Try another transformation.

  Warning    -  The F-test of homogeneity is sensitive to non-normality
                and should not be performed with this data as is.


  Title:  60297514-100-(112-116)
  File:        058112s.dat              Transform:     ARC SINE(SQUARE ROOT(Y))

                      F-Test for Equality of Two Variances
  ---------------------------------------------------------------------------
           GROUP    IDENTIFICATION          VARIANCE           F
           -----    --------------        ------------     ---------
             1        Sand Control           0.0138
             2        Form. Control          0.0134          1.0262
  ---------------------------------------------------------------------------
                                                   (p-value = 0.9736)
    Critical F = 8.8854    (P=0.01, 7, 7)
                 4.9949    (P=0.05, 7, 7)

    Since F <= Critical F, FAIL TO REJECT Ho: Equal Variances (alpha = 0.01).
```

① AR 11/01/13 E

QA: AR 11/01/13
K 10/31/13

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
Summary Statistics for Survival for Sand Control and Formulated Sediment Control

  Title:  60297514-100-(112-116)
  File:        058112s.dat            Transform:           NO TRANSFORMATION

  Wilcoxon's Rank Sum Test w/ Bonferroni Adjustment     Ho: Control<Treatment
  ---------------------------------------------------------------------------
                                  MEAN IN       RANK    CRIT.         SIG
  GROUP    IDENTIFICATION     ORIGINAL UNITS    SUM     VALUE   REPS  0.05
  ----- --------------------   -----------    -------  ------  -----  ---
    1          Sand Control       0.9500
    2          Form. Control      0.9375       64.50      51      8
  ---------------------------------------------------------------------------
  Critical values are 1 tailed ( k = 1 )
```

QA: 11/01/13
11/1/13

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
Summary Statistics for Growth per Original for Sand Control and Formulated Sediment
Control

  Title:  60297514-100-(112-116)
  File:       058116g.dat            Transform:            NO TRANSFORMATION

                Summary Statistics on Data              TABLE 1 of 2
  ----------------------------------------------------------------------------

          GRP  IDENTIFICATION    N      MIN         MAX        MEAN
          ---  ---------------  ----  ----------  ----------  ----------
           1     Sand Control    7    0.7330      1.0020      0.8631
           2     Form Control    8    0.9480      1.9530      1.5431
  ----------------------------------------------------------------------------


  Title:  60297514-100-(112-116)
  File:       058116g.dat            Transform:            NO TRANSFORMATION

                Summary Statistics on Data              TABLE 2 of 2
  ----------------------------------------------------------------------------

     GRP  IDENTIFICATION      VARIANCE        SD         SEM         C.V. %
     ---  ---------------  --------------  ----------  ----------  ----------
      1    Sand Control          0.0093      0.0965      0.0365     11.1842
      2    Form Control          0.1130      0.3361      0.1188     21.7815
  ----------------------------------------------------------------------------
```

QA: MR 11/01/13
dk 11/1/13

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
Analysis of Growth per Original for Sand Control and Formulated Sediment Control

  Title:  60297514-100-(112-116)
  File:        058116g.dat              Transform:              NO TRANSFORMATION

                     Shapiro - Wilk's Test for Normality
  ------------------------------------------------------------------------------

        D =    0.8466
        W =    0.9112

        Critical W  = 0.8350 (alpha = 0.01 , N = 15)
                 W  = 0.8810 (alpha = 0.05 , N = 15)

  ------------------------------------------------------------------------------
  Data PASS normality test (alpha = 0.01). Continue analysis.


  Title:  60297514-100-(112-116)
  File:        058116g.dat              Transform:              NO TRANSFORMATION

                     F-Test for Equality of Two Variances
  ------------------------------------------------------------------------------
           GROUP     IDENTIFICATION          VARIANCE           F
           -----     --------------        ------------     ---------
             1         Sand Control          0.0093
             2         Form Control          0.1130          12.1224
  ------------------------------------------------------------------------------
                                                      (p-value = 0.0073)
    Critical F = 10.7859    (P=0.01, 7, 6)
                  5.6955   (P=0.05, 7, 6)

    Since F > Critical F, REJECT Ho: Equal Variances (alpha = 0.01).
```

QA: AR 11/01/13
11/1/13

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
Analysis of Growth per Original for Sand Control and Formulated Sediment Control

 Title:  60297514-100-(112-116)
 File:       058116g.dat             Transform:                NO TRANSFORMATION
                               ANOVA Table
 ----------------------------------------------------------------------------
   SOURCE             DF               SS                MS            F
 ----------------------------------------------------------------------------
   Between             1             1.7260            1.7260      26.5017
   Within (Error)     13             0.8466            0.0651
 ----------------------------------------------------------------------------
   Total              14             2.5726
 ----------------------------------------------------------------------------
                                                       (p-value = 0.0002)
   Critical F  = 9.0738  (alpha = 0.01, df = 1,13)
               = 4.6672  (alpha = 0.05, df = 1,13)
   Since  F > Critical F  REJECT  Ho: All equal (alpha = 0.05)

 Title:  60297514-100-(112-116)
 File:       058116g.dat             Transform:                NO TRANSFORMATION
        2 Sample t-Test   -   TABLE 1 OF 2            Ho: Control=Treatment
 ----------------------------------------------------------------------------
                                TRANSFORMED   MEAN CALCULATED IN          SIG
 GROUP   IDENTIFICATION            MEAN         ORIGINAL UNITS    t STAT  0.05
 ----- --------------------   -----------   ------------------   ------  ---
   1          Sand Control      0.8631            0.8631
   2          Form Control      1.5431            1.5431          5.1480  *
 ----------------------------------------------------------------------------
  Equal Var: t critical value = 2.1604   (2 Tailed, alpha = 0.05, df = 13)
                                                   (p-value = 0.0000)
                                TRANSFORMED   MEAN CALCULATED IN          SIG
 GROUP   IDENTIFICATION            MEAN         ORIGINAL UNITS    T STAT  0.05
 ----- --------------------   -----------   ------------------   ------  ---
   1          Sand Control      0.8631            0.8631
   2          Form Control      1.5431            1.5431          5.4699  *
 ----------------------------------------------------------------------------
 Unequal Var: t critical value = 2.3060   (2 Tailed, alpha = 0.05, df = 8)
                                                   (p-value = 0.0001)

 Title:  60297514-100-(112-116)
 File:       058116g.dat             Transform:                NO TRANSFORMATION
        2 Sample t-Test   -   TABLE 2 OF 2            Ho: Control=Treatment
 ----------------------------------------------------------------------------
  Equal Variances:
 ----------------------------------------------------------------------------
                              NUM OF   MIN SIG DIFF    % OF     DIFFERENCE
 GROUP   IDENTIFICATION        REPS   (IN ORIG. UNITS) CONTROL  FROM CONTROL
 ----- --------------------  -------  ---------------  -------  ------------
   1          Sand Control      7
   2          Form Control      8          0.2853        33.1       0.6799
 ----------------------------------------------------------------------------
  Unequal Variances:
 ----------------------------------------------------------------------------
                              NUM OF   MIN SIG DIFF    % OF     DIFFERENCE
 GROUP   IDENTIFICATION        REPS   (IN ORIG. UNITS) CONTROL  FROM CONTROL
 ----- --------------------  -------  ---------------  -------  ------------
   1          Sand Control      7
   2          Form Control      8          0.2866        33.2       0.6799
 ----------------------------------------------------------------------------
```

QA: AR ~~10/01~~ ① 11/01/13
dR 10/1/13

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
Summary Statistics for Growth per Surviving for Sand control and Formulated Sediment
Control

  Title:  60297514-100-(112-116)
  File:      058116gt.dat             Transform:             NO TRANSFORMATION

              Summary Statistics on Data              TABLE 1 of 2
  ----------------------------------------------------------------------------

        GRP  IDENTIFICATION    N      MIN         MAX        MEAN
        ---  ---------------- ----  ----------  ----------  ----------
         1    Sand Control     7    0.7800      1.0020      0.8878
         2          Form Sed   8    1.0533      2.0700      1.6577
  ----------------------------------------------------------------------------


  Title:  60297514-100-(112-116)
  File:      058116gt.dat             Transform:             NO TRANSFORMATION

              Summary Statistics on Data              TABLE 2 of 2
  ----------------------------------------------------------------------------

     GRP  IDENTIFICATION       VARIANCE        SD          SEM          C.V. %
     ---  ---------------- -------------- ----------  -----------  -----------
      1    Sand Control          0.0064     0.0799       0.0302       8.9994
      2          Form Sed        0.1477     0.3844       0.1359      23.1882
  ----------------------------------------------------------------------------
```

①AR 11/01/13 E

11/1/13

QA: 11/01/13

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
Analysis of Growth per Surviving for Sand control and Formulated Sediment Control

  Title:  60297514-100-(112-116)
  File:      058116gt.dat              Transform:              NO TRANSFORMATION

                     Shapiro - Wilk's Test for Normality
  ----------------------------------------------------------------------------

       D =    1.0726
       W =    0.9069

       Critical W  = 0.8350 (alpha = 0.01 , N = 15)
                W  = 0.8810 (alpha = 0.05 , N = 15)

  ----------------------------------------------------------------------------

  Data PASS normality test (alpha = 0.01). Continue analysis.


  Title:  60297514-100-(112-116)
  File:      058116gt.dat              Transform:              NO TRANSFORMATION

                     F-Test for Equality of Two Variances
  ----------------------------------------------------------------------------
          GROUP    IDENTIFICATION         VARIANCE          F
          -----    --------------       ------------    ---------
            1       Sand Control          0.0064
            2            Form Sed         0.1477         23.1440
  ----------------------------------------------------------------------------
                                                    (p-value = 0.0012)
    Critical F = 10.7859    (P=0.01, 7, 6)
                  5.6955    (P=0.05, 7, 6)

    Since F > Critical F, REJECT Ho: Equal Variances (alpha = 0.01).
```

QA: AR 11/01/13
* 11/1/13

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
Analysis of Growth per Surviving for Sand control and Formulated Sediment Control
    Title:   60297514-100-(112-116)
    File:       058116gt.dat              Transform:              NO TRANSFORMATION
                                    ANOVA Table
    ---------------------------------------------------------------------------
       SOURCE              DF                 SS                MS           F
    ---------------------------------------------------------------------------
       Between              1               2.2125            2.2125      26.8173
       Within (Error)      13               1.0726            0.0825
    ---------------------------------------------------------------------------
       Total               14               3.2851
    ---------------------------------------------------------------------------
                                                             (p-value = 0.0002)
       Critical F  = 9.0738  (alpha = 0.01, df = 1,13)
                   = 4.6672  (alpha = 0.05, df = 1,13)
       Since  F > Critical F  REJECT  Ho: All equal (alpha = 0.05)

    Title:   60297514-100-(112-116)
    File:       058116gt.dat              Transform:              NO TRANSFORMATION
           2 Sample t-Test   -   TABLE 1 OF 2             Ho: Control=Treatment
    ---------------------------------------------------------------------------
                                   TRANSFORMED    MEAN CALCULATED IN          SIG
    GROUP    IDENTIFICATION           MEAN          ORIGINAL UNITS    t STAT  0.05
    -----  -------------------   -----------    ------------------  ------  ---
      1          Sand Control       0.8878             0.8878
      2               Form Sed      1.6577             1.6577          5.1785  *
    ---------------------------------------------------------------------------
      Equal Var: t critical value = 2.1604    (2 Tailed, alpha = 0.05, df = 13)
                                                         (p-value = 0.0000)
                                   TRANSFORMED    MEAN CALCULATED IN          SIG
    GROUP    IDENTIFICATION           MEAN          ORIGINAL UNITS    T STAT  0.05
    -----  -------------------   -----------    ------------------  ------  ---
      1          Sand Control       0.8878             0.8878
      2               Form Sed      1.6577             1.6577          5.5298  *
    ---------------------------------------------------------------------------
    Unequal Var: t critical value = 2.3060    (2 Tailed, alpha = 0.05, df = 8)
                                                         (p-value = 0.0001)

    Title:   60297514-100-(112-116)
    File:       058116gt.dat              Transform:              NO TRANSFORMATION
           2 Sample t-Test   -   TABLE 2 OF 2             Ho: Control=Treatment
    ---------------------------------------------------------------------------
     Equal Variances:
    ---------------------------------------------------------------------------
                                 NUM OF    MIN SIG DIFF     % OF     DIFFERENCE
    GROUP    IDENTIFICATION       REPS   (IN ORIG. UNITS)  CONTROL  FROM CONTROL
    -----  -------------------  -------  ---------------   -------  ------------
      1          Sand Control      7
      2               Form Sed     8           0.3212        36.2        0.7698
    ---------------------------------------------------------------------------
     Unequal Variances:
    ---------------------------------------------------------------------------
                                 NUM OF    MIN SIG DIFF     % OF     DIFFERENCE
    GROUP    IDENTIFICATION       REPS   (IN ORIG. UNITS)  CONTROL  FROM CONTROL
    -----  -------------------  -------  ---------------   -------  ------------
      1          Sand Control      7
      2               Form Sed     8           0.3210        36.2        0.7698
    ---------------------------------------------------------------------------
```

QA: AR11/01/13
11/1/13

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
Summary Statistics for Growth per Original

  Title:  60297514-100-(112-116)
  File:       058112g.dat            Transform:            NO TRANSFORMATION
  Number of Groups:  7
  ----------------------------------------------------------------------------

     GRP  IDENTIFICATION   REP       VALUE            TRANS VALUE
     --- ---------------- -----   -------------     -------------
      1    Sand Control     1          0.8400              0.8400
      1    Sand Control     2          0.7800              0.7800
      1    Sand Control     3          0.8240              0.8240
      1    Sand Control     4          1.0020              1.0020
      1    Sand Control     5          0.9050              0.9050
      1    Sand Control     6          0.9578              0.9578
      1    Sand Control     7          0.7330              0.7330
      2             LSH     1          1.1440              1.1440
      2             LSH     2          0.8690              0.8690
      2             LSH     3          1.2470              1.2470
      2             LSH     4          1.1120              1.1120
      2             LSH     5          0.7690              0.7690
      2             LSH     6          1.2200              1.2200
      2             LSH     7          1.1700              1.1700
      2             LSH     8          1.1230              1.1230
      3             LJC     1          0.8620              0.8620
      3             LJC     2          0.8450              0.8450
      3             LJC     3          0.8390              0.8390
      3             LJC     4          1.1100              1.1100
      3             LJC     5          0.9800              0.9800
      3             LJC     6          1.0530              1.0530
      3             LJC     7          1.0840              1.0840
      3             LJC     8          1.1670              1.1670
      4             USC     1          1.2140              1.2140
      4             USC     2          1.2540              1.2540
      4             USC     3          1.2510              1.2510
      4             USC     4          1.1810              1.1810
      4             USC     5          0.9760              0.9760
      4             USC     6          1.2440              1.2440
      4             USC     7          1.3900              1.3900
      4             USC     8          1.3770              1.3770
      5            EFSC     1          1.0450              1.0450
      5            EFSC     2          1.0870              1.0870
      5            EFSC     3          1.0910              1.0910
      5            EFSC     4          0.8250              0.8250
      5            EFSC     5          1.2478              1.2478
      5            EFSC     6          0.8420              0.8420
      5            EFSC     7          1.0311              1.0311
      5            EFSC     8          1.0990              1.0990
      6             LSC     1          1.1350              1.1350
      6             LSC     2          1.2740              1.2740
      6             LSC     3          1.6030              1.6030
      6             LSC     4          1.5630              1.5630
      6             LSC     5          1.4070              1.4070
      6             LSC     6          1.4300              1.4300
      6             LSC     7          1.4100              1.4100
      6             LSC     8          1.4230              1.4230
      7        Form Sed     1          1.6150              1.6150
      7        Form Sed     2          1.9530              1.9530
      7        Form Sed     3          1.8400              1.8400
      7        Form Sed     4          1.5827              1.5827
      7        Form Sed     5          1.6010              1.6010
      7        Form Sed     6          1.1467              1.1467
      7        Form Sed     7          0.9480              0.9480
      7        Form Sed     8          1.6580              1.6580
  ----------------------------------------------------------------------------
```

QA: AR 11/01/13
11/1/13

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
Summary Statistics for Growth per Original

 Title:  60297514-100-(112-116)
 File:      058112g.dat           Transform:            NO TRANSFORMATION

            Summary Statistics on Data            TABLE 1 of 2
 ------------------------------------------------------------------------------

         GRP  IDENTIFICATION     N      MIN        MAX        MEAN
         ---  ---------------  ----  ---------- ---------- ----------
          1     Sand Control     7    0.7330     1.0020     0.8631
          2              LSH     8    0.7690     1.2470     1.0817
          3              LJC     8    0.8390     1.1670     0.9925
          4              USC     8    0.9760     1.3900     1.2359
          5             EFSC     8    0.8250     1.2478     1.0335
          6              LSC     8    1.1350     1.6030     1.4056
          7         Form Sed     8    0.9480     1.9530     1.5431
 ------------------------------------------------------------------------------


 Title:  60297514-100-(112-116)
 File:      058112g.dat           Transform:            NO TRANSFORMATION

            Summary Statistics on Data            TABLE 2 of 2
 ------------------------------------------------------------------------------

    GRP  IDENTIFICATION      VARIANCE       SD         SEM         C.V. %
    ---  ---------------  -------------- ---------- ----------  ----------
     1     Sand Control       0.0093     0.0965     0.0365      11.1842
     2              LSH       0.0291     0.1706     0.0603      15.7725
     3              LJC       0.0170     0.1303     0.0461      13.1256
     4              USC       0.0165     0.1284     0.0454      10.3855
     5             EFSC       0.0195     0.1397     0.0494      13.5200
     6              LSC       0.0222     0.1489     0.0526      10.5933
     7         Form Sed       0.1130     0.3361     0.1188      21.7815
 ------------------------------------------------------------------------------
```

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
Analysis of Ash Free Dry Weight per Original
```

dk 10/17/13

```
  Title:  60297514-100-(112-116)
  File:       058112g.dat              Transform:          NO TRANSFORMATION
```

QA: AR 10/29/13

```
                                    ANOVA Table
  ----------------------------------------------------------------------------

     SOURCE               DF              SS                 MS            F
  ----------------------------------------------------------------------------
     Between               5            1.4159             0.2832      14.7773

     Within (Error)       41            0.7857             0.0192
  ----------------------------------------------------------------------------
     Total                46            2.2015
  ----------------------------------------------------------------------------
                                                          (p-value = 0.0000)

     Critical F  = 3.5007  (alpha = 0.01, df = 5,41)
                 = 2.4434  (alpha = 0.05, df = 5,41)

     Since  F > Critical F  REJECT  Ho: All equal (alpha = 0.05)


  Title:  60297514-100-(112-116)
  File:       058112g.dat              Transform:          NO TRANSFORMATION

       Bonferroni t-Test    -   TABLE 1 OF 2          Ho: Control<Treatment
  ----------------------------------------------------------------------------
                                  TRANSFORMED   MEAN CALCULATED IN         SIG
  GROUP    IDENTIFICATION            MEAN        ORIGINAL UNITS    t STAT  0.05
  -----  --------------------    -----------   ------------------  ------  ---
    1          Sand Control        0.8631          0.8631
    2                   LSH        1.0817          1.0817         -3.0517
    3                   LJC        0.9925          0.9925         -1.8060
    4                   USC        1.2359          1.2359         -5.2030
    5                  EFSC        1.0335          1.0335         -2.3781
    6                   LSC        1.4056          1.4056         -7.5723
  ----------------------------------------------------------------------------
  Bonferroni t critical value = 2.4208   (1 Tailed, alpha = 0.05, df = 5,41)


  Title:  60297514-100-(112-116)
  File:       058112g.dat              Transform:          NO TRANSFORMATION

       Bonferroni t-Test    -   TABLE 2 OF 2          Ho: Control<Treatment
  ----------------------------------------------------------------------------
                                NUM OF    MIN SIG DIFF     % OF    DIFFERENCE
  GROUP    IDENTIFICATION        REPS   (IN ORIG. UNITS)  CONTROL  FROM CONTROL
  -----  --------------------   -------  ----------------  -------  ------------
    1          Sand Control       7
    2                   LSH       8            0.1734        20.1      -0.2186
    3                   LJC       8            0.1734        20.1      -0.1294
    4                   USC       8            0.1734        20.1      -0.3728
    5                  EFSC       8            0.1734        20.1      -0.1704
    6                   LSC       8            0.1734        20.1      -0.5425
  ----------------------------------------------------------------------------
```

<7 PMSD

10/25/13
QA: AR 10/29/13

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
List Data for Growth per Surviving Organism

  Title:  60297514-100-(112-116)
  File:       058112gs.dat            Transform:          NO TRANSFORMATION
  Number of Groups:  7
  ----------------------------------------------------------------------------

    GRP  IDENTIFICATION   REP       VALUE          TRANS VALUE
    ---  --------------  -----  -------------    -------------
     1    Sand Control     1          0.8400           0.8400
     1    Sand Control     2          0.7800           0.7800
     1    Sand Control     3          0.9156           0.9156
     1    Sand Control     4          1.0020           1.0020
     1    Sand Control     5          0.9050           0.9050
     1    Sand Control     6          0.9578           0.9578
     1    Sand Control     7          0.8144           0.8144
     2             LSH     1          1.1440           1.1440
     2             LSH     2          1.0862           1.0862
     2             LSH     3          1.2470           1.2470
     2             LSH     4          1.1120           1.1120
     2             LSH     5          0.8544           0.8544
     2             LSH     6          1.2200           1.2200
     2             LSH     7          1.3000           1.3000
     2             LSH     8          1.1230           1.1230
     3             LJC     1          1.0775           1.0775
     3             LJC     2          0.9389           0.9389
     3             LJC     3          0.9322           0.9322
     3             LJC     4          1.1100           1.1100
     3             LJC     5          1.0889           1.0889
     3             LJC     6          1.1700           1.1700
     3             LJC     7          1.2044           1.2044
     3             LJC     8          1.2967           1.2967
     4             USC     1          1.5175           1.5175
     4             USC     2          1.2540           1.2540
     4             USC     3          1.2510           1.2510
     4             USC     4          1.3122           1.3122
     4             USC     5          1.0844           1.0844
     4             USC     6          1.2440           1.2440
     4             USC     7          1.3900           1.3900
     4             USC     8          1.3770           1.3770
     5            EFSC     1          1.3062           1.3062
     5            EFSC     2          1.0870           1.0870
     5            EFSC     3          1.2122           1.2122
     5            EFSC     4          1.1786           1.1786
     5            EFSC     5          1.4037           1.4037
     5            EFSC     6          0.9356           0.9356
     5            EFSC     7          1.1600           1.1600
     5            EFSC     8          1.0990           1.0990
     6             LSC     1          1.2611           1.2611
     6             LSC     2          1.2740           1.2740
     6             LSC     3          1.6030           1.6030
     6             LSC     4          1.5630           1.5630
     6             LSC     5          1.4070           1.4070
     6             LSC     6          1.4300           1.4300
     6             LSC     7          1.4100           1.4100
     6             LSC     8          1.5811           1.5811
     7        Form Sed     1          2.0187           2.0187
     7        Form Sed     2          1.9530           1.9530
     7        Form Sed     3          2.0700           2.0700
```

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
List Data for Growth per Surviving Organism

      7          Form Sed    4        1.5827         1.5827
      7          Form Sed    5        1.7789         1.7789
      7          Form Sed    6        1.1467         1.1467
      7          Form Sed    7        1.0533         1.0533
      7          Form Sed    8        1.6580         1.6580
  ------------------------------------------------------------
```

AR 10/25/13
QA: AR 10/29/13

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
Summary Statistics for Growth per Surviving Organism
```

& 10/25/13
QA: AR 10/29/13

```
  Title:  60297514-100-(112-116)
  File:      058112gs.dat              Transform:            NO TRANSFORMATION

             Summary Statistics on Data             TABLE 1 of 2
  ----------------------------------------------------------------------------

          GRP  IDENTIFICATION      N      MIN         MAX         MEAN
          ---  ---------------- ----  ----------  ----------  ----------
           1     Sand Control    7     0.7800      1.0020      0.8878
           2              LSH    8     0.8544      1.3000      1.1358
           3              LJC    8     0.9322      1.2967      1.1023
           4              USC    8     1.0844      1.5175      1.3038
           5             EFSC    8     0.9356      1.4037      1.1728
           6              LSC    8     1.2611      1.6030      1.4412
           7         Form Sed    8     1.0533      2.0700      1.6577
  ----------------------------------------------------------------------------


  Title:  60297514-100-(112-116)
  File:      058112gs.dat              Transform:            NO TRANSFORMATION

             Summary Statistics on Data             TABLE 2 of 2
  ----------------------------------------------------------------------------

     GRP  IDENTIFICATION      VARIANCE        SD          SEM         C.V. %
     ---  ---------------- -------------- ----------  ----------  ----------
      1    Sand Control         0.0064      0.0799      0.0302      8.9994
      2             LSH         0.0184      0.1357      0.0480     11.9454
      3             LJC         0.0156      0.1249      0.0442     11.3351
      4             USC         0.0165      0.1285      0.0454      9.8527
      5            EFSC         0.0203      0.1424      0.0503     12.1415
      6             LSC         0.0176      0.1327      0.0469      9.2072
      7        Form Sed         0.1477      0.3844      0.1359     23.1882
  ----------------------------------------------------------------------------
```

QA: AR 10/29/13
10/25/13

```
Toxstat Version 3.5
Study # 60297514-100-(112-116)
Coeur Alaska, Inc.
C. dilutus
Analysis of Growth per Surviving Organism

  Title:  60297514-100-(112-116)
  File:      058112gs.dat             Transform:             NO TRANSFORMATION

       Bonferroni t-Test    -  TABLE 1 OF 2            Ho: Control<Treatment
  ----------------------------------------------------------------------------
                                TRANSFORMED    MEAN CALCULATED IN          SIG
  GROUP    IDENTIFICATION          MEAN          ORIGINAL UNITS    t STAT  0.05
  ----- --------------------    -----------    ------------------  ------  ---
    1          Sand Control       0.8878             0.8878
    2                   LSH       1.1358             1.1358       -3.7849
    3                   LJC       1.1023             1.1023       -3.2737
    4                   USC       1.3038             1.3038       -6.3480
    5                  EFSC       1.1728             1.1728       -4.3491
    6                   LSC       1.4412             1.4412       -8.4448
  ----------------------------------------------------------------------------
  Bonferroni t critical value = 2.4208   (1 Tailed, alpha = 0.05, df = 5,41)


  Title:  60297514-100-(112-116)
  File:      058112gs.dat             Transform:             NO TRANSFORMATION

       Bonferroni t-Test    -  TABLE 2 OF 2            Ho: Control<Treatment
  ----------------------------------------------------------------------------
                              NUM OF     MIN SIG DIFF     % OF     DIFFERENCE
  GROUP    IDENTIFICATION      REPS    (IN ORIG. UNITS)  CONTROL  FROM CONTROL
  ----- --------------------  -------  ----------------  -------  ------------
    1          Sand Control      7
    2                   LSH      8            0.1586      17.9       -0.2480
    3                   LJC      8            0.1586      17.9       -0.2145
    4                   USC      8            0.1586      17.9       -0.4159
    5                  EFSC      8            0.1586      17.9       -0.2850
    6                   LSC      8            0.1586      17.9       -0.5533
  ----------------------------------------------------------------------------
```

APPENDIX C

Analytical Data

Page ___ of ___
FCETL QA Form No.131
Revision 0
Effective 10/06

QA: AR 10/07/13
9/30/13

PERCENT TOTAL SOLIDS AND PERCENT TOTAL VOLATILE SOLIDS (TVS)

Project No: [058] 6029754-100-(104-109)(112-116)

Analytical Balance ID: AND #2

TARE: Date/time: 9/17/13 @ 1200 Analyst: AB

DRY GROSS: Date/time: 9/18/13 @ 1200 Analyst: AB

ASHED GROSS: Date/time: 9/19/13 @ 0850 Analyst:

Dried in Oven # 1 from Date: 9/17/13 Time: 1210
Oven °C: 104 to Date: 9/18/13 Time: 1100

Ashed in Furnace from Date: 9/18/13 Time: 1200
Furnace °C: 550 to Date: 9/19/13 Time: 1615

Dish No.	Treatment	Rep	Tare Weight of Dish (g) A	Dish + Wet Sample (g) B	Dry Gross Weight (g) (dish + dry sample) C	% Total Solids (g) [(C-A)(100)]/(B-A)	Ashed Gross Weight (dish + sample)(g) D	% Total Volatile Solids (g) [(C-D)(100)]/(C-A)
32A	Sand	A	12.~~6767~~ 4131	22.5445	20.4688		20.4645	
1A		B	12.4274	22.7732	20.4912		20.4833	
29A	Form Sed	A	12.0585	23.8334	21.0468		20.5670	
25A		B	11.9437	23.3834	20.7595		20.3213	
8	LSC	A	12.0272	24.5976	21.3083		21.1605	
13A		B	12.1451	22.2708	19.7697		19.6431	
17	LJC	A	11.9310	22.3045	19.3161		19.2512	
5A		B	12.0062	22.7401	20.0809		20.0070	
6	LSH	A	12.1565	22.1942	19.5983		19.5419	
22A		B	12.8550	23.5910	21.1912		21.0803	
33A	USC	A	11.8432	22.5681	19.7520		19.5326	
27A		B	11.2006	21.8412	19.1961		18.9333	
12	EFSC	A	10.7977	22.8491	15.9992		15.3040	
Blank			12.6767		12.6771		12.6771	

---

[1] Add in weight loss of blank boat, if appropriate.

Page ___ of ___
FCETL QA Form No.13
Revision 0
Effective 10/06

QA: AR 10/07/13
9/30/13

PERCENT TOTAL SOLIDS AND PERCENT TOTAL VOLATILE SOLIDS (TVS)

Project No: [058]
U0297514100-(104-109)(112-116)

Analytical Balance ID: AND #2

TARE: Date/time: 9/17/13 @ 1200 Analyst:

DRY GROSS: Date/time: 9/18/13 @ 1200 Analyst:

ASHED GROSS: Date/time: 9/19/13 @ 0850 Analyst:

Dried in Oven # 1 from Date: 9/17/13 Time: 1210
Oven °C: 104 to Date: 9/18/13 Time: 110

Ashed in Furnace from Date: 9/18/13 Time: 1200
Furnace °C: 550 to Date: 9/18/13 Time: 1605

Dish No.	Treatment	Rep	Tare Weight of Dish (g) A	Dish + Wet Sample (g) B	Dry Gross Weight (g) (dish + dry sample) C	% Total Solids (g) [(C-A)(100)]/(B-A)	Ashed Gross Weight (dish + sample)(g) D	% Total Volatile Solids (g) [(C-D)(100)]/(C-A)
234	EFSC	B	11.8719	22.9187	16.7506		16.1053	
Blank								

---

[1] Add in weight loss of blank boat, if appropriate.

Percent Total Solids and Percent Total Volatile Solids

Project Number: 60297514-100-(104-109), (112-116)

10/17/13

Treatment	Rep		Tare Weight (g) A	Dish + Wet Sample (g) B	Dry Gross Weight (g) (dish + dry sample) C	% Total Solids [(C-A)(100)]/(B-A)	Treatment Mean % Total Solids	Ashed Gross Weight (g) (dish + sample) D	% Total Volatile Solids [(C-D)(100)]/(C-A)	Treatment Mean % Total Volatile Solids
Sand	A		12.4131	22.5445	20.4688	79.5122	78.7275	20.4645	0.0534	0.0757
	B		12.4274	22.7732	20.4912	77.9427		20.4833	0.0980	
Form Sed	A		12.0585	23.8334	21.0468	76.3344	76.6988	20.567	5.3381	5.1543
	B		11.9437	23.3834	20.7595	77.0632		20.3213	4.9706	
LSC	A		12.0272	24.5976	21.3083	73.8330	74.5662	21.1605	1.5925	1.6264
	B		12.1451	22.2708	19.7697	75.2995		19.6431	1.6604	
LJC	A		11.9310	22.3045	19.3161	71.1920	73.2091	19.2512	0.8788	0.8970
	B		12.0062	22.7401	20.0809	75.2262		20.0070	0.9152	
LSH	A		12.1565	22.1942	19.5983	74.1385	75.6600	19.5419	0.7579	0.7464
	B		12.8550	23.5910	21.1412	77.1814		21.0803	0.7350	
USC	A		11.8432	22.5681	19.7520	73.7424	74.2070	19.5326	2.7741	2.7262
	B		11.2006	21.8412	19.1461	74.6715		18.9333	2.6782	
EFSC	A		10.7977	22.8491	15.9992	43.1610	43.6637	15.3040	13.3654	13.2955
	B		11.8714	22.9187	16.7506	44.1664		16.1053	13.2255	
Blank			12.6767		12.6771			12.6771		

Friday, August 16, 2013

MSE
Analytical Laboratory

Rami Naddy
AECOM
4303 W Laporte Ave
Fort Collins, CO 80521

RE: Sediment Analysis

Work Order: 1307108

Dear Rami Naddy:

MSE Lab Services received 9 sample(s) on 7/17/2013 for the analyses presented in the following report.

Please find enclosed analytical results for the sample(s) received at the MSE Laboratory.

If you have any questions regarding these test results, please feel free to call.

Sincerely,

Sara Ward

Sara Ward
Laboratory Manager
406-494-7334

Enclosure

MSE Analytical Laboratory
P.O. Box 4078
200 Technology Way
Butte, MT 59701
Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

8/19/13

CLIENT:	AECOM	**Client Sample ID:**	LJC (#26895)
Lab Order:	1307108	**Collection Date:**	7/1/2013 11:00:00 AM
Project:	Sediment Analysis		
Lab ID:	1307108-003	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	ND	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:			
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT: AECOM
Lab Order: 1307108
Project: Sediment Analysis
Lab ID: 1307108-004

Client Sample ID: LSC (#26898)
Collection Date: 7/2/2013 10:00:00 AM
Matrix: SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	1.84	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:				
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT: AECOM
Lab Order: 1307108
Project: Sediment Analysis
Lab ID: 1307108-005

Client Sample ID: USC (#26896)
Collection Date: 7/1/2013 1:00:00 PM
Matrix: SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	ND	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT:	AECOM	**Client Sample ID:**	LSH (#26894)
Lab Order:	1307108	**Collection Date:**	7/1/2013 9:00:00 AM
Project:	Sediment Analysis		
Lab ID:	1307108-006	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	ND	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:				
E	Value above quantitation range		H	Holding times for preparation or analysis exceeded
J	Analyte detected below the Reporting Limit		Limit	Reporting Limit
MDL	Method Detection Limit		ND	Not Detected at the Method Detection Limit (MDL)

CLIENT:	AECOM	**Client Sample ID:**	EFSC (#26897)
Lab Order:	1307108	**Collection Date:**	7/1/2013 3:00:00 PM
Project:	Sediment Analysis		
Lab ID:	1307108-007	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	5.20	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

AECOM

CHAIN OF CUSTODY RECORD

Page ____ of ____

Client/Project Name:

Project Location: FCETL

Project Number:

Field Logbook No.:

Sampler (Print Name)/(Affiliation): Benjamin Brewster/ADFG
Amber Potts/AECOM

Chain of Custody Tape Nos.: 43703

Signature: Amber Potts

Send Results/Report to: Karin Naddy

TAT: SH

Analysis Requested

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	Total Metals (Al, Cr, Ni, Ag, Zn, As, Cd, Cu, Pb, Se)	TOC (Walkley Black)	Mercury	% Coarse Material	Rapid Hydro (% clay, silt, sand)	AVS					Lab I.D.	Remarks
USH (#26899)	7/1/13	1100			500ml	SD	4°C	NA	X	X	X	X	X							
WFSC (#26900)	7/2/13	1400			500ml	SD	4°C	NA	X	X	X	X	X							
LTC (#26895)	7/1/13	1100			4oz	SD	4°C	NA						X						
LSC (#26898)	7/2/13	1000			↓	↓	↓	↓						X						
USC (#26896)	7/1/13	1300			↓	↓	↓	↓						X						
LSH (#26894)	7/1/13	0900			↓	↓	↓	↓						X						
EFSC (#26897)	7/1/13	1500			↓	↓	↓	↓						X						
WFSC (#26900)	7/2/13	1900			2oz	SD	4°C	NA						X						
USH (#26899)	7/1/13	1000			↓	↓	↓	↓						X						

Container Type:
P – Plastic
A – Amber Glass
G – Clear Glass
V – VOA Vial
O – Other
E – Encore

Preservation:
1 – HCl, 4°
2 – H2SO4, 4°
3 – HNO3, 4°
4 – NaOH, 4°
5 – NaOH/ZnAc, 4°
6 – Na2S2O3, 4°
7 – 4°

Matrix Codes:

DW – Drinking Water	S – Soil
WW – Wastewater	SL – Sludge
GW – Groundwater	SD – Sediment
SW – Surface Water	SO – Solid
ST – Storm Water	A – Air
W – Water	L – Liquid
	P – Product

Relinquished by: (Print Name)/(Affiliation) Amber Potts/AECOM
Signature: Amber Potts
Date: 7/17/13
Time: 1030

Received by: (Print Name)/(Affiliation) Debbie Griego; ASETA LAB
Signature:
Date: 7-17-13
Time: 10:55

Relinquished by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

Received by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

Relinquished by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

Received by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

Analytical Laboratory (Destination):

AECOM Toxicology Lab
4303 W. Laporte Avenue
Fort Collins, CO 80521
(970) 416-0916
(970) 490-2963 (FAX)

MSE

Sample Shipped Via: UPS [✓ FedEx] Courier Other

Temp blank: Yes [✓ No]

O:\GRAPHICS\FORMS\Chain of Custody (COC)\Chain-of-Custody_Ft_Collins_10_07.doc

Sealed cooler/ice

Serial No. 53534

MSE Lab Services

Sample Receipt Checklist

Client Name AECOM_INC

Date and Time Received: 7/17/2013 12:55:00 PM

Work Order Number 1307108

RcptNo: 1

Received by DO

COC_ID: 1307108

CoolerID:

Checklist completed by 7/17/13
Signature Date

Reviewed by SW 7/18/13
Initials Date

Matrix:

Carrier name FedEx

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shippping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☐	No ☑	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☐	No ☑	
Water - VOA vials have zero headspace?	No VOA vials submitted ☑	Yes ☐	No ☐
Water - pH acceptable upon receipt?	Yes ☐	No ☐	Blank ☐

Adjusted? No

Checked by NA soil

7/17/13

Any No and/or NA (not applicable) response must be detailed in the comments section be

Client contacted

Date contacted:

Person contacted

Contacted by:

Regarding:

Comments: FED EX TEMP=NA SOIL

Corrective Action

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis

Work Order: 1309111
BatchID: 7262

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: ***1309111-001A-MS***			*Method:* ***SW6020***		*Batch ID:* ***7262***			*Analysis Date: 10/24/2013 2:54:11 PM*		
Copper	223	2.60	mg/Kg-dry	95.64	161	75	125			S
Lead	383	0.260	mg/Kg-dry	327.1	115	75	125			
Nickel	200	0.260	mg/Kg-dry	142.0	119	75	125			
Selenium	305	0.520	mg/Kg-dry	277.5	109	75	125			
Silver	91.5	0.260	mg/Kg-dry	78.18	117	75	125			
Zinc	932	13.0	mg/Kg-dry	729.7	112	75	125			
Sample ID: ***1309111-001A-MSD***			*Method:* ***SW6020***		*Batch ID:* ***7262***			*Analysis Date: 10/24/2013 2:54:11 PM*		
Aluminum	16900	7.76	mg/Kg-dry	1446	105	75	125	3.14	35	NA
Arsenic	189	7.76	mg/Kg-dry	131.6	125	75	125	4.35	35	
Cadmium	281	0.517	mg/Kg-dry	241.1	116	75	125	0.186	35	
Chromium	349	12.9	mg/Kg-dry	235.8	132	75	125	3.58	35	S
Copper	171	2.59	mg/Kg-dry	95.64	106	75	125	26.4	35	
Lead	381	0.259	mg/Kg-dry	327.1	114	75	125	0.645	35	
Nickel	202	0.259	mg/Kg-dry	142.0	121	75	125	1.15	35	
Selenium	312	0.517	mg/Kg-dry	277.5	112	75	125	2.12	35	
Silver	89.8	0.259	mg/Kg-dry	78.18	114	75	125	1.97	35	
Zinc	941	12.9	mg/Kg-dry	729.7	114	75	125	1.01	35	
Sample ID: ***1309111-001A-MST***			*Method:* ***SW6020***		*Batch ID:* ***7262***			*Analysis Date: 10/24/2013 2:54:11 PM*		
Aluminum	17900	7.79	mg/Kg-dry	1446	173	75	125	8.82	35	NA
Arsenic	184	7.79	mg/Kg-dry	131.6	120	75	125	1.35	35	
Cadmium	298	0.519	mg/Kg-dry	241.1	123	75	125	5.75	35	
Chromium	341	13.0	mg/Kg-dry	235.8	129	75	125	1.35	35	S*
Copper	173	2.60	mg/Kg-dry	95.64	109	75	125	25.2	35	
Lead	390	0.260	mg/Kg-dry	327.1	117	75	125	1.82	35	
Nickel	204	0.260	mg/Kg-dry	142.0	122	75	125	2.01	35	
Selenium	304	0.519	mg/Kg-dry	277.5	109	75	125	0.196	35	
Silver	88.7	0.260	mg/Kg-dry	78.18	113	75	125	3.11	35	
Zinc	941	13.0	mg/Kg-dry	729.7	114	75	125	0.935	35	

Qualifiers:

NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/kg; Nickel 79.2-139 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis

Work Order: 1309111
BatchID: R24739

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: ***1309111-006A-D***			*Method:* ***ASTMD422***	*Batch ID:* ***R24739***			*Analysis Date: 10/3/2013 1:00:00 PM*			
1" Gradation	ND	0.10	%					0	35	
2mm Gradation	ND	0.10	%					0	35	

Qualifiers: NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/kg; Nickel 79.2-139 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis
Work Order: 1309111
BatchID: R24748

Sample ID: ***1309111-006A-D*** *Method:* ***MSA15-5*** *Batch ID:* ***R24748*** *Analysis Date: 10/3/2013 3:00:00 PM*

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
% Clay	2.0	0.1	%					0	35	
% Sand	96.0	0.1	%					0	35	
% Silt	2.0	0.1	%					0	35	
Soil Class	SAND									

Qualifiers: NA Sample conc. is > 4*spike level S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/kg; Nickel 79.2-139 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis

Work Order: 1309111
BatchID: R24797

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: PB — *Method: OM_WALKLE Batch ID: **R24797*** — *Analysis Date: 10/3/2013 4:00:00 PM*										
Organic Matter - Walkl	ND	0.20	%							
Sample ID: LCS — *Method: OM_WALKLE Batch ID: **R24797*** — *Analysis Date: 10/3/2013 4:00:00 PM*										
Organic Matter - Walkl	2.14	0.20	%	2.500	85.4	80	120			
*Sample ID: **1309111-001A-D*** — *Method: OM_WALKLE Batch ID: **R24797*** — *Analysis Date: 10/3/2013 4:00:00 PM*										
Organic Matter - Walkl	0.54	0.20	%					12.2	35	

Qualifiers: NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/kg; Nickel 79.2-139 mg/kg

Friday, October 25, 2013

MSE
Analytical Laboratory

Rami Naddy
AECOM
4303 W Laporte Ave
Fort Collins, CO 80521

RE: Sediment Analysis

Work Order: 1309111

Dear Rami Naddy:

MSE Lab Services received 7 sample(s) on 9/19/2013 for the analyses presented in the following report.

Please find enclosed analytical results for the sample(s) received at the MSE Laboratory.

If you have any questions regarding these test results, please feel free to call.

Sincerely,

Sara Ward

Sara Ward
Laboratory Manager
406-494-7334

Enclosure

10/28/13

MSE Lab Services

Date: *28-Oct-13*

CLIENT: AECOM
Lab Order: 1309111
Project: Sediment Analysis
Lab ID: 1309111-001

Client Sample ID: 058 LSH #26894
Collection Date: 8/26/2013 3:30:00 PM
Matrix: SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Aluminum	15400	2.45	7.80	N	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Arsenic	25.4	2.55	7.80		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Cadmium	0.390	0.174	0.520	J	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Chromium	37.4	4.60	13.0		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Copper	69.4	0.577	2.60		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Lead	7.39	0.094	0.260		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Nickel	30.9	0.075	0.260		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Selenium	1.77	0.177	0.520		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Silver	0.306	0.096	0.260		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Zinc	111	7.18	13.0		mg/Kg-dry	2	10/24/2013 2:54:11 PM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	ND	0.0384	0.133	H	mg/Kg-dry	1	10/2/2013 9:07:00 AM
ORGANIC MATTER-WALKLEY BLACK			**OM_WALKLEYBLACK**				Analyst: **hb/df**
Organic Matter - Walkley Black	0.61	0.09	0.20		%	1	10/3/2013 4:00:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **hb**
1" Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
2mm Gradation	0.58	0.05	0.10		%	1	10/3/2013 1:00:00 PM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **hb**
% Clay	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Sand	96.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Silt	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
Soil Class	SAND					1	10/3/2013 3:00:00 PM

Qualifiers:	H	Holding times for preparation or analysis exceeded	J	Analyte detected below the Reporting Limit
	Limit	Reporting Limit	MDL	Method Detection Limit
	N	Spike Recovery outside accepted recovery limits	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *28-Oct-13*

CLIENT: AECOM
Lab Order: 1309111
Project: Sediment Analysis
Lab ID: 1309111-002

Client Sample ID: 058 LJC #26895
Collection Date: 8/26/2013 3:00:00 PM
Matrix: SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Aluminum	10300	2.27	7.21	N	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Arsenic	11.9	2.36	7.21		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Cadmium	0.492	0.161	0.481		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Chromium	24.4	4.25	12.0		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Copper	56.1	0.533	2.40		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Lead	8.00	0.087	0.240		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Nickel	15.7	0.069	0.240		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Selenium	ND	0.163	0.481		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Silver	0.269	0.088	0.240		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Zinc	121	6.63	12.0		mg/Kg-dry	2	10/24/2013 2:54:11 PM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	ND	0.0354	0.122	H	mg/Kg-dry	1	10/2/2013 9:07:00 AM
ORGANIC MATTER-WALKLEY BLACK			**OM_WALKLEYBLACK**				Analyst: **hb/df**
Organic Matter - Walkley Black	1.08	0.09	0.20		%	1	10/3/2013 4:00:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **hb**
1" Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
2mm Gradation	0.28	0.05	0.10		%	1	10/3/2013 1:00:00 PM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **hb**
% Clay	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Sand	96.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Silt	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
Soil Class	SAND					1	10/3/2013 3:00:00 PM

Qualifiers:				
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below the Reporting Limit
	Limit	Reporting Limit	MDL	Method Detection Limit
	N	Spike Recovery outside accepted recovery limits	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *28-Oct-13*

CLIENT: AECOM
Lab Order: 1309111
Project: Sediment Analysis
Lab ID: 1309111-003

Client Sample ID: 058 USC #26896
Collection Date: 8/26/2013 3:45:00 PM
Matrix: SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Aluminum	14600	2.41	7.68	N	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Arsenic	13.5	2.51	7.68		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Cadmium	0.750	0.171	0.512		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Chromium	101	4.53	12.8		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Copper	44.6	0.568	2.56		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Lead	2.70	0.092	0.256		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Nickel	55.0	0.073	0.256		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Selenium	3.21	0.174	0.512		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Silver	0.131	0.094	0.256	J	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Zinc	105	7.06	12.8		mg/Kg-dry	2	10/24/2013 2:54:11 PM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	ND	0.0380	0.131	H	mg/Kg-dry	1	10/2/2013 9:07:00 AM
ORGANIC MATTER-WALKLEY BLACK		**OM_WALKLEYBLACK**					Analyst: **hb/df**
Organic Matter - Walkley Black	5.50	0.09	0.20		%	1	10/3/2013 4:00:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **hb**
1" Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
2mm Gradation	0.15	0.05	0.10		%	1	10/3/2013 1:00:00 PM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **hb**
% Clay	4.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Sand	96.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Silt	ND	0.1	0.1		%	1	10/3/2013 3:00:00 PM
Soil Class	SAND					1	10/3/2013 3:00:00 PM

Qualifiers:				
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below the Reporting Limit
	Limit	Reporting Limit	MDL	Method Detection Limit
	N	Spike Recovery outside accepted recovery limits	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT: AECOM **Client Sample ID:** 058 EFSC #26897
Lab Order: 1309111 **Collection Date:** 8/26/2013 3:00:00 PM
Project: Sediment Analysis
Lab ID: 1309111-004 **Matrix:** SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Aluminum	13900	4.01	12.8	N	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Arsenic	42.2	4.18	12.8		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Cadmium	13.9	0.285	0.851		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Chromium	32.7	7.53	21.3		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Copper	73.4	0.945	4.25		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Lead	12.5	0.153	0.425		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Nickel	79.8	0.122	0.425		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Selenium	4.79	0.289	0.851		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Silver	0.334	0.157	0.425	J	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Zinc	844	11.7	21.3		mg/Kg-dry	2	10/24/2013 2:54:11 PM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	0.0774	0.0627	0.216	JH	mg/Kg-dry	1	10/2/2013 9:07:00 AM
ORGANIC MATTER-WALKLEY BLACK		**OM_WALKLEYBLACK**					Analyst: **hb/df**
Organic Matter - Walkley Black	18.3	0.09	0.20		%	1	10/3/2013 4:00:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **hb**
1" Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
2mm Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **hb**
% Clay	6.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Sand	82.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Silt	12.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
Soil Class	LOAMY SAND					1	10/3/2013 3:00:00 PM

Qualifiers:				
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below the Reporting Limit
	Limit	Reporting Limit	MDL	Method Detection Limit
	N	Spike Recovery outside accepted recovery limits	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT: AECOM
Lab Order: 1309111
Project: Sediment Analysis
Lab ID: 1309111-005

Client Sample ID: 058 LSC #26898
Collection Date: 8/26/2013 10:00:00 AM
Matrix: SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Aluminum	12300	2.32	7.38	N	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Arsenic	23.7	2.42	7.38		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Cadmium	1.29	0.165	0.492		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Chromium	94.5	4.36	12.3		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Copper	56.7	0.546	2.46		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Lead	9.14	0.089	0.246		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Nickel	73.4	0.071	0.246		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Selenium	1.94	0.167	0.492		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Silver	0.168	0.091	0.246	J	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Zinc	205	6.79	12.3		mg/Kg-dry	2	10/24/2013 2:54:11 PM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	0.0402	0.0354	0.122	JH	mg/Kg-dry	1	10/2/2013 9:07:00 AM
ORGANIC MATTER-WALKLEY BLACK			**OM_WALKLEYBLACK**				Analyst: **hb/df**
Organic Matter - Walkley Black	1.67	0.09	0.20		%	1	10/3/2013 4:00:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **hb**
1" Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
2mm Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **hb**
% Clay	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Sand	96.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Silt	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
Soil Class	SAND					1	10/3/2013 3:00:00 PM

Qualifiers:

H	Holding times for preparation or analysis exceeded	J	Analyte detected below the Reporting Limit
Limit	Reporting Limit	MDL	Method Detection Limit
N	Spike Recovery outside accepted recovery limits	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT:	AECOM	**Client Sample ID:**	SAND (058)
Lab Order:	1309111	**Collection Date:**	8/26/2013 10:00:00 AM
Project:	Sediment Analysis		
Lab ID:	1309111-006	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Aluminum	205	1.20	3.82	N	mg/Kg-dry	1	10/24/2013 2:54:11 PM
Arsenic	ND	1.25	3.82		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Cadmium	ND	0.085	0.255		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Chromium	5.87	2.26	6.37	J	mg/Kg-dry	1	10/24/2013 2:54:11 PM
Copper	ND	0.283	1.27		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Lead	0.144	0.046	0.127		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Nickel	0.273	0.037	0.127		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Selenium	ND	0.087	0.255		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Silver	ND	0.047	0.127		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Zinc	4.09	3.52	6.37	J	mg/Kg-dry	1	10/24/2013 2:54:11 PM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	ND	0.0372	0.128		mg/Kg-dry	1	10/2/2013 9:07:00 AM
ORGANIC MATTER-WALKLEY BLACK			**OM_WALKLEYBLACK**				Analyst: **hb/df**
Organic Matter - Walkley Black	ND	0.09	0.20		%	1	10/3/2013 4:00:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **hb**
1" Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
2mm Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **hb**
% Clay	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Sand	96.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Silt	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
Soil Class	SAND					1	10/3/2013 3:00:00 PM

Qualifiers:	H	Holding times for preparation or analysis exceeded	J	Analyte detected below the Reporting Limit
	Limit	Reporting Limit	MDL	Method Detection Limit
	N	Spike Recovery outside accepted recovery limits	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT: AECOM
Lab Order: 1309111
Project: Sediment Analysis
Lab ID: 1309111-007

Client Sample ID: FORM SED (058)
Collection Date: 8/26/2013 10:00:00 AM

Matrix: SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Aluminum	2280	1.29	4.09	N	mg/Kg-dry	1	10/24/2013 2:54:11 PM
Arsenic	ND	1.34	4.09		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Cadmium	0.118	0.091	0.273	J	mg/Kg-dry	1	10/24/2013 2:54:11 PM
Chromium	10.0	2.42	6.82		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Copper	ND	0.303	1.36		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Lead	2.13	0.049	0.136		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Nickel	0.754	0.039	0.136		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Selenium	0.279	0.093	0.273		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Silver	0.060	0.050	0.136	J	mg/Kg-dry	1	10/24/2013 2:54:11 PM
Zinc	5.42	3.77	6.82	J	mg/Kg-dry	1	10/24/2013 2:54:11 PM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	ND	0.0406	0.140	H	mg/Kg-dry	1	10/2/2013 9:07:00 AM
ORGANIC MATTER-WALKLEY BLACK			**OM_WALKLEYBLACK**				Analyst: **hb/df**
Organic Matter - Walkley Black	18.0	0.09	0.20		%	1	10/3/2013 4:00:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **hb**
1" Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
2mm Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **hb**
% Clay	8.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Sand	88.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Silt	4.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
Soil Class	LOAMY SAND					1	10/3/2013 3:00:00 PM

Qualifiers:

H	Holding times for preparation or analysis exceeded	J	Analyte detected below the Reporting Limit
Limit	Reporting Limit	MDL	Method Detection Limit
N	Spike Recovery outside accepted recovery limits	ND	Not Detected at the Method Detection Limit (MDL)

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis

Work Order: 1309111
BatchID: 7259

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: ***7259-PB***			*Method:* ***SW7471***		*Batch ID:* ***7259***		*Analysis Date: 10/2/2013 9:07:00 AM*			
Mercury	ND	0.100	mg/Kg							
Sample ID: ***LCS-7259***			*Method:* ***SW7471***		*Batch ID:* ***7259***		*Analysis Date: 10/2/2013 9:07:00 AM*			
Mercury	17.1	1.22	mg/Kg	21.70	78.9	80	120			S*
Sample ID: ***1309111-001A-MS***			*Method:* ***SW7471***		*Batch ID:* ***7259***		*Analysis Date: 10/2/2013 9:07:00 AM*			
Mercury	25.3	1.58	mg/Kg-dry	28.28	89.5	75	125			H
Sample ID: ***1309111-001A-MSD***			*Method:* ***SW7471***		*Batch ID:* ***7259***		*Analysis Date: 10/2/2013 9:07:00 AM*			
Mercury	26.0	1.58	mg/Kg-dry	28.28	92.0	75	125	2.78	35	H

Qualifiers:

NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/kg; Nickel 79.2-139 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis

Work Order: 1309111
BatchID: 7262

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: 7262-PB-FILTERED			*Method: SW6020*		*Batch ID: 7262*					*Analysis Date: 10/24/2013 2:54:11 PM*
Aluminum	ND	3.00	mg/Kg							
Arsenic	ND	3.00	mg/Kg							
Cadmium	ND	0.200	mg/Kg							
Chromium	ND	5.00	mg/Kg							
Copper	ND	1.00	mg/Kg							
Lead	ND	0.100	mg/Kg							
Nickel	ND	0.100	mg/Kg							
Selenium	ND	0.200	mg/Kg							
Silver	ND	0.100	mg/Kg							
Zinc	ND	5.00	mg/Kg							
Sample ID: 7262-PB-UNFILTERED			*Method: SW6020*		*Batch ID: 7262*					*Analysis Date: 10/24/2013 2:54:11 PM*
Aluminum	ND	3.00	mg/Kg							
Arsenic	ND	3.00	mg/Kg							
Cadmium	ND	0.200	mg/Kg							
Chromium	ND	5.00	mg/Kg							
Copper	ND	1.00	mg/Kg							
Lead	ND	0.100	mg/Kg							
Nickel	ND	0.100	mg/Kg							
Selenium	ND	0.200	mg/Kg							
Silver	ND	0.100	mg/Kg							
Zinc	ND	5.00	mg/Kg							
Sample ID: LCS-7262			*Method: SW6020*		*Batch ID: 7262*					*Analysis Date: 10/24/2013 2:54:11 PM*
Aluminum	4530	2.99	mg/Kg	1107	409	80	120			S
Arsenic	110	2.99	mg/Kg	100.8	109	80	120			
Cadmium	195	0.200	mg/Kg	184.6	106	80	120			
Chromium	234	4.99	mg/Kg	180.6	130	80	120			S*
Copper	79.9	0.998	mg/Kg	73.22	109	80	120			
Lead	285	0.100	mg/Kg	250.4	114	80	120			
Nickel	131	0.100	mg/Kg	108.7	121	80	120			S*
Selenium	227	0.200	mg/Kg	212.5	107	80	120			
Silver	70.8	0.100	mg/Kg	59.86	118	80	120			
Zinc	633	4.99	mg/Kg	558.7	113	80	120			
Sample ID: LFB			*Method: SW6020*		*Batch ID: 7262*					*Analysis Date: 10/24/2013 2:54:11 PM*
Aluminum	194	3.00	mg/Kg	200.0	96.8	85	115			
Sample ID: 1309111-001A-MS			*Method: SW6020*		*Batch ID: 7262*					*Analysis Date: 10/24/2013 2:54:11 PM*
Aluminum	16400	7.79	mg/Kg-dry	1446	68.7	75	125			NA
Arsenic	181	7.79	mg/Kg-dry	131.6	118	75	125			
Cadmium	281	0.520	mg/Kg-dry	241.1	116	75	125			
Chromium	337	13.0	mg/Kg-dry	235.8	127	75	125			S*

Qualifiers: NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/kg; Nickel 79.2-139 mg/kg

Date: 28-Oct-13
Report Date: 25-Oct-13

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis
Work Order: 1309111
BatchID: 7262

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: ***1309111-001A-MS***			*Method:* ***SW6020***		*Batch ID:* ***7262***			*Analysis Date: 10/24/2013 2:54:11 PM*		
Copper	223	2.60	mg/Kg-dry	95.64	161	75	125			S
Lead	383	0.260	mg/Kg-dry	327.1	115	75	125			
Nickel	200	0.260	mg/Kg-dry	142.0	119	75	125			
Selenium	305	0.520	mg/Kg-dry	277.5	109	75	125			
Silver	91.5	0.260	mg/Kg-dry	78.18	117	75	125			
Zinc	932	13.0	mg/Kg-dry	729.7	112	75	125			
Sample ID: ***1309111-001A-MSD***			*Method:* ***SW6020***		*Batch ID:* ***7262***			*Analysis Date: 10/24/2013 2:54:11 PM*		
Aluminum	16900	7.76	mg/Kg-dry	1446	105	75	125	3.14	35	NA
Arsenic	189	7.76	mg/Kg-dry	131.6	125	75	125	4.35	35	
Cadmium	281	0.517	mg/Kg-dry	241.1	116	75	125	0.186	35	
Chromium	349	12.9	mg/Kg-dry	235.8	132	75	125	3.58	35	S
Copper	171	2.59	mg/Kg-dry	95.64	106	75	125	26.4	35	
Lead	381	0.259	mg/Kg-dry	327.1	114	75	125	0.645	35	
Nickel	202	0.259	mg/Kg-dry	142.0	121	75	125	1.15	35	
Selenium	312	0.517	mg/Kg-dry	277.5	112	75	125	2.12	35	
Silver	89.8	0.259	mg/Kg-dry	78.18	114	75	125	1.97	35	
Zinc	941	12.9	mg/Kg-dry	729.7	114	75	125	1.01	35	
Sample ID: ***1309111-001A-MST***			*Method:* ***SW6020***		*Batch ID:* ***7262***			*Analysis Date: 10/24/2013 2:54:11 PM*		
Aluminum	17900	7.79	mg/Kg-dry	1446	173	75	125	8.82	35	NA
Arsenic	184	7.79	mg/Kg-dry	131.6	120	75	125	1.35	35	
Cadmium	298	0.519	mg/Kg-dry	241.1	123	75	125	5.75	35	
Chromium	341	13.0	mg/Kg-dry	235.8	129	75	125	1.35	35	S*
Copper	173	2.60	mg/Kg-dry	95.64	109	75	125	25.2	35	
Lead	390	0.260	mg/Kg-dry	327.1	117	75	125	1.82	35	
Nickel	204	0.260	mg/Kg-dry	142.0	122	75	125	2.01	35	
Selenium	304	0.519	mg/Kg-dry	277.5	109	75	125	0.196	35	
Silver	88.7	0.260	mg/Kg-dry	78.18	113	75	125	3.11	35	
Zinc	941	13.0	mg/Kg-dry	729.7	114	75	125	0.935	35	

Qualifiers:
NA Sample conc. is > 4*spike level
S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/kg; Nickel 79.2-139 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis
Work Order: 1309111
BatchID: R24739

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
*Sample ID: **1309111-006A-D***			*Method: **ASTMD422***		*Batch ID: **R24739***		*Analysis Date: 10/3/2013 1:00:00 PM*			
1" Gradation	ND	0.10	%					0	35	
2mm Gradation	ND	0.10	%					0	35	

Qualifiers: NA Sample conc. is > 4*spike level S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/kg; Nickel 79.2-139 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis
Work Order: 1309111
BatchID: R24748

Sample ID: 1309111-006A-D *Method: MSA15-5* *Batch ID: R24748* *Analysis Date: 10/3/2013 3:00:00 PM*

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
% Clay	2.0	0.1	%					0	35	
% Sand	96.0	0.1	%					0	35	
% Silt	2.0	0.1	%					0	35	
Soil Class	SAND									

Qualifiers: NA Sample conc. is > 4*spike level S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/kg; Nickel 79.2-139 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis
Work Order: 1309111
BatchID: R24797

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
*Sample ID: **PB***			*Method: **OM_WALKLE***	*Batch ID: **R24797***			*Analysis Date: 10/3/2013 4:00:00 PM*			
Organic Matter - Walkl	ND	0.20	%							
*Sample ID: **LCS***			*Method: **OM_WALKLE***	*Batch ID: **R24797***			*Analysis Date: 10/3/2013 4:00:00 PM*			
Organic Matter - Walkl	2.14	0.20	%	2.500	85.4	80	120			
*Sample ID: **1309111-001A-D***			*Method: **OM_WALKLE***	*Batch ID: **R24797***			*Analysis Date: 10/3/2013 4:00:00 PM*			
Organic Matter - Walkl	0.54	0.20	%					12.2	35	

Qualifiers: NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/kg; Nickel 79.2-139 mg/kg

Coeur Alaska, Inc.
Juneau, Alaska

Report of Short-Term Chronic Toxicity of Whole Sediment to *Hyalella azteca*

Prepared by

AECOM

AECOM Environment
Environmental Toxicology
Fort Collins, CO

60297514-100-(104-109)
August / September 2013

Report of Short-Term Chronic Toxicity of Whole Sediment to Hyalella azteca

Project IDs: 60297514-100-(104-109)
August / September 2013

Sponsor and Laboratory Information

Sponsor	Coeur Alaska Inc. Kensington Mine 3031 Clinton Drive Suite 202 Juneau, Alaska 99801
Project Officer	Kevin Eppers (907) 523-3328
Testing Facility	AECOM Environment Fort Collins Environmental Toxicology Laboratory 4303 West LaPorte Ave. Fort Collins, CO 80521 Fax: (970) 490-2963 State of Florida NELAP Laboratory ID: E87972
Study Director	Rami B. Naddy, Ph.D (970) 416-0916 email: rami.naddy@aecom.com
Report Author	Amber Potts (970) 416-0916 email: amber.potts@aecom.com

Test Information

Test	Short-term chronic screening toxicity test of sediment	
Basis	USEPA (2000) and ASTM (2012)	
Test Period	August 27, 2013 @ 1100 - 1145 to September 6, 2013 @ 0900-1200	
Test Length	10 days	
Species	*Hyalella azteca*	
Test Material	Whole sediment	
Sediment ID	Sample ID	AECOM Laboratory ID
	LSH	26894
	LJC	26895
	USC	26896
	EFSC	26897
	LSC	26898
Control Treatments	Overlying Water, Silica Sand, and Formulated Sediment	
Overlying water	Moderately hard reconstituted water prepared according to USEPA (2002), augmented with approximately 50 mg/L Cl^- (as NaCl)	
Test Concentrations	0 (control) and 100% of each test sediment	

- *Results described in this report apply only to the samples submitted to the laboratory and analyzed, as listed in the report*
- *Test results comply with NELAC standards. Reports are intended to be considered in their entirety; AECOM is not responsible for consequences arising from use of a partial report*
- *This report contains 8 pages plus 3 appendices*

Sediment Collection and Receipt

Sample ID	Collection Date and Time	AECOM No.	Date of Receipt	Temp. at Arrival (°C)[a]
LSH	07/01/13 @ 0900	26894	07/10/13	3.8
LJC	07/01/13 @ 1100	26895	07/10/13	
USC	07/01/13 @ 1300	26896	07/10/13	
EFSC	07/01/13 @ 1500	26897	07/10/13	
LSC	07/02/13 @ 1000	26898	07/10/13	

[a] Air temperature of cooler
Note: See Appendix A for copies of chain of custody records

Control Sediment

The primary control sediment was coarse silica sand, obtained from a local commercial supplier (manufactured by Unimin® Corporation). A second control sediment with a smaller grain size and higher organic matter content (Kemble et al. 1999), was prepared in the laboratory. The composition of the formulated sediment is given in the following table.

Composition of Laboratory Formulated Sediment (Control)

Material	Source	Pre-Treatment	Weight (g)
Coarse Quartz Sand	Unimin Corporation, Emmett, ID	Rinsed with gentle mixing in deionized water until water ran clear. Dried in oven.	1242
Silt/Clay (ASP400)	Mozel, St. Louis, MO. Distributor = Englehardt	None	219
Dolomite	Grey Rock Clay Center, Ft. Collins, CO.	None	7.5
α-cellulose	Sigma	None	77.3
Humic Acid	Fluka	None	0.150
Total			1545.95

An additional control treatment was tested using only water (the same water used as overlying water in the other controls and field sediment tests).

Initial Overlying Water Characterization

Batch No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)	Cl^- (mg/L)
10820	8.1	88	58	543	<0.02	<1.0	51.8

[a] As $CaCO_3$
[b] Total residual chlorine

Test Sediment Preparation

Sample ID	Date Homogenized	Time Homogenized
Sand Control	August 26, 2013	1515-1518
Formulated Sediment		1526-1528
LSH		1519-1522
LJC		1519-1522
USC		1540-1543
EFSC		1539-1542
LSC		1540-1545

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Overlying water was added to the sand control and formulated sediment during the homogenization process to wet both controls prior to placement in test chambers. Before, during, and after homogenization, any noticeable debris (including sticks and other plant material) and large stones were removed from the test sediment and discarded.

Test Conditions

Test Type	Static sediment with continuous replacement of overlying water
Test Duration	10 days
Overlying Water Delivery System	Continuous renewal (flow-through)[a]
Test Endpoints	Survival, dry weight per original and surviving organism
Test Chambers	500-ml glass beakers
Test Sediment Volume	100 ml
Overlying Water Volume	175 ml
Replicates per Treatment	8
Organisms per Replicate	10
Test Temperature	23 ± 1°C
Lighting	Fluorescent, 16 hours light:8 hours dark
Chamber Placement	Randomized
Test Sediment Renewal	None
Test Overlying Water Renewal	Approximately two volume additions per test chamber per day

[a] Continuous replacement via a drip system

Test Organism

Species and Lot Number	*Hyalella azteca*, FCETL Lot 13-032
Age	8 – 10 days
Size (pre-test wt.)	0.018 mg/organism (mean)
Source	Aquatic BioSystems (ABS), Fort Collins, CO
Overlying Water	Moderately Hard Reconstituted Water with added chloride (51.8 mg/L) as NaCl, RW # 10820
Reference Toxicant Testing	Initiated August 27, 2013 using sodium chloride (NaCl)

TEST RESULTS

Biological Data – Survival and Dry Weight

Sample ID	Percent Survival	Dry Weight (mg)	
		Per original organism	Per surviving organism
Water Control	92.5	0.053	0.057
Sand Control	96.2	0.070	0.072
Formulated Sediment	50.0	0.022	0.048
LSH	95.0	0.066	0.068
LJC	87.5	0.059	0.068
USC	96.2	0.070	0.073
EFSC	91.2	0.065	0.072
LSC	96.2	0.081	0.085

Note: None of the test sediments had any statistically significant reductions in survival or growth relative to the sand. Analyses were completed using Toxstat Version 3.5 (WEST, Inc. and Gulley 1996).See Appendix B for test data sheets

Analytical Data

Parameter	Sample Identification						
	Sand	Form. Sed.	LSC	LSH	LJC	USC	EFSC
Metals (mg/kg-dry)[a]							
Aluminum	205 N	2,280 N	12,300 N	15,400 N	10,300 N	14,600 N	13,900 N
Chromium	5.87 J	10.0	94.5	37.4	24.4	101	32.7
Zinc	4.09 J	5.42 J	205	111	121	105	844
Arsenic	<1.25	<1.34	23.7	25.4	11.9	13.5	42.2
Cadmium	<0.085	0.118 J	1.29	0.390 J	0.492	0.750	13.9
Copper	<0.283	<0.303	56.7	69.4	56.1	44.6	73.4
Lead	0.144	2.13	9.14	7.39	8.00	2.70	12.5
Nickel	0.273	0.754	73.4	30.9	15.7	55.0	79.8
Selenium	<0.087	0.279	1.94	1.77	<0.163	3.21	4.79
Silver	<0.047	0.060 J	0.168 J	0.306	0.269	0.131 J	0.334 J
Mercury	<0.0372	<0.0406 H	0.0402 J, H	<0.0384 H	<0.0354 H	<0.0380 H	0.0774 J, H
Particle Size (%)[b]							
Clay	2.0	8.0	2.0	2.0	2.0	4.0	6.0
Sand	96.0	88.0	96.0	96.0	96.0	96.0	82.0
Silt	2.0	4.0	2.0	2.0	2.0	ND	12.0
Texture	Sand	Loamy sand	Sand	Sand	Sand	Sand	Loamy sand
Coarse Material (2 mm)	<0.05	<0.05	<0.05	0.58	0.28	0.15	<0.05
TOC (%-dry)[c]	<0.09	18.0	1.67	0.61	1.08	5.50	18.3
Acid Volatile Sulfide (µmoles/g)	NM	NM	1.84	<1.40	<1.40	<1.40	5.20

[a] As, Cd, Cr, Pb, Ni, Se Al, Zn, and Ag by SW-846 Method 6020, Hg by SW-846 7471 (USEPA 1986)
[b] Particle size was determined using ASTM Method D422 and Modified ASA 15-5
[c] TOC was determined using the Walkley Black Method
N = Spike recovery outside accepted recovery limits
J = The concentration was below the reporting limit but above the method detection limit
H = Holding times for preparation or analysis exceeded
Values presented as ‘<’ are below the MDL
NM = Parameter not measured for this sample
Note: See Appendix C for a copy of the reports from the analytical laboratory (MSE Analytical Laboratory, Butte, MT)

Total and Total Volatile Solids

Sample ID	Percent Total Solids[a]	Percent Total Volatile Solids[b]
Sand	78.73	0.076
Formulated Sediment	76.70	5.15
LSC	74.57	1.63
LJC	73.21	0.90
LSH	75.66	0.75
USC	74.21	2.73
EFSC	43.66	13.30

[a] Total solids were determined using Standard Methods 2540B (APHA 1998)

[b] Total volatile solids were determined using Standard Methods 2540E (APHA 1998)

Note: All values are means of duplicate analyses and determined at AECOM/FCETL. See Appendix C for data sheets.

Physical and Chemical Data

Sample ID	pH (s.u.)	DO (mg/L)	Cond. (µS/cm)	Temp. (°C)[a]	Ammonia as N (mg/L)	Hardness (mg/L as $CaCO_3$)	Alkalinity (mg/L as $CaCO_3$)
Water Control	7.6-8.2	5.3-6.3	543-574	23-24	<1.0 to 1.0	88-100	58-66
Sand Control	7.9-8.2	5.9-6.5	539-613	23-24	<1.0	80-108	60-74
Formulated Sediment	7.8-8.0	5.2-6.4	583-776	23-24	<1.0	104-150	67-115
LSH	7.8-8.1	5.6-6.5	517-760	22-24	<1.0	100-128	63-82
LJC	7.6-8.0	5.8-6.4	512-565	23-24	<1.0	84-114	49-67
USC	7.8-8.0	5.8-6.2	539-664	22-24	<1.0	100-114	57-65
EFSC	7.6-7.8	5.1-6.2	557-685	22-24	<1.0	114-162	79-104
LSC	7.7-7.9	5.4-6.5	493-626	22-24	<1.0	92-136	59-93

[a] Temperature in test chambers

Reference Toxicant Test Results for *H. azteca*

Organism Lot Number	Test Dates	96-Hour LC_{50}	AECOM/FCETL Historical 95% Control Limits	
			Low	High
13-032	08/27/13 to 08/31/13	1,888	1,240	3,253

Note: Values are expressed as mg/L chloride

References

APHA. 1998. Standard Methods for the Examination of Water and Wastewater. Amer. Public Health Assoc., Amer. Water Works Assoc., Water Pollut. Control Fed., APHA, Washington, DC.

ASTM. 2012. Standard Test Method for Measuring the Toxicity of Sediment-Associated Contaminants with Fresh Water Invertebrates. Method E 1706-05 In *2012 Annual Book of ASTM Standards, Section 11, Water and Environmental Technology, Volume 11.06, Biological Effects and Environmental Fate; Biotechnology*. American Society of Testing and Materials. West Conshohocken, PA.

Kemble, N.E., F.J. Dwyer, C.G. Ingersoll, T.D. Dawson, and T.J. Norberg-King. 1999. Tolerance of Freshwater Test Organisms to Formulated Sediments for Use as Control Materials in Whole-Sediment Toxicity Test. *Environ. Toxicol. Chem.* 18:222-230.

USEPA. 1986. Test Methods for Evaluating Solid Waste. Third Edition. SW-846.

USEPA. 2000. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. EPA/600/R-99/064.

USEPA. 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. Fifth Edition. EPA-821-R-02-012.

WEST, Inc. and D.D. Gulley. 1996. Toxstat Version 3.5. Western EcoSystems Technology, Inc., Cheyenne, WY.

Statement of Procedural Compliance

I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge, accurate and complete.

October 29, 2013

Rami Naddy, Ph.D.
Study Director

Date

Statement of Quality Assurance

The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with standard operating procedures, and that the resulting data and report meet the requirements of the NELAC standards. This report is an accurate reflection of the raw data.

Anita Rellner

October 29, 2013

Quality Assurance Unit

Date

APPENDIX A

Chain of Custody

AECOM

CHAIN OF CUSTODY RECORD

Page 1 of 2

Client/Project Name: Coeur Alaska

Project Number: 058

Sampler (Print Name)/(Affiliation): Benjamin Brewster ADFG

Signature: Benjamin Brewster

Project Location: FCet C/AECOM

Field Logbook No.:

Chain of Custody Tape Nos.: 43903

Send Results/Report to: Kate.Kanouse@alaska.gov

TAT:

Container Type
P – Plastic
A – Amber Glass
S – Clear Glass
V – VOA Vial
O – Other
E – Encore

Preservation
1 – HCl, 4°
2 – H2SO4, 4°
3 – HNO3, 4°
4 – NaOH, 4°
5 – NaOH/ZnAc, 4°
6 – Na2S2O3, 4°
7 – 4°

Matrix Codes:
DW – Drinking Water
WW – Wastewater
GW – Groundwater
SW – Surface Water
ST – Storm Water
W – Water
S – Soil
SL – Sludge
SD – Sediment
SO – Solid
A – Air
L – Liquid
P – Product

Analysis Requested

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	Total metals (Al, Cr, Ni, Ag, Zn, (As, Cd, Cu, Pb, Se)	TOC (walkley Black)	Mercury	% (Coarse Material)	Rapid Hydro (% Clay/Sand, Silt)	AVS	Short term toxicity of whole sediment to C. dilutus	Short term toxicity of whole sediment to H. azteca			Lab I.D.	Remarks
#1 058 LSH	7/1/13	0900			1g	L	ice		X	X	X	X	X		X	X			26894	
#2 058 LJC	7/1/13	1100			1g	"	"		X	X	X	X	X		X	X			26895	
#3 058 USC	7/1/13	1300			1g	"	"		X	X	X	X	X		X	X			26896	
#4 058 EFSC	7/1/13	1500			1g	"	"		X	X	X	X	X		X	X			26897	
#5 058 LSC	7/2/13	1000			1g	"	"		X	X	X	X	X		X	X			26898	
LSH	7/1/13	0900			4oz	"	"							X						
LJC	7/1/13	1100			4oz	"	"							X						
USC	7/1/13	1300			4oz	"	"							X						
EFSC	7/1/13	1500			4oz	"	"							X						
LSC	7/2/13	1000			4oz	"	"							X						
WFSC	7/2/13	1400			500ml	"	"		X	X	X	X	X							
USH	7/1/13	1000			50ml	"	"		X	X	X	X	X						26899	
WFSC	7/2/13	1400			2oz	"	"							X					26900	

Relinquished by: (Print Name)/(Affiliation) Benjamin Brewster ADFG
Signature: Benjamin Brewster
Date: 7/9/13
Time: 8:12

Received by: (Print Name)/(Affiliation) Kara Barnett/AECOM
Signature: Kara Barnett
Date: 7/10/13
Time: 1000

Relinquished by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

Received by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

Relinquished by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

Received by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

Analytical Laboratory (Destination):
Cooler temp 3.8 °C
AECOM Toxicology Lab
4303 W. Laporte Avenue
Fort Collins, CO 80521
(970) 416-0916
(970) 490-2963 (FAX)
(L-4)

Sample Shipped Via: UPS [✓ FedEx] Courier Other

Temp blank: Yes [✓ No]

Serial No. № 51531

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APPENDIX B

Data Sheets

H. azteca 10-day Survival and Growth, Testing Cover Page

10/17/13
QA: 10/25/13

Project Number: 60297514-100-(104-109)
Test Substance: Sediment
Test Species: *H. azteca*
Lot #: 13-032

① Method ~~Protocol~~ #: USEPA(2000) & ASTM (2009)
Age: 8-10 days (7-14 days)
Supplier: ABS

Test Type: Chronic, Static-Renewal
Overlying Water: Reconstituted Fresh Water (Smith et al., 1997) - (RW# 10820)
Sampling Date(s): 07/01/12 - 07/02/12
FCETL Sample #(s): 26894 - LSH; 26895 - LJC; 26896 - USC; 26897 - EFSC; 26898 - LSC
Test Initiation Date/Time: 8/27/13 @ ② ~~1145~~ 1100-1145
Test Termination Date/Time: 9/6/13 @ 0900-1200

Investigators: Amy / RR / KB / MW /
Sampling Time(s): LSH - 7/1/13 @ 0900, LJC - 7/1/13 @ 1100
USC - 7/1/13 @ 1300, EFSC - 7/1/13 @ 1500
LSC - 7/2/13 @ 1000

Renewal Frequency: Cont. drip, 2+ vol/day
Feeding Freq: daily
Food Type/Amount: 1 ml YTC daily
Test Temp: 23 +/- 1 deg C

Test Chamber Capacity: 500-ML
Test Soltn. Vol: 100 mL sed/175 mL H2O
Repl's/Trtmnt: 8

Test Duration: 10 days
Org.'s/Repl: 10
Env. Chmbr/[✓ Bath]: 3

Photoperiod: 16hr light: 8hr dark
Light Intensity: 50-100 ft.-c

Water Characterization: Minimum of Hardness, Alkalinity, & Conductivity on days 0 and 10; Ammonia on days 0, 3, 7, and 10; No TRC; pH, temperature & DO daily on overlying water
aerate if dissolved oxygen <2.5 mg/L

Test Sediment (s):
1) Water (Cont.)
2) Sand (Cont.)
3) Form Sed. (Cont.)
4) LSH
5) LJC
6) USC
7) EFSC
8) LSC
9)
10)
11)

Reference Tox. Dates: 8/27/13 - 8/31/13
LC50: 1888 mg/L Cl
Hist. Limits: 1240-3253 mg/L Cl
Method: Probit
Study Director Initials: for RBN
Date: 8/26/13

Overlying water added at a minimum of 2 volume additions/day; equivalent to >350 ml/day or >0.24 ml/min

① 10/18/13, E
② 10/28/13, CF

RW10820 = 70% MQ, 30% HT moderately hard reconstituted water with the addition of 50mg/L Cl

SEDIMENT/SOIL PREPARATION

Project Number: 60297514-100-(104-109)

10/28/13
10/18/13

Artificial soil	
Constituent/source	**Amount added (g)**
Coarse Silica Sand	1242
Silt/Clay (ASP 400)	219
Dolomite	7.5
α-cellulose	77.3
Humic Acid	0.15
Total	1545.95

Notes: Container was placed into tumbler for a minimum of an hour to homogenize prior to use 8/26/13 @ ~~1000~~ ① 0940 -1400

See TIE Sheet Daily Log for notes on the preparation of the formulated sediment

Soil/sediment	FCETL#	Homogenization			
		Date	From	To	Analyst
Water (Cont.)	NA				
Sand (Cont.)	NA	8/26/13	1515	1518	
Form Sed. (Cont.)	NA	8/26/13	1526	1528	
LSH	26894	8/26/13	1519	1522	Am
LJC	26895	8/26/13	1519	1522	RR
USC	26896	8/26/13	1540	1543	An
EFSC	26897	8/26/13	1539	1542	RR
LSC	26898	8/26/13	1540	1545	

① A 8/26/13, E

10/18/13
QA: AR 10/25/13

SUBJECT: DAILY LOG

ALL ENTRIES MUST BE INITIALLED WITH DATE AND TIME:

60297514-100-(104-109) H. azteca

Prep. of formulated sediment 8/26/13 @ 0830

Combined the following together in a plastic 4L Jar:

~1242g Coarse silica sand (washed & baked)
~219g clay
~7.5g Dolomite
~77.3g α-cellulose (lot # C12-087)
~0.1502g humic acid (lot # C10-034)
total: ~1545.9g

Placed 4L jar with above ingredients into rotary tumbler on 8/26/13 @ 0940 to 1400

Formulated sediment was moistened with RW 10820 (overlaying H_2O) and warmed to ~23°C in environmental chamber

BIOLOGICAL DATA H. azteca Chronic, Static-Renewal Project No, 60297514-100-(104-109) QA: AR 09/26/13 10/17/13

Test terminated: 9/6/13 from 0900-1200

Sediment	Test Termination	A	B	C	D	E	F	G	H	Remarks:	%survival
Water (Cont.)	# Surviving	10	~~0~~~~8~~9	9	~~8~~8	10	9	10	9		92.5%
	# Observed Dead	0	1	0	②~~0~~1	0	0	0	1	Found worm organism in H	
	# Not Found	0	0	1	②~~0~~1	0	1	0	0		
	Initials	MW	[illegible]	RR	②RR JDM	W	[illegible]	[illegible]	JDM		
Sand (Cont.)	# Surviving	10	9	10	10	10	8	10	10	Found worm organism in H	96.2%
	# Observed Dead	0	0	0	0	0	0	0	0		
	# Not Found	0	1	0	0	0	2	0	0		
	Initials	MW	JDM	[illegible]	[illegible]	W	[illegible]	RR	[illegible]		
Form Sed. (Cont.)	# Surviving	10	4	7	5	2	8	2	2		50%
	# Observed Dead	0	0	0	0	0	0	0	0		
	# Not Found	0	6	3	5	8	2	8	8		
	Initials	[illegible]	W	MW	RR	[illegible]	JDM	[illegible]	[illegible]		
LSH	# Surviving	9	10	10	9	10	10	8	10		95%
	# Observed Dead	0	0	0	0	0	0	0	0		
	# Not Found	1	0	0	1	0	0	2	0		
	Initials	JDM	MW	RR	[illegible]	RR	[illegible]	JDM	[illegible]		
LJC	# Surviving	~~0~~~~8~~9	10	10	8	9	7	10	~~10~~7	①Found worm organism in H	87.5%
	# Observed Dead	0	0	0	1	0	2	0	0		
	# Not Found	2	0	0	1	1	~~2~~1②	0	①~~0~~3		
	Initials	[illegible]	[illegible]	MW	RR	JDM	RR	[illegible]	[illegible]	← W	
USC	# Surviving	9	10	10	9	10	10	9	10		96.2%
	# Observed Dead	0	0	0	0	0	0	0	0		
	# Not Found	②~~0~~1	0	0	1	0	0	1	0		
	Initials	RR	MW	[illegible]	RR	JDM	JDM	[illegible]	W		
EFSC	# Surviving	10	9	9	7	10	9	10	9		91.2%
	# Observed Dead	0	0	0	0	0	0	0	0		
	# Not Found	0	1	1	3	0	1	0	1		
	Initials	RR	MW	MW	W	MW	MW	RR	[illegible]		
LSC	# Surviving	10	10	10	10	10	8	10	9		96.25%
	# Observed Dead	0	0	0	0	0	0	0	0		
	# Not Found	0	0	0	0	0	2	0	1		
	Initials	JDM	MW	MW	MW	MW	[illegible]	MW	MW		
	# Surviving										
	# Observed Dead										
	# Not Found										
	Initials										
	# Surviving										
	# Observed Dead										
	# Not Found										
	Initials										

①RB 9/6/13 E
②RR 9/6/13 E

Page 5 of 33

10/18/13
QA 10/25/13

CHEMICAL DATA (Composite of Overlying Water) *H. azteca* Chronic, Static-Renewal Project No. 60297514-100-(104-109)

Parameter	Sediment	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day	Meter	Date	Time	Initials
Dissolved	Water (Cont.)	6.3	6.3	5.7	5.8	5.7	5.2	5.6	5.3	6.2	6.2	5.9	0	5	8/27/13	1030	Am
Oxygen	Sand (Cont.)	6.4	6.5	6.4	6.4	6.5	6.4	6.3	5.9	6.2	6.3	6.1	1	5	8/28/13	0940	Am
(mg/l)	Form Sed. (Cont.)	6.2	6.0	5.9	5.4	6.0	5.8	6.0	5.5	5.7	6.4	5.2	2	5	8/29/13	1440	KB
	LSH	5.9	6.5	5.8	5.8	6.0	6.3	6.1	6.3	5.8	6.1	5.6	3	5	8/30/13	1045	Am
	LJC	5.8	6.4	5.8	5.8	6.1	6.0	6.2	5.8	5.9	6.2	5.8	4	5	8/31/13	1450	AB
	USC	5.8	6.2	5.9	6.1	6.1	6.2	6.1	6.1	6.0	6.2	5.8	5	5	9/1/13	1130	RR
	EFSC	5.1	5.3	5.4	6.0	6.2	6.1	6.0	5.7	5.7	6.1	5.2	6	5	9/2/13	1645	RR
	LSC	5.7	5.8	6.1	5.9	6.3	6.1	6.5	6.1	6.0	6.2	5.4	7	5	9/3/13	1645	KB
													8	5	9/4/13	1540	KB
													9	5	9/5/13	1515	*
													10	5	9/6/13	0850	KB
	Replicate	A	B	C	D	E	F	G	H	A	B	C					
Temp	Water (Cont.)	24	24	23	24	23	24	24	23	24	23	24	0	L-6	8/27/13	1030	Am
	Sand (Cont.)	24	24	23	23	23	24	23	24	24	23	24	1	L-6	8/28/13	0940	Am
(deg C)	Form Sed. (Cont.)	24	24	23	24	23	23	23	24	24	23	23	2	L-6	8/29/13	1440	KB
	LSH	24	24	23	24	23	24	23	22	23	22	23	3	L-6	8/30/13	1045	Am
	LJC	24	24	23	24	23	24	23	23	23	23	23	4	L-6	8/31/13	1450	AB
	USC	24	24	23	24	23	23	24	22	23	22	23	5	L-6	9/1/13	1130	RR
	EFSC	24	24	23	24	23	23	23	23	23	22	23	6	L-6	9/2/13	1645	RR
	LSC	24	24	23	23	23	23	24	23	24	22	23	7	L-13	9/3/13	1645	KB
													8	L-13	9/4/13	1540	KB
													9	L13	9/5/13	1455	*
													10	L-13	9/6/13	0850	KB
	Replicate	A	B	C	D	E	F	G	H	A	B	C					
pH	Water (Cont.)	8.2	7.9	7.8	7.8	7.7	7.7	7.6	7.8	7.7	7.9	8.0	0	FM20	8/27/13	1030	Am
	Sand (Cont.)	8.2	8.2	8.0	8.1	8.1	8.0	8.1	8.0	7.9	8.1	8.1	1	FM20	8/28/13	0940	Am
	Form Sed. (Cont.)	8.0	7.8	7.8	7.8	7.9	7.9	7.9	8.0	7.8	7.9	7.9	2	FM20	8/29/13	1440	KB
	LSH	8.0	8.1	7.8	7.9	8.0	7.9	7.9	8.0	7.8	8.0	8.0	3	FM20	8/30/13	1045	Am
	LJC	7.6	7.8	7.8	7.7	7.8	7.6	7.6	7.8	7.7	7.9	8.0	4	FM20	8/31/13	1450	AB
	USC	7.9	7.9	7.8	7.9	7.9	7.9	7.9	8.0	7.9	7.9	7.8	5	FM20	9/1/13	1140	RR
	EFSC	7.5	7.6	7.6	7.8	7.8	7.7	7.7	7.8	7.6	7.8	7.7	6	FM20	9/2/13	1645	RR
	LSC	7.7	7.7	7.8	7.7	7.9	7.7	7.8	7.9	7.7	7.9	7.7	7	FM20	9/3/13	1645	KB
													8	FM20	9/4/13	1540	KB
													9	FM20	9/5/13	1520	*
	Replicate	A	B	C	D	E	F	G	H	A	B	C	10	FM20	9/6/13	0850	KB

OVERLYING WATER CHARACTERIZATION *H. azteca* Chronic, Static-Renewal Project No. 60297514-100-(104-109)

QA: AF 10/25/13

	Conductivity (µS/cm)		Hardness (mg/L as CaCO3)		Alkalinity (mg/L as CaCO3)		Ammonia (mg/L)			
Sediment	Day 0	Day 10	Day 0	Day 10	Day 0	Day 10	Day 0	Day 3	Day 7	Day 10
Water (Cont.)	543	574	98	100	58	66	<1.0	<1.0	<1.0	1.5/1.0*
Sand (Cont.)	539	613	80	108	60	74	<1.0	<1.0	<1.0	<1.0
Form Sed. (Cont.)	583	776	104	150	67	115	<1.0	<1.0	<1.0	<1.0
LSH	517	762	100	128	63	82	<1.0	<1.0	<1.0	<1.0
LJC	512	565	84	114	49	67	<1.0	<1.0	<1.0	<1.0
USC	539	664	100	114	65	57	<1.0	<1.0	<1.0	<1.0
EFSC	557	685	114	162	79	104	<1.0(0.92)*	<1.0	<1.0	<1.0
LSC	493	626	92	136	59	93	<1.0	<1.0	<1.0	<1.0
Overlying Water	543		98		58		<1.0			
TRC:	<0.02									
Cl:	50.1									
Meter #	15	15	titr	titr	titr	titr	HA#1	HA#1	HA#1	HA#1
Date:	8/27/13	9/6/13	8/27/13	9/6/13	8/27/13	9/6/13	8/27/13	8/30/13	9/3/13	9/6/13
Time:	1120	0850	1120	1315	1120	1315	1500	1505	1700	1430
Initials:	MW	KB	MW	JDM	MW	JDM	MW	AB	MW	SP

*HA#1/HS#1

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DAILY TESTING LOG | *H. azteca* | Chronic, Static-Renewal | Project No. 60297514-100-(104-109)

QA AR 10/25/13 10/17/13

Day -1	Sediment Homogenized @ 1515-1545 Overlying water added to chambers @ 1600			Initials/Date: Am / 8/26/13
Day 0	Test organisms added to chambers @ 1100 Bath CT = 23.0°C	Range = 21.0-24.2°C	Feeding: 1200	Initials/Date: Am 8/27/13
Day 1	Bath CT = 23.8°C	Range = 23.4-24.2 °C	Feeding: 1635 KB	Initials/Date: Am 8/28/13
Day 2	Bath CT = 23.8°C	Range = 23.4-24.2 °C	Feeding: 1630 KB	Initials/Date: KB 8/29/13
Day 3	Bath CT = 23.8°C	Range = 23.4-24.2°C	Feeding: 1650 Am	Initials/Date: AmL 8/30/13
Day 4	Bath CT = 23.8 °C	Range = 23.4-24.2°C	Feeding: 1530 Am	Initials/Date: KB 8/31/13
Day 5	Bath CT = 23.8°C	Range = 23.4-24.2°C	Feeding: 1615 KB	Initials/Date: RR 9/1/13
Day 6	Bath CT = 23.8	Range = 23.8-24.2°C	Feeding: 1650 KB	Initials/Date: RR 9/2/13
Day 7	Bath CT = 23.8	Range = 23.8-24.2 °C	Feeding: 1655 KB	Initials/Date: KB 9/3/13
Day 8	Bath CT = 24.0	Range = 23.8-24.4 °C	Feeding: 1650 MT	Initials/Date: KB 9/4/13
Day 9	Bath CT = 24.0	Range = 23.8-24.4 °C	Feeding: 1525	Initials/Date: 9/5/13
Day 10	Bath CT = 23.8	Range = 21.2-24.4 °C	Feeding: N/A	Initials/Date: KB 9/6/13

058/LB14 Pre-weights TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

*10/17/13 QBJ AR 10/25/13

Project Number: 60297514-100(104-109)
Species: H.①a Azteca
Date/Time of Tare Wt.: 8/27/13 @ 1130
Test Substance:
Analyst Tare: mt Analyst Gross: mt
Date/Time of Gross Wt.: 9/11/13 @ 1445
Comments:
Analytical Balance ID: Sart #1
Dried in Oven # 3 from ①Date: 8/27/13 Time: 1215
to Date: ~~8/28/13~~ Δ Time: Δ

Weight Type (Circle): Wet Blot Dry [✓ Dry (~~>100°C~~ 60-90°C)②] AFDW (>500°C)
[✓ Lot] or Batch Number: 13-032

Boat No.	Treatment	Rep.	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)[1]	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	1			0.93257	0.93288	0.00031					15		
	2			0.94082	0.94164	0.00082					8°		
	3			0.93713	0.93735	0.00022					15		
	4			0.93103	0.93107	0.00004					2*		
Blank				0.93920	0.93920								
Range													
Mean													

Test Solution Volume:
Loading Rate:

[1] Add in weight loss of blank boat, if appropriate.

① mt 9/11/13 E
② AR 09/26/13

° Pan #2 was knocked over. Some organisms were lost, dirt possibly added to pan.
* A salt crystal was removed from pan before weighing.
Δ no date or time

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 60297514-100-(104-109) [058]

Species: *Hyalella azteca*

9/26/13
QA: AR 10/07/13

Treatment	Rep	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)	No of Org. Organisms	Mean Wt./ Original Organism (mg)	Mean Wt./ Treatment (mg) (Original)	Number of Surv. Organisms	Mean Wt./ Surviving Organism (mg)	Mean Wt./ Treatment (mg) (Surviving)
Initial wts	A		0.93257	0.93288	0.00031	0.00031	15	0.021	0.0177	15	0.021	0.0177
	B		0.93713	0.93735	0.00022	0.00022	15	0.015		15	0.015	
Blank			0.93920	0.93920	0.00000							

Summary Statistics for Growth Data (dry wt per original)

Treatment	N	Min	Max	Mean	SD	C.V.
Initial wts	2	0.015	0.021	0.0177	0.0042	24.015%

Summary Statistics for Growth Data (dry wt per surviving organism)

Treatment	N	Min	Max	Mean	SD	C.V.
Initial wts	2	0.015	0.021	0.0177	0.0042	24.015%

&9/27/13

QA: AR09/26/13

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 6029754-100-(104-109)
Test Substance: Sediment
Species: H. azteca
Analyst Tare: wt
Analyst Gross: RR
Date/Time of Tare Wt.: 9/6/13 @ 1120
Date/Time of Gross Wt.: 9/9/13 @ 1320

Comments:
Analytical Balance ID: Sart #1
Dried in Oven # 3 from Date: 9/6/13 Time: 1550
to Date: 9/9/13 Time: 0855

Weight Type (Circle): Wet Blot Dry [✓ Dry (~~>100°C~~) ③ (60-90°C)] AFDW (>500°C)

[✓ Lot] or Batch Number: 13-032

Boat No.	Treatment	Rep.	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)[1]	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	Water control	A		0.91208	0.91275	0.00067					10		
		B		0.93338	0.93386	0.00048					9		
		C		0.93009	0.93047	0.00038					9		
		D		0.92437	0.92473	0.00036					8		
		E		0.91291	0.91366	0.00075					10		
		F		0.91764	0.91808	0.00044					9		
		G		0.92400	0.92444	0.00044					10		
		H		0.92136	0.92179	0.00043					9		
	Sand control	A		①6 0.93~~7~~96	0.93757	0.00061					10		
		B		0.94271	0.94326	0.00055					9		
		C		0.94354	0.94422	0.00068					10		
		D		0.94409	0.94484	0.00075 ~~0.945~~②					10		
Blank				0.92174	0.92170	-0.00004							
Range													
Mean													

Test Solution Volume:

Loading Rate:

[1] Add in weight loss of blank boat, if appropriate.

①wt 9/6/13E
②RR 9/9/13;wp
③&9/26/13;E

&9/27/13 ak-AR09/26/13

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 60297514-100-(104-109)
Test Substance: Sediment
Species: H. azteca
Analyst Tare: mt
Analyst Gross: RR
Date/Time of Tare Wt.: 9/6/13 @ 1120
Date/Time of Gross Wt.: 9/9/13 @1320

Comments:
Analytical Balance ID: Sart #1
Dried in Oven # 3 from Date: 9/6/13 Time: ~~1530~~ 1550 ①
to Date: 9/9/13 Time: 0855

Weight Type (Circle): Wet Blot Dry [✓ Dry (~~>100°C~~ 60-90°C)] AFDW (>500°C)

[✓ Lot] or Batch Number: 13-032

Boat No.	Treatment	Rep.	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)[1]	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	Sand control	E		0.94279	0.94355	0.00076		10			10		
		F		0.91857	0.91913	0.00056		10			8		
		G		0.91522	0.91596	0.00074		10			10		
		H		0.91138	0.91197	0.00059		10			10		
	Form Sed Control	A		0.94324	0.94354	0.00030		10			10		
		B		0.94085	0.94093	0.00008		10			4		
		C		0.94248	0.94278	0.00030		10			7		
		D		0.93784	0.93801	0.00017		10			5		
		E		0.94517	0.94533	0.00016		10			2		
		F		0.94475	0.94504	0.00029		10			8		
		G		0.94540	0.94543	0.00003		10			2		
		H		0.94599	0.94606	0.00007					2		
Blank													
Range													
Mean													

Test Solution Volume:
Loading Rate:

[1] Add in weight loss of blank boat, if appropriate.

①AR9/26/13

✱ 9/27/13

QA > AR09126/13

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 6029514-100-(104-109)
Test Substance: Sediment
Comments:
Analytical Balance ID: Sart #1
Dried in Oven # 3 from Date: 9/6/13 Time: 1550
to Date: 9/9/13 Time: 0855
Species: H. azteca
Analyst Tare: mt
Analyst Gross: RR
Date/Time of Tare Wt.: 9/6/13 @ 1120
Date/Time of Gross Wt.: 9/9/13 @ 1320

Weight Type (Circle): Wet Blot Dry [✓ Dry (~~>100°C~~ 60-90°C ②)] AFDW (>500°C)

[✓ Lot] or Batch Number: 13-032

Boat No.	Treatment	Rep.	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)[1]	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	LSH	A		0.93806	0.93861	0.00055		10			9		
		B		0.93859	0.93921 ~~0.00055~~ ①	0.00062		10			10		
		C		0.92381	0.92443 ~~0.93[illegible]~~ ①	0.00062		10			10		
		D		0.92124	0.92182	0.00058		10			9		
		E		0.93040	0.93093	0.00053		10			10		
		F		0.92125	0.92195	0.00070		10			10		
		G		0.93455	0.93533	0.00078		10			10 ▲		
		H		0.92200	0.92241 ~~0.93553~~ ①	0.00041		6			6 Ⓐ		
	LSC	A		0.95787	0.95837	0.00050		10			9		
		B		0.92053	0.92117	0.00064		10			10		
		C		0.94968	0.95033	0.00065		10			10		
		D		0.92806	0.92847	0.00041		10			8		
Blank													
Range													
Mean													

Test Solution Volume:
Loading Rate:

[1] Add in weight loss of blank boat, if appropriate.

① RR 9/9/13; WP
② ✱ 10/3/13, E

Ⓐ During the drying process 4 organisms were lost, making the total organism count 6 instead

▲ During the drying process two organisms were ~~lost,~~ gained ② making a ~~total~~ total organism count for Replicate G 10 instead of ② ~~10~~ 8. This replicate was excluded from analysis of growth.

db 9/27/13
QA: AR09/26/13

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 60297514-100-(104-109)
Test Substance: Sediment
Species: H. azteca
Analyst Tare: mt
Analyst Gross: RR
Date/Time of Tare Wt.: 9/6/13 @ 1120
Date/Time of Gross Wt.: 9/9/13 @ 1320

Comments:
Analytical Balance ID: Sart #1
Dried in Oven # 3 from Date: 9/6/13 Time: 1550
to Date: 9/9/13 Time: 0855

Weight Type (Circle): Wet Blot Dry [✓ Dry ~~(>100°C)~~ 60-90°C ③] AFDW (>500°C)
[✓ Lot] or Batch Number: 13-032

Boat No.	Treatment	Rep.	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)¹	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	LWC	E		0.93005	0.93061	0.00056		10			10 ④		
		F		0.93086	0.93139	0.00053		10			7		
		G		0.93~~4~~396	0.93464	0.00068		10			10		
		H		0.93974	0.94019	0.00045		10			7		
	USC	A		0.97198	0.97253	0.00055		10			9		
		B		0.96869	0.96924	0.00055		10			10		
		C		0.96303	0.96364	0.00061		10			10		
		D		0.97302	0.97349	0.00047		9			8 ▲		
		E		0.97337	0.97424	0.00087		10			10		
		F		0.97335	0.97392	0.00057		9			9 *		
		G		0.96623	0.96697	0.00074		10			② ~~10~~ 9		
		H		0.96942	0.97019	0.00077		10			10		
Blank													
Range													
Mean													

Test Solution Volume:

Loading Rate:

¹ Add in weight loss of blank boat, if appropriate.

▲ During the drying process 1 organism was lost, making 8 organisms on the pan instead of 9 for USC rep D.

* During the drying process 1 organism was lost, making the total count 9 on the pan instead of 10 for USC rep F.

① mt 9/6/13 E

② RR 9/9/13; E

③ db 9/26/13, E

④ During the drying process LWC rep E gained 1 organism, so instead of having 9 organisms it had 10. This replicate was excluded from analysis of grow @test termination.

FCETL QA Form No. 010
Revision 5
Effective 08/99

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

*9/27/13

QA: AR09/26/13

Project Number: 602975H-100-(104-109)

Test Substance: Sediment

Species: H. azteca

Analyst Tare: MA

Analyst Gross: RR

Date/Time of Tare Wt.: 9/6/13 @ 1120

Date/Time of Gross Wt.: 9/9/13 @ 1320

Comments:
Analytical Balance ID: Sart #1
Dried in Oven # 3 from Date: 9/6/13 Time: 1550
to Date: 9/9/13 Time: 0855

Weight Type (Circle): Wet Blot Dry [✓ Dry (~~>100°C~~ 60-90°C)②] AFDW (>500°C)

[✓ Lot] or Batch Number: 13-032

Boat No.	Treatment	Rep.	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)[1]	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	EFSC	A		0.95648	0.95714	0.00066		10			10		
		B		0.94898	0.94950	0.00052		10			9		
		C		0.96248	0.96293	0.00045		10			9		
		D		0.96525	0.96569	0.00044		10			7		
		E		0.96741	0.96816	0.00075		10			10		
		F		0.96719	0.96779	0.00060		10			9		
		G		0.96864	0.96945	0.00081		10			10		
		H		0.97418	0.97463	0.00045		7			6*		
	LSC	A		0.94029	0.941~~08~~10 ①	0.00081		10			10		
		B		0.94447	0.94518	0.00071		10			10		
		C		0.94862	0.94931	0.00069		10			10		
		D		0.95292	0.95363	0.00071		10			10		
Blank													
Range													
Mean													

Test Solution Volume:

Loading Rate:

[1] Add in weight loss of blank boat, if appropriate.

①RR 9/9/13 ; TE

②RR 9/9/13 ; TE

*During the drying process 3 organisms were lost, so only 6 organisms were on the pan instead of 9, for rep H of EFSC

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

9/27/13
QA: AR 09/26/13

Project Number: 602975H-100-(104-109)
Test Substance: Sediment
Species: H. azteca
Analyst Tare: MT
Analyst Gross: RR
Date/Time of Tare Wt.: 9/6/13 @ 1120
Date/Time of Gross Wt.: 9/9/13 @ 1320

Comments:
Analytical Balance ID: Sart #1
Dried in Oven # 3 from Date: 9/6/13 Time: 1550
to Date: 9/9/13 Time: 0855

Weight Type (Circle): Wet Blot Dry [✓ Dry (~~>100°C~~ 60-90°C)] ② AFDW (>500°C)

[✓ Lot] or Batch Number: 13-032

Boat No.	Treatment	Rep.	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)[1]	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	LSC	E		0.94282	0.94360	0.00078		10			10		
		F		0.93986	~~0.90078~~ ① 0.94050	0.00064		9			7 *		
		G		0.94099	~~0.94050~~ ① 0.94173	0.00074		8			8 Δ		
		H		0.94001	0.94084	0.00083		10			9		
Blank													
Range													
Mean													

Test Solution Volume:

Loading Rate:

---

[1] Add in weight loss of blank boat, if appropriate.

① RR 9/9/13, WP

Δ 2 organisms were lost during the drying process from LSC rep G; so only 8 of 10 organisms were on the weigh boat

② AR 09/26/13, E

* during the drying process 1 organism was lost so only 7 of 8 organisms were on the pan for LSC rep F.

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

QA: AR 10/07/13
9/26/13

Project Number: 60297514-100-(104-109) [058] Species: *Hyalella azteca*

Treatment	Rep	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)	No of Orig. Organisms	Mean Wt./ Original Organism (mg)	Mean Wt./ Treatment (mg) (Original)	Number of Surv. Organisms	Mean Wt./ Surviving Organism (mg)	Mean Wt./ Treatment (mg) (Surviving)
Water Control	A		0.91208	0.91275	0.00067	0.00071	10	0.071		10	0.071	
	B		0.93338	0.93386	0.00048	0.00052	10	0.052		9	0.058	
	C		0.93009	0.93047	0.00038	0.00042	10	0.042		9	0.047	
	D		0.92437	0.92473	0.00036	0.00040	10	0.040		8	0.050	
	E		0.91291	0.91366	0.00075	0.00079	10	0.079		10	0.079	
	F		0.91764	0.91808	0.00044	0.00048	10	0.048		9	0.053	
	G		0.92400	0.92444	0.00044	0.00048	10	0.048		10	0.048	
	H		0.92136	0.92179	0.00043	0.00047	10	0.047	0.0534	9	0.052	0.0573
Blank			0.92174	0.92170	-0.00004							

Project Number: 60297514-100-(104-109) [058] Species: *Hyalella azteca*

Summary Statistics for Survival Data

Treatment	N	Min	Max	Mean	SD	C.V.
Water Control	8	80%	100%	92.5%	7.1%	7.644%

Summary Statistics for Growth Data (dry wt per original organism)

Treatment	N	Min	Max	Mean	SD	C.V.
Water Control	8	0.040	0.079	0.0534	0.0140	26.267%

Summary Statistics for Growth Data (dry wt per surviving organism)

Treatment	N	Min	Max	Mean	SD	C.V.
Water Control	8	0.047	0.079	0.0573	0.0117	20.382%

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

de 9/26/13
QA: AR 10/07/13

Project Number: 60297514-100-(104-109) [058] Species: *Hyalella azteca*

Treatment	Rep	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)	No of Orig. Organisms	Mean Wt./ Original Organism (mg)	Mean Wt./ Treatment (mg) (Original)	Number of Surv. Organisms	Mean Wt./ Surviving Organism (mg)	Mean Wt./ Treatment (mg) (Surviving)
Sand Control	A		0.93696	0.93757	0.00061	0.00065	10	0.065		10	0.065	
	B		0.94271	0.94326	0.00055	0.00059	10	0.059		9	0.066	
	C		0.94354	0.94422	0.00068	0.00072	10	0.072		10	0.072	
	D		0.94409	0.94484	0.00075	0.00079	10	0.079		10	0.079	
	E		0.94279	0.94355	0.00076	0.00080	10	0.080		10	0.080	
	F		0.91857	0.91913	0.00056	0.00060	10	0.060		8	0.075	
	G		0.91522	0.91596	0.00074	0.00078	10	0.078		10	0.078	
	H		0.91138	0.91197	0.00059	0.00063	10	0.063	0.0695	10	0.063	0.0722
Blank			0.92174	0.92170	-0.00004							

Project Number: 60297514-100-(104-109) [058] Species: *Hyalella azteca*

Summary Statistics for Survival Data

Treatment	N	Min	Max	Mean	SD	C.V.
Sand Control	8	80%	100%	96.3%	7.4%	7.730%

Summary Statistics for Growth Data (dry wt per original organism)

Treatment	N	Min	Max	Mean	SD	C.V.
Sand Control	8	0.059	0.080	0.0695	0.0088	12.661%

Summary Statistics for Growth Data (dry wt per surviving organism)

Treatment	N	Min	Max	Mean	SD	C.V.
Sand Control	8	0.063	0.080	0.0722	0.0069	9.499%

QA: AR 10/07/13
9/26/13

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 60297514-100-(104-109) [058] Species: *Hyalella azteca*

Treatment	Rep	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)	No of Orig. Organisms	Mean Wt./ Original Organism (mg)	Mean Wt./ Treatment (mg) (Original)	Number of Surv. Organisms	Mean Wt./ Surviving Organism (mg)	Mean Wt./ Treatment (mg) (Surviving)
Form Sed Control	A		0.94324	0.94354	0.00030	0.00034	10	0.034		10	0.034	
	B		0.94085	0.94093	0.00008	0.00012	10	0.012		4	0.030	
	C		0.94248	0.94278	0.00030	0.00034	10	0.034		7	0.049	
	D		0.93784	0.93801	0.00017	0.00021	10	0.021		5	0.042	
	E		0.94517	0.94533	0.00016	0.00020	10	0.020		2	0.100	
	F		0.94475	0.94504	0.00029	0.00033	10	0.033		8	0.041	
	G		0.94540	0.94543	0.00003	0.00007	10	0.007		2	0.035	
	H		0.94599	0.94606	0.00007	0.00011	10	0.011	0.0215	2	0.055	0.0482
Blank			0.92174	0.92170	-0.00004							

Project Number: 60297514-100-(104-109) [058] Species: *Hyalella azteca*

Summary Statistics for Survival Data

Treatment	N	Min	Max	Mean	SD	C.V.
Form Sed Control	8	20%	100%	50.0%	30.7%	61.412%

Summary Statistics for Growth Data (dry wt per original organism)

Treatment	N	Min	Max	Mean	SD	C.V.
Form Sed Control	8	0.007	0.034	0.0215	0.0111	51.494%

Summary Statistics for Growth Data (dry wt per surviving organism)

Treatment	N	Min	Max	Mean	SD	C.V.
Form Sed Control	8	0.030	0.100	0.0482	0.0224	46.520%

QA: AR 10/07/13
AR 9/26/13

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 60297514-100-(104-109) [058]   Species: *Hyalella azteca*

Treatment	Rep	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)	No of Orig. Organisms	Mean Wt./ Original Organism (mg)	Mean Wt./ Treatment (mg) (Original)	Number of Surv. Organisms	Mean Wt./ Surviving Organism (mg)	Mean Wt./ Treatment (mg) (Surviving)
LSH	A		0.93806	0.93861	0.00055	0.00059	10	0.059		9	0.066	
	B		0.93859	0.93921	0.00062	0.00066	10	0.066		10	0.066	
	C		0.92381	0.92443	0.00062	0.00066	10	0.066		10	0.066	
	D		0.92124	0.92182	0.00058	0.00062	10	0.062		9	0.069	
	E		0.93040	0.93093	0.00053	0.00057	10	0.057		10	0.057	
	F		0.92125	0.92195	0.00070	0.00074	10	0.074		10	0.074	
	G											
	H		0.92200	0.92241	0.00041	0.00045	6	0.075	0.0656	6	0.075	0.0675
Blank			0.92174	0.92170	-0.00004							

Project Number: 60297514-100-(104-109) [058]   Species: *Hyalella azteca*

Summary Statistics for Survival Data

Treatment	N	Min	Max	Mean ⊛	SD	C.V.
LSH	7	90%	100%	97.1%	4.9%	5.023%

Summary Statistics for Growth Data (dry wt per original organism)

Treatment	N	Min	Max	Mean	SD	C.V.
LSH	7	0.057	0.075	0.0656	0.0069	10.597%

Summary Statistics for Growth Data (dry wt per surviving organism)

Treatment	N	Min	Max	Mean	SD	C.V.
LSH	7	0.057	0.075	0.0675	0.0060	8.951%

⊛ Actual survival is 95%; spreadsheet is not in agreement b/c replicate G was excluded from weight analysis.

QA: AR 10/07/13
9/26/13

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 60297514-100-(104-109) [058] Species: *Hyalella azteca*

Treatment	Rep	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)	No of Orig. Organisms	Mean Wt./ Original Organism (mg)	Mean Wt./ Treatment (mg) (Original)	Number of Surv. Organisms	Mean Wt./ Surviving Organism (mg)	Mean Wt./ Treatment (mg) (Surviving)
LJC	A		0.95787	0.95837	0.00050	0.00054	10	0.054		9	0.060	
	B		0.92053	0.92117	0.00064	0.00068	10	0.068		10	0.068	
	C		0.94968	0.95033	0.00065	0.00069	10	0.069		10	0.069	
	D		0.92806	0.92847	0.00041	0.00045	10	0.045		8	0.056	
	E										-	
	F		0.93086	0.93139	0.00053	0.00057	10	0.057		7	0.081	
	G		0.93396	0.93464	0.00068	0.00072	10	0.072		10	0.072	
	H		0.93974	0.94019	0.00045	0.00049	10	0.049	0.0591	7	0.070	0.0681
Blank			0.92174	0.92170	-0.00004							

Project Number: 60297514-100-(104-109) [058] Species: *Hyalella azteca*

Summary Statistics for Survival Data

Treatment	N	Min	Max	Mean ⊛	SD	C.V.
LJC	7	70%	100%	87.1%	13.8%	15.838%

Summary Statistics for Growth Data (dry wt per original organism)

Treatment	N	Min	Max	Mean	SD	C.V.
LJC	7	0.045	0.072	0.0591	0.0106	17.932%

Summary Statistics for Growth Data (dry wt per surviving organism)

Treatment	N	Min	Max	Mean	SD	C.V.
LJC	7	0.056	0.081	0.0681	0.0082	12.040%

⊛ Actual survival is 87.5%; spreadsheet is not in agreement b/c replicate E was excluded from weight analysis.

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

QA: AR 10/07/13
9/26/13

Project Number: 60297514-100-(104-109) [058]   Species: *Hyalella azteca*

Treatment	Rep	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)	No of Orig. Organisms	Mean Wt./ Original Organism (mg)	Mean Wt./ Treatment (mg) (Original)	Number of Surv. Organisms	Mean Wt./ Surviving Organism (mg)	Mean Wt./ Treatment (mg) (Surviving)
USC	A		0.97198	0.97253	0.00055	0.00059	10	0.059		9	0.066	
	B		0.96869	0.96924	0.00055	0.00059	10	0.059		10	0.059	
	C		0.96303	0.96364	0.00061	0.00065	10	0.065		10	0.065	
	D		0.97302	0.97349	0.00047	0.00051	9	0.057		8	0.064	
	E		0.97337	0.97424	0.00087	0.00091	10	0.091		10	0.091	
	F		0.97335	0.97392	0.00057	0.00061	9	0.068		9	0.068	
	G		0.96623	0.96697	0.00074	0.00078	10	0.078		9	0.087	
	H		0.96942	0.97019	0.00077	0.00081	10	0.081	0.0697	10	0.081	0.0725
Blank			0.92174	0.92170	-0.00004							

Project Number: 60297514-100-(104-109) [058]   Species: *Hyalella azteca*

Summary Statistics for Survival Data

Treatment	N	Min	Max	Mean ⊛	SD	C.V.
USC	8	89%	100%	96.1%	5.4%	5.596%

Summary Statistics for Growth Data (dry wt per original organism)

Treatment	N	Min	Max	Mean	SD	C.V.
USC	8	0.057	0.091	0.0697	0.0124	17.784%

Summary Statistics for Growth Data (dry wt per surviving organism)

Treatment	N	Min	Max	Mean	SD	C.V.
USC	8	0.059	0.091	0.0725	0.0120	16.499%

⊛ Actual survival is 96.2%; spreadsheet is not in agreement b/c of a technician error, during the drying process, for replicate D.

QA: AR 10/07/13
9|28|13

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 60297514-100-(104-109) [058]   Species: *Hyalella azteca*

Treatment	Rep	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)	No of Orig. Organisms	Mean Wt./ Original Organism (mg)	Mean Wt./ Treatment (mg) (Original)	Number of Surv. Organisms	Mean Wt./ Surviving Organism (mg)	Mean Wt./ Treatment (mg) (Surviving)
EFSC	A		0.95648	0.95714	0.00066	0.00070	10	0.070		10	0.070	
	B		0.94898	0.94950	0.00052	0.00056	10	0.056		9	0.062	
	C		0.96248	0.96293	0.00045	0.00049	10	0.049		9	0.054	
	D		0.96525	0.96569	0.00044	0.00048	10	0.048		7	0.069	
	E		0.96741	0.96816	0.00075	0.00079	10	0.079		10	0.079	
	F		0.96719	0.96779	0.00060	0.00064	10	0.064		9	0.071	
	G		0.96864	0.96945	0.00081	0.00085	10	0.085		10	0.085	
	H		0.97418	0.97463	0.00045	0.00049	7	0.070	0.0651	6	0.082	0.0715
Blank			0.92174	0.92170	-0.00004							

Project Number: 60297514-100-(104-109) [058]   Species: *Hyalella azteca*

Summary Statistics for Survival Data

Treatment	N	Min	Max	Mean ⊛	SD	C.V.
EFSC	8	70%	100%	90.7%	10.1%	11.136%

Summary Statistics for Growth Data (dry wt per original organism)

Treatment	N	Min	Max	Mean	SD	C.V.
EFSC	8	0.048	0.085	0.0651	0.0135	20.706%

Summary Statistics for Growth Data (dry wt per surviving organism)

Treatment	N	Min	Max	Mean	SD	C.V.
EFSC	8	0.054	0.085	0.0715	0.0102	14.280%

⊛Actual survival is 91.2%; spreadsheet is not in agreement b/c organisms were lost during the drying process for replicat H.

QA: AR 10/07/13
9/26/13

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 60297514-100-(104-109) [058] Species: *Hyalella azteca*

Treatment	Rep	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)	No of Orig. Organisms	Mean Wt./ Original Organism (mg)	Mean Wt./ Treatment (mg) (Original)	Number of Surv. Organisms	Mean Wt./ Surviving Organism (mg)	Mean Wt./ Treatment (mg) (Surviving)
LSC	A		0.94029	0.94110	0.00081	0.00085	10	0.085		10	0.085	
	B		0.94447	0.94518	0.00071	0.00075	10	0.075		10	0.075	
	C		0.94862	0.94931	0.00069	0.00073	10	0.073		10	0.073	
	D		0.95292	0.95363	0.00071	0.00075	10	0.075		10	0.075	
	E		0.94282	0.94360	0.00078	0.00082	10	0.082		10	0.082	
	F		0.93986	0.94050	0.00064	0.00068	9	0.076		7	0.097	
	G		0.94099	0.94173	0.00074	0.00078	8	0.098		8	0.098	
	H		0.94001	0.94084	0.00083	0.00087	10	0.087	0.0813	9	0.097	0.0852
Blank			0.92174	0.92170	-0.00004							

Project Number: 60297514-100-(104-109) [058] Species: *Hyalella azteca*

Summary Statistics for Survival Data

Treatment	N	Min	Max	Mean ⊛	SD	C.V.
LSC	8	78%	100%	96.0%	8.1%	8.484%

Summary Statistics for Growth Data (dry wt per original organism)

Treatment	N	Min	Max	Mean	SD	C.V.
LSC	8	0.073	0.098	0.0813	0.0084	10.300%

Summary Statistics for Growth Data (dry wt per surviving organism)

Treatment	N	Min	Max	Mean	SD	C.V.
LSC	8	0.073	0.098	0.0852	0.0106	12.495%

⊛ Actual survival is 96.25%; spreadsheet is not in agreement because organisms lost during the drying process.

9/27/13
QA: AR 10/07/13

```
Toxstat Version 3.5
Study # 60297514-100-(104-109)
Alaska Department of Fish and Game - Coeur Alaska
Hyalella azteca
List Data for Growth per Original Organism

  Title:  60297514-100-(104-109)
  File:      058109ha.dat              Transform:              NO TRANSFORMATION
  Number of Groups:  8
  ---------------------------------------------------------------------------

     GRP  IDENTIFICATION   REP        VALUE           TRANS VALUE
     ---  ---------------- -----   -------------    -------------
      1    Sand Control     1           0.0650             0.0650
      1    Sand Control     2           0.0590             0.0590
      1    Sand Control     3           0.0720             0.0720
      1    Sand Control     4           0.0790             0.0790
      1    Sand Control     5           0.0800             0.0800
      1    Sand Control     6           0.0600             0.0600
      1    Sand Control     7           0.0780             0.0780
      1    Sand Control     8           0.0630             0.0630
      2              LSH    1           0.0590             0.0590
      2              LSH    2           0.0660             0.0660
      2              LSH    3           0.0660             0.0660
      2              LSH    4           0.0620             0.0620
      2              LSH    5           0.0570             0.0570
      2              LSH    6           0.0740             0.0740
      2              LSH    7           0.0750             0.0750
      3              LJC    1           0.0540             0.0540
      3              LJC    2           0.0680             0.0680
      3              LJC    3           0.0690             0.0690
      3              LJC    4           0.0450             0.0450
      3              LJC    5           0.0570             0.0570
      3              LJC    6           0.0720             0.0720
      3              LJC    7           0.0490             0.0490
      4              USC    1           0.0590             0.0590
      4              USC    2           0.0590             0.0590
      4              USC    3           0.0650             0.0650
      4              USC    4           0.0570             0.0570
      4              USC    5           0.0910             0.0910
      4              USC    6           0.0680             0.0680
      4              USC    7           0.0780             0.0780
      4              USC    8           0.0810             0.0810
      5             EFSC    1           0.0700             0.0700
      5             EFSC    2           0.0560             0.0560
      5             EFSC    3           0.0490             0.0490
      5             EFSC    4           0.0480             0.0480
      5             EFSC    5           0.0790             0.0790
      5             EFSC    6           0.0640             0.0640
      5             EFSC    7           0.0850             0.0850
      5             EFSC    8           0.0700             0.0700
      6              LSC    1           0.0850             0.0850
      6              LSC    2           0.0750             0.0750
      6              LSC    3           0.0730             0.0730
      6              LSC    4           0.0750             0.0750
      6              LSC    5           0.0820             0.0820
      6              LSC    6           0.0760             0.0760
      6              LSC    7           0.0980             0.0980
      6              LSC    8           0.0870             0.0870
      7    Water Control    1           0.0710             0.0710
      7    Water Control    2           0.0520             0.0520
      7    Water Control    3           0.0420             0.0420
      7    Water Control    4           0.0400             0.0400
```

QA: AR 10/07/13
9/27/13

```
Toxstat Version 3.5
Study # 60297514-100-(104-109)
Alaska Department of Fish and Game - Coeur Alaska
Hyalella azteca
List Data for Growth per Original Organism

     7    Water Control    5          0.0790           0.0790
     7    Water Control    6          0.0480           0.0480
     7    Water Control    7          0.0480           0.0480
     7    Water Control    8          0.0470           0.0470
     8  Form Sed Contro    1          0.0340           0.0340
     8  Form Sed Contro    2          0.0120           0.0120
     8  Form Sed Contro    3          0.0340           0.0340
     8  Form Sed Contro    4          0.0210           0.0210
     8  Form Sed Contro    5          0.0200           0.0200
     8  Form Sed Contro    6          0.0330           0.0330
     8  Form Sed Contro    7          0.0070           0.0070
     8  Form Sed Contro    8          0.0110           0.0110
  ----------------------------------------------------------------------------
```

QA: AR 10/07/13
9/27/13

```
Toxstat Version 3.5
Study # 60297514-100-(104-109)
Alaska Department of Fish and Game - Coeur Alaska
Hyalella azteca
Summary Statistics for Growth per Original Organism

 Title:  60297514-100-(104-109)
 File:      058109ha.dat            Transform:            NO TRANSFORMATION

            Summary Statistics on Data              TABLE 1 of 2
 ----------------------------------------------------------------------------

         GRP  IDENTIFICATION    N      MIN        MAX        MEAN
         --- ---------------- ---- ---------- ---------- ----------
          1    Sand Control     8    0.0590     0.0800     0.0695
          2             LSH     7    0.0570     0.0750     0.0656
          3             LJC     7    0.0450     0.0720     0.0591
          4             USC     8    0.0570     0.0910     0.0697
          5            EFSC     8    0.0480     0.0850     0.0651
          6             LSC     8    0.0730     0.0980     0.0814
          7   Water Control     8    0.0400     0.0790     0.0534
          8 Form Sed Control    8    0.0070     0.0340     0.0215
 ----------------------------------------------------------------------------


 Title:  60297514-100-(104-109)
 File:      058109ha.dat            Transform:            NO TRANSFORMATION

            Summary Statistics on Data              TABLE 2 of 2
 ----------------------------------------------------------------------------

    GRP IDENTIFICATION       VARIANCE        SD         SEM         C.V. %
    --- ---------------- -------------- ---------- ----------   ----------
     1    Sand Control          0.0001     0.0088     0.0031      12.6609
     2             LSH          0.0000     0.0069     0.0026      10.5973
     3             LJC          0.0001     0.0106     0.0040      17.9320
     4             USC          0.0002     0.0123     0.0044      17.6882
     5            EFSC          0.0002     0.0135     0.0048      20.7060
     6             LSC          0.0001     0.0085     0.0030      10.4054
     7   Water Control          0.0002     0.0140     0.0050      26.2665
     8 Form Sed Control        0.0001     0.0111     0.0039      51.4939
 ----------------------------------------------------------------------------
```

QA: AR 10/07/13
dk 9/27/13

```
Toxstat Version 3.5
Study # 60297514-100-(104-109)
Alaska Department of Fish and Game - Coeur Alaska
Hyalella azteca
Analysis of Data for Growth per Original Organism

  Title:  60297514-100-(104-109)
  File:      058109ha.dat             Transform:              NO TRANSFORMATION

                        Shapiro - Wilk's Test for Normality
  ----------------------------------------------------------------------------

       D =    0.0043
       W =    0.9578

       Critical W  = 0.9270 (alpha = 0.01 , N = 46)
                W  = 0.9450 (alpha = 0.05 , N = 46)

  ----------------------------------------------------------------------------

  Data PASS normality test (alpha = 0.01). Continue analysis.


  Title:  60297514-100-(104-109)
  File:      058109ha.dat             Transform:              NO TRANSFORMATION

                     Bartlett's Test for Homogeneity of Variance
  ----------------------------------------------------------------------------

  Calculated B1 statistic =  3.7615               (p-value = 0.5842)

  Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

  ----------------------------------------------------------------------------

  Critical B = 15.0863  (alpha = 0.01, df =  5)
             = 11.0705  (alpha = 0.05, df =  5)

  ----------------------------------------------------------------------------

                          Using Average Degrees of Freedom
                     (Based on average replicate size of    7.67)

  Calculated B2 statistic =  3.4090               (p-value = 0.6372)

  Data PASS B2 homogeneity test at 0.01 level. Continue analysis.
```

QA: AR 10/07/13
ak 9/27/13

```
Toxstat Version 3.5
Study # 60297514-100-(104-109)
Alaska Department of Fish and Game - Coeur Alaska
Hyalella azteca
Analysis of Data for Growth per Original Organism


 Title:  60297514-100-(104-109)
 File:      058109ha.dat           Transform:          NO TRANSFORMATION

                                ANOVA Table
 ---------------------------------------------------------------------------

    SOURCE              DF              SS                MS           F
 ---------------------------------------------------------------------------
    Between              5            0.0021            0.0004      3.8820

    Within (Error)      40            0.0043            0.0001
 ---------------------------------------------------------------------------
    Total               45            0.0065
 ---------------------------------------------------------------------------
                                                         (p-value = 0.0058)

    Critical F  = 3.5138  (alpha = 0.01, df = 5,40)
                = 2.4495  (alpha = 0.05, df = 5,40)

    Since  F > Critical F  REJECT  Ho: All equal (alpha = 0.05)


 Title:  60297514-100-(104-109)
 File:      058109ha.dat           Transform:          NO TRANSFORMATION

      Bonferroni t-Test   -   TABLE 1 OF 2          Ho: Control<Treatment
 ---------------------------------------------------------------------------
                               TRANSFORMED   MEAN CALCULATED IN         SIG
 GROUP   IDENTIFICATION           MEAN        ORIGINAL UNITS    t STAT  0.05
 -----  --------------------  -----------  -----------------  ------  ---
   1          Sand Control       0.0695          0.0695
   2                   LSH       0.0656          0.0656        0.7282
   3                   LJC       0.0591          0.0591        1.9197
   4                   USC       0.0697          0.0697       -0.0480
   5                  EFSC       0.0651          0.0651        0.8394
   6                   LSC       0.0814          0.0814       -2.2783
 ---------------------------------------------------------------------------
 Bonferroni t critical value = 2.4233  (1 Tailed, alpha = 0.05, df = 5,40)

 Title:  60297514-100-(104-109)
 File:      058109ha.dat           Transform:          NO TRANSFORMATION

      Bonferroni t-Test   -   TABLE 2 OF 2          Ho: Control<Treatment
 ---------------------------------------------------------------------------
                              NUM OF   MIN SIG DIFF     % OF    DIFFERENCE
 GROUP   IDENTIFICATION        REPS   (IN ORIG. UNITS) CONTROL  FROM CONTROL
 -----  --------------------  -------  ---------------  -------  ------------
   1          Sand Control       8
   2                   LSH       7          0.0131       18.8       0.0039
   3                   LJC       7          0.0131       18.8       0.0104
   4                   USC       8          0.0126       18.2      -0.0003
   5                  EFSC       8          0.0126       18.2       0.0044
   6                   LSC       8          0.0126       18.2      -0.0119
 ---------------------------------------------------------------------------
```

QA: AR 10/07/13
de 9/30/13

```
Toxstat Version 3.5
Study # 60297514-100-(104-109)
Alaska Department of Fish and Game - Coeur Alaska
Hyalella azteca
List Data for Growth per Surviving Organism

  Title:  60297514-100-(104-109)
  File:      058109hs.dat               Transform:               NO TRANSFORMATION
  Number of Groups:  8
  ------------------------------------------------------------------------------

    GRP  IDENTIFICATION   REP       VALUE             TRANS VALUE
    ---  --------------  -----   -------------     -------------
     1     Sand Control    1          0.0650             0.0650
     1     Sand Control    2          0.0660             0.0660
     1     Sand Control    3          0.0720             0.0720
     1     Sand Control    4          0.0790             0.0790
     1     Sand Control    5          0.0800             0.0800
     1     Sand Control    6          0.0750             0.0750
     1     Sand Control    7          0.0780             0.0780
     1     Sand Control    8          0.0630             0.0630
     2              LSH    1          0.0660             0.0660
     2              LSH    2          0.0660             0.0660
     2              LSH    3          0.0660             0.0660
     2              LSH    4          0.0690             0.0690
     2              LSH    5          0.0570             0.0570
     2              LSH    6          0.0740             0.0740
     2              LSH    7          0.0750             0.0750
     3              LJC    1          0.0600             0.0600
     3              LJC    2          0.0680             0.0680
     3              LJC    3          0.0690             0.0690
     3              LJC    4          0.0560             0.0560
     3              LJC    5          0.0810             0.0810
     3              LJC    6          0.0720             0.0720
     3              LJC    7          0.0700             0.0700
     4              USC    1          0.0660             0.0660
     4              USC    2          0.0590             0.0590
     4              USC    3          0.0650             0.0650
     4              USC    4          0.0640             0.0640
     4              USC    5          0.0910             0.0910
     4              USC    6          0.0680             0.0680
     4              USC    7          0.0870             0.0870
     4              USC    8          0.0810             0.0810
     5             EFSC    1          0.0700             0.0700
     5             EFSC    2          0.0620             0.0620
     5             EFSC    3          0.0540             0.0540
     5             EFSC    4          0.0690             0.0690
     5             EFSC    5          0.0790             0.0790
     5             EFSC    6          0.0710             0.0710
     5             EFSC    7          0.0850             0.0850
     5             EFSC    8          0.0820             0.0820
     6              LSC    1          0.0850             0.0850
     6              LSC    2          0.0750             0.0750
     6              LSC    3          0.0730             0.0730
     6              LSC    4          0.0750             0.0750
     6              LSC    5          0.0820             0.0820
     6              LSC    6          0.0970             0.0970
     6              LSC    7          0.0980             0.0980
     6              LSC    8          0.0970             0.0970
     7   Water Control     1          0.0710             0.0710
     7   Water Control     2          0.0580             0.0580
     7   Water Control     3          0.0470             0.0470
     7   Water Control     4          0.0500             0.0500
```

QA: AR 10/07/13
9/30/13

```
Toxstat Version 3.5
Study # 60297514-100-(104-109)
Alaska Department of Fish and Game - Coeur Alaska
Hyalella azteca
List Data for Growth per Surviving Organism

     7   Water Control     5          0.0790          0.0790
     7   Water Control     6          0.0530          0.0530
     7   Water Control     7          0.0480          0.0480
     7   Water Control     8          0.0520          0.0520
     8  Form Sed Contro    1          0.0340          0.0340
     8  Form Sed Contro    2          0.0300          0.0300
     8  Form Sed Contro    3          0.0490          0.0490
     8  Form Sed Contro    4          0.0420          0.0420
     8  Form Sed Contro    5          0.1000          0.1000
     8  Form Sed Contro    6          0.0410          0.0410
     8  Form Sed Contro    7          0.0350          0.0350
     8  Form Sed Contro    8          0.0550          0.0550
  ---------------------------------------------------------------------
```

QA: AR 10/07/13
9/30/13

```
Toxstat Version 3.5
Study # 60297514-100-(104-109)
Alaska Department of Fish and Game - Coeur Alaska
Hyalella azteca
Summary Statistics for Growth per Surviving Organism

  Title:  60297514-100-(104-109)
  File:      058109hs.dat               Transform:            NO TRANSFORMATION

             Summary Statistics on Data                TABLE 1 of 2
 ------------------------------------------------------------------------------

          GRP  IDENTIFICATION    N      MIN        MAX         MEAN
          ---  ---------------  ----  ---------  ---------  ---------
           1     Sand Control     8    0.0630     0.0800      0.0723
           2              LSH     7    0.0570     0.0750      0.0676
           3              LJC     7    0.0560     0.0810      0.0680
           4              USC     8    0.0590     0.0910      0.0726
           5             EFSC     8    0.0540     0.0850      0.0715
           6              LSC     8    0.0730     0.0980      0.0853
           7   Water Control      8    0.0470     0.0790      0.0573
           8  Form Sed Contro     8    0.0300     0.1000      0.0482
 ------------------------------------------------------------------------------


  Title:  60297514-100-(104-109)
  File:      058109hs.dat               Transform:            NO TRANSFORMATION

             Summary Statistics on Data                TABLE 2 of 2
 ------------------------------------------------------------------------------

     GRP  IDENTIFICATION        VARIANCE       SD        SEM         C.V. %
     ---  ---------------    -------------  ---------  ---------  ---------
      1     Sand Control          0.0000      0.0068     0.0024      9.4091
      2              LSH          0.0000      0.0060     0.0023      8.9147
      3              LJC          0.0001      0.0081     0.0031     11.9772
      4              USC          0.0001      0.0119     0.0042     16.4400
      5             EFSC          0.0001      0.0104     0.0037     14.5155
      6              LSC          0.0001      0.0108     0.0038     12.6144
      7   Water Control           0.0001      0.0117     0.0041     20.3648
      8  Form Sed Contro          0.0005      0.0224     0.0079     46.5251
 ------------------------------------------------------------------------------
```

QA: AR 10/07/13
de 9/30/13

```
Toxstat Version 3.5
Study # 60297514-100-(104-109)
Alaska Department of Fish and Game - Coeur Alaska
Hyalella azteca
Analysis of Growth per Surviving Organism

  Title:  60297514-100-(104-109)
  File:      058109hs.dat                 Transform:               NO TRANSFORMATION

                    Shapiro - Wilk's Test for Normality
  ---------------------------------------------------------------------------

      D =    0.0035
      W =    0.9668

      Critical W  = 0.9270 (alpha = 0.01 , N = 46)
               W  = 0.9450 (alpha = 0.05 , N = 46)

  ---------------------------------------------------------------------------
  Data PASS normality test (alpha = 0.01). Continue analysis.


  Title:  60297514-100-(104-109)
  File:      058109hs.dat                 Transform:               NO TRANSFORMATION

                Bartlett's Test for Homogeneity of Variance
  ---------------------------------------------------------------------------

  Calculated B1 statistic =  4.3401              (p-value = 0.5016)

  Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

  ---------------------------------------------------------------------------

  Critical B = 15.0863   (alpha = 0.01, df =  5)
             = 11.0705   (alpha = 0.05, df =  5)

  ---------------------------------------------------------------------------

                   Using Average Degrees of Freedom
              (Based on average replicate size of    7.67)

  Calculated B2 statistic =  3.9576              (p-value = 0.5555)

  Data PASS B2 homogeneity test at 0.01 level. Continue analysis.
```

QA: AR 10/07/13
9/30/13

```
Toxstat Version 3.5
Study # 60297514-100-(104-109)
Alaska Department of Fish and Game - Coeur Alaska
Hyalella azteca
Analysis of Growth per Surviving Organism

 Title:  60297514-100-(104-109)
 File:      058109hs.dat                Transform:          NO TRANSFORMATION

                              ANOVA Table
 ----------------------------------------------------------------------------
   SOURCE              DF            SS                MS           F
 ----------------------------------------------------------------------------
   Between              5           0.0016            0.0003       3.6681

   Within (Error)      40           0.0035            0.0001
 ----------------------------------------------------------------------------
   Total               45           0.0051
 ----------------------------------------------------------------------------
                                                        (p-value = 0.0080)

   Critical F   = 3.5138  (alpha = 0.01, df = 5,40)
                = 2.4495  (alpha = 0.05, df = 5,40)

   Since  F > Critical F  REJECT  Ho: All equal (alpha = 0.05)


 Title:  60297514-100-(104-109)
 File:      058109hs.dat                Transform:          NO TRANSFORMATION

      Bonferroni t-Test    -   TABLE 1 OF 2          Ho: Control<Treatment
 ----------------------------------------------------------------------------
                                TRANSFORMED   MEAN CALCULATED IN           SIG
 GROUP    IDENTIFICATION           MEAN        ORIGINAL UNITS      t STAT  0.05
 -----  --------------------   -----------   ------------------   ------   ---
   1            Sand Control      0.0723           0.0723
   2                     LSH      0.0676           0.0676          0.9663
   3                     LJC      0.0680           0.0680          0.8778
   4                     USC      0.0726           0.0726         -0.0802
   5                    EFSC      0.0715           0.0715          0.1603
   6                     LSC      0.0853           0.0853         -2.7793
 ----------------------------------------------------------------------------
 Bonferroni t critical value = 2.4233   (1 Tailed, alpha = 0.05, df = 5,40)


 Title:  60297514-100-(104-109)
 File:      058109hs.dat                Transform:          NO TRANSFORMATION

      Bonferroni t-Test    -   TABLE 2 OF 2          Ho: Control<Treatment
 ----------------------------------------------------------------------------
                               NUM OF    MIN SIG DIFF      % OF    DIFFERENCE
 GROUP    IDENTIFICATION        REPS   (IN ORIG. UNITS)  CONTROL  FROM CONTROL
 -----  --------------------  -------  ----------------  -------  ------------
   1            Sand Control     8
   2                     LSH     7          0.0117         16.2       0.0047
   3                     LJC     7          0.0117         16.2       0.0043
   4                     USC     8          0.0113         15.7      -0.0004
   5                    EFSC     8          0.0113         15.7       0.0008
   6                     LSC     8          0.0113         15.7      -0.0130
 ----------------------------------------------------------------------------
```

APPENDIX C

Analytical Data

FCETL QA Form No.131
Revision 0
Effective 10/06

PERCENT TOTAL SOLIDS AND PERCENT TOTAL VOLATILE SOLIDS (TVS)

QA: AR 10/07/13
9/30/13

Project No: [058] 6029754-100-(104-109)(112-116)
Analytical Balance ID: AND #2
TARE: Date/time: 9/17/13 @ 1200 Analyst: AB
DRY GROSS: Date/time: 9/18/13 @ 1200 Analyst: AB
ASHED GROSS: Date/time: 9/19/13 @ 0850 Analyst:
Dried in Oven # 1 from Date: 9/17/13 Time: 1210
Oven °C: 104 to Date: 9/18/13 Time: 1100
Ashed in Furnace from Date: 9/18/13 Time: 1200
Furnace °C: 550 to Date: 9/19/13 Time: 1615

Dish No.	Treatment	Rep	Tare Weight of Dish (g) A	Dish + Wet Sample (g) B	Dry Gross Weight (g) (dish + dry sample) C	% Total Solids (g) [(C-A)(100)]/(B-A)	Ashed Gross Weight (dish + sample)(g) D	% Total Volatile Solids (g) [(C-D)(100)]/(C-A)
32A	Sand	A	12.~~6767~~ 4131	22.5445	20.4688		20.4645	
1A		B	12.4274	22.7732	20.4912		20.4833	
29A	Form Sed	A	12.0585	23.8334	21.0468		20.5670	
25A		B	11.9437	23.3834	20.7595		20.3213	
8	LSC	A	12.0272	24.5976	21.3083		21.1605	
134		B	12.1451	22.2708	19.7697		19.6431	
17	LJC	A	11.9310	22.3045	19.3161		19.2512	
5A		B	12.0062	22.7401	20.0809		20.0070	
6	LSH	A	12.1565	22.1942	19.5983		19.5419	
22A		B	12.8550	23.5910	21.1412		21.0803	
33A	USC	A	11.8432	22.5681	19.7520		19.5326	
27A		B	11.2006	21.8412	19.1461		189333	
12	EFSC	A	10.7977	22.8491	15.9992		15.3040	
Blank			12.6767		12.6771		12.6771	

---

[1] Add in weight loss of blank boat, if appropriate.

Page 2 of 3
FCETL QA Form No.131
Revision 0
Effective 10/06

QA: AR 10/07/13
9/30/13

PERCENT TOTAL SOLIDS AND PERCENT TOTAL VOLATILE SOLIDS (TVS)

Project No: [058] 60297514100-(104-109)(112-116)
Analytical Balance ID: AND #2

TARE: Date/time: 9/17/13 @ 1200 Analyst:
DRY GROSS: Date/time: 9/18/13 @ 1200 Analyst:
ASHED GROSS: Date/time: 9/19/13 @ 0850 Analyst:

Dried in Oven # 1 from Date: 9/17/13 Time: 1210
Oven °C: 104 to Date: 9/18/13 Time: 1100
Ashed in Furnace from Date: 9/18/13 Time: 1200
Furnace °C: 550 to Date: 9/18/13 Time: 1615

Dish No.	Treatment	Rep	Tare Weight of Dish (g) A	Dish + Wet Sample (g) B	Dry Gross Weight (g) (dish + dry sample) C	% Total Solids (g) [(C-A)(100)]/(B-A)	Ashed Gross Weight (dish + sample)(g) D	% Total Volatile Solids (g) [(C-D)(100)]/(C-A)
23A	EFSC	B	11.8719	22.9187	16.7506		16.1053	
Blank								

---

[1] Add in weight loss of blank boat, if appropriate.

Percent Total Solids and Percent Total Volatile Solids

Project Number: 60297514-100-(104-109), (112-116)

QA: 10/25/13
10/17/13

Treatment	Rep		Tare Weight (g) A	Dish + Wet Sample (g) B	Dry Gross Weight (g) (dish + dry sample) C	% Total Solids [(C-A)(100)]/(B-A)	Treatment Mean % Total Solids	Ashed Gross Weight (g) (dish + sample) D	% Total Volatile Solids [(C-D)(100)]/(C-A)	Treatment Mean % Total Volatile Solids
Sand	A		12.4131	22.5445	20.4688	79.5122	78.7275	20.4645	0.0534	0.0757
	B		12.4274	22.7732	20.4912	77.9427		20.4833	0.0980	
Form Sed	A		12.0585	23.8334	21.0468	76.3344	76.6988	20.567	5.3381	5.1543
	B		11.9437	23.3834	20.7595	77.0632		20.3213	4.9706	
LSC	A		12.0272	24.5976	21.3083	73.8330	74.5662	21.1605	1.5925	1.6264
	B		12.1451	22.2708	19.7697	75.2995		19.6431	1.6604	
LJC	A		11.9310	22.3045	19.3161	71.1920	73.2091	19.2512	0.8788	0.8970
	B		12.0062	22.7401	20.0809	75.2262		20.0070	0.9152	
LSH	A		12.1565	22.1942	19.5983	74.1385	75.6600	19.5419	0.7579	0.7464
	B		12.8550	23.5910	21.1412	77.1814		21.0803	0.7350	
USC	A		11.8432	22.5681	19.7520	73.7424	74.2070	19.5326	2.7741	2.7262
	B		11.2006	21.8412	19.1461	74.6715		18.9333	2.6782	
EFSC	A		10.7977	22.8491	15.9992	43.1610	43.6637	15.3040	13.3654	13.2955
	B		11.8714	22.9187	16.7506	44.1664		16.1053	13.2255	
Blank			12.6767		12.6771			12.6771		

MSE
Analytical Laboratory

Friday, October 25, 2013

Rami Naddy
AECOM
4303 W Laporte Ave
Fort Collins, CO 80521

RE: Sediment Analysis

Work Order: 1309111

Dear Rami Naddy:

MSE Lab Services received 7 sample(s) on 9/19/2013 for the analyses presented in the following report.

Please find enclosed analytical results for the sample(s) received at the MSE Laboratory.

If you have any questions regarding these test results, please feel free to call.

Sincerely,

Sara Ward

Sara Ward
Laboratory Manager
406-494-7334

Enclosure

MSE Analytical Laboratory
P.O. Box 4078
200 Technology Way
Butte, MT 59701
Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

10/28/13

MSE Lab Services

Date: *28-Oct-13*

CLIENT: AECOM
Lab Order: 1309111
Project: Sediment Analysis
Lab ID: 1309111-001

Client Sample ID: 058 LSH #26894
Collection Date: 8/26/2013 3:30:00 PM
Matrix: SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Aluminum	15400	2.45	7.80	N	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Arsenic	25.4	2.55	7.80		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Cadmium	0.390	0.174	0.520	J	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Chromium	37.4	4.60	13.0		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Copper	69.4	0.577	2.60		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Lead	7.39	0.094	0.260		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Nickel	30.9	0.075	0.260		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Selenium	1.77	0.177	0.520		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Silver	0.306	0.096	0.260		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Zinc	111	7.18	13.0		mg/Kg-dry	2	10/24/2013 2:54:11 PM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	ND	0.0384	0.133	H	mg/Kg-dry	1	10/2/2013 9:07:00 AM
ORGANIC MATTER-WALKLEY BLACK			**OM_WALKLEYBLACK**				Analyst: **hb/df**
Organic Matter - Walkley Black	0.61	0.09	0.20		%	1	10/3/2013 4:00:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **hb**
1" Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
2mm Gradation	0.58	0.05	0.10		%	1	10/3/2013 1:00:00 PM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **hb**
% Clay	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Sand	96.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Silt	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
Soil Class	SAND					1	10/3/2013 3:00:00 PM

Qualifiers:	H	Holding times for preparation or analysis exceeded	J	Analyte detected below the Reporting Limit
	Limit	Reporting Limit	MDL	Method Detection Limit
	N	Spike Recovery outside accepted recovery limits	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT: AECOM
Lab Order: 1309111
Project: Sediment Analysis
Lab ID: 1309111-002

Client Sample ID: 058 LJC #26895
Collection Date: 8/26/2013 3:00:00 PM

Matrix: SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Aluminum	10300	2.27	7.21	N	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Arsenic	11.9	2.36	7.21		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Cadmium	0.492	0.161	0.481		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Chromium	24.4	4.25	12.0		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Copper	56.1	0.533	2.40		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Lead	8.00	0.087	0.240		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Nickel	15.7	0.069	0.240		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Selenium	ND	0.163	0.481		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Silver	0.269	0.088	0.240		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Zinc	121	6.63	12.0		mg/Kg-dry	2	10/24/2013 2:54:11 PM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	ND	0.0354	0.122	H	mg/Kg-dry	1	10/2/2013 9:07:00 AM
ORGANIC MATTER-WALKLEY BLACK		**OM_WALKLEYBLACK**					Analyst: **hb/df**
Organic Matter - Walkley Black	1.08	0.09	0.20		%	1	10/3/2013 4:00:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **hb**
1" Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
2mm Gradation	0.28	0.05	0.10		%	1	10/3/2013 1:00:00 PM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **hb**
% Clay	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Sand	96.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Silt	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
Soil Class	SAND					1	10/3/2013 3:00:00 PM

Qualifiers:				
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below the Reporting Limit
	Limit	Reporting Limit	MDL	Method Detection Limit
	N	Spike Recovery outside accepted recovery limits	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT: AECOM
Lab Order: 1309111
Project: Sediment Analysis
Lab ID: 1309111-003

Client Sample ID: 058 USC #26896
Collection Date: 8/26/2013 3:45:00 PM

Matrix: SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Aluminum	14600	2.41	7.68	N	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Arsenic	13.5	2.51	7.68		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Cadmium	0.750	0.171	0.512		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Chromium	101	4.53	12.8		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Copper	44.6	0.568	2.56		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Lead	2.70	0.092	0.256		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Nickel	55.0	0.073	0.256		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Selenium	3.21	0.174	0.512		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Silver	0.131	0.094	0.256	J	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Zinc	105	7.06	12.8		mg/Kg-dry	2	10/24/2013 2:54:11 PM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	ND	0.0380	0.131	H	mg/Kg-dry	1	10/2/2013 9:07:00 AM
ORGANIC MATTER-WALKLEY BLACK		**OM_WALKLEYBLACK**					Analyst: **hb/df**
Organic Matter - Walkley Black	5.50	0.09	0.20		%	1	10/3/2013 4:00:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **hb**
1" Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
2mm Gradation	0.15	0.05	0.10		%	1	10/3/2013 1:00:00 PM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **hb**
% Clay	4.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Sand	96.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Silt	ND	0.1	0.1		%	1	10/3/2013 3:00:00 PM
Soil Class	SAND					1	10/3/2013 3:00:00 PM

Qualifiers:				
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below the Reporting Limit
	Limit	Reporting Limit	MDL	Method Detection Limit
	N	Spike Recovery outside accepted recovery limits	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *28-Oct-13*

CLIENT:	AECOM	**Client Sample ID:**	058 EFSC #26897
Lab Order:	1309111	**Collection Date:**	8/26/2013 3:00:00 PM
Project:	Sediment Analysis		
Lab ID:	1309111-004	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Aluminum	13900	4.01	12.8	N	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Arsenic	42.2	4.18	12.8		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Cadmium	13.9	0.285	0.851		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Chromium	32.7	7.53	21.3		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Copper	73.4	0.945	4.25		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Lead	12.5	0.153	0.425		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Nickel	79.8	0.122	0.425		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Selenium	4.79	0.289	0.851		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Silver	0.334	0.157	0.425	J	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Zinc	844	11.7	21.3		mg/Kg-dry	2	10/24/2013 2:54:11 PM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	0.0774	0.0627	0.216	JH	mg/Kg-dry	1	10/2/2013 9:07:00 AM
ORGANIC MATTER-WALKLEY BLACK			**OM_WALKLEYBLACK**				Analyst: **hb/df**
Organic Matter - Walkley Black	18.3	0.09	0.20		%	1	10/3/2013 4:00:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **hb**
1" Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
2mm Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **hb**
% Clay	6.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Sand	82.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Silt	12.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
Soil Class	LOAMY SAND					1	10/3/2013 3:00:00 PM

Qualifiers:

H	Holding times for preparation or analysis exceeded	J	Analyte detected below the Reporting Limit
Limit	Reporting Limit	MDL	Method Detection Limit
N	Spike Recovery outside accepted recovery limits	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *28-Oct-13*

CLIENT: AECOM
Lab Order: 1309111
Project: Sediment Analysis
Lab ID: 1309111-005

Client Sample ID: 058 LSC #26898
Collection Date: 8/26/2013 10:00:00 AM

Matrix: SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Aluminum	12300	2.32	7.38	N	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Arsenic	23.7	2.42	7.38		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Cadmium	1.29	0.165	0.492		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Chromium	94.5	4.36	12.3		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Copper	56.7	0.546	2.46		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Lead	9.14	0.089	0.246		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Nickel	73.4	0.071	0.246		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Selenium	1.94	0.167	0.492		mg/Kg-dry	2	10/24/2013 2:54:11 PM
Silver	0.168	0.091	0.246	J	mg/Kg-dry	2	10/24/2013 2:54:11 PM
Zinc	205	6.79	12.3		mg/Kg-dry	2	10/24/2013 2:54:11 PM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	0.0402	0.0354	0.122	JH	mg/Kg-dry	1	10/2/2013 9:07:00 AM
ORGANIC MATTER-WALKLEY BLACK			**OM_WALKLEYBLACK**				Analyst: **hb/df**
Organic Matter - Walkley Black	1.67	0.09	0.20		%	1	10/3/2013 4:00:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **hb**
1" Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
2mm Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **hb**
% Clay	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Sand	96.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Silt	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
Soil Class	SAND					1	10/3/2013 3:00:00 PM

Qualifiers:

H	Holding times for preparation or analysis exceeded	J	Analyte detected below the Reporting Limit
Limit	Reporting Limit	MDL	Method Detection Limit
N	Spike Recovery outside accepted recovery limits	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *28-Oct-13*

CLIENT:	AECOM	**Client Sample ID:**	SAND (058)
Lab Order:	1309111	**Collection Date:**	8/26/2013 10:00:00 AM
Project:	Sediment Analysis		
Lab ID:	1309111-006	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Aluminum	205	1.20	3.82	N	mg/Kg-dry	1	10/24/2013 2:54:11 PM
Arsenic	ND	1.25	3.82		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Cadmium	ND	0.085	0.255		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Chromium	5.87	2.26	6.37	J	mg/Kg-dry	1	10/24/2013 2:54:11 PM
Copper	ND	0.283	1.27		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Lead	0.144	0.046	0.127		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Nickel	0.273	0.037	0.127		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Selenium	ND	0.087	0.255		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Silver	ND	0.047	0.127		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Zinc	4.09	3.52	6.37	J	mg/Kg-dry	1	10/24/2013 2:54:11 PM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	ND	0.0372	0.128		mg/Kg-dry	1	10/2/2013 9:07:00 AM
ORGANIC MATTER-WALKLEY BLACK			**OM_WALKLEYBLACK**				Analyst: **hb/df**
Organic Matter - Walkley Black	ND	0.09	0.20		%	1	10/3/2013 4:00:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **hb**
1" Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
2mm Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **hb**
% Clay	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Sand	96.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Silt	2.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
Soil Class	SAND					1	10/3/2013 3:00:00 PM

Qualifiers:	H	Holding times for preparation or analysis exceeded	J	Analyte detected below the Reporting Limit
	Limit	Reporting Limit	MDL	Method Detection Limit
	N	Spike Recovery outside accepted recovery limits	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *28-Oct-13*

CLIENT:	AECOM	**Client Sample ID:**	FORM SED (058)
Lab Order:	1309111	**Collection Date:**	8/26/2013 10:00:00 AM
Project:	Sediment Analysis		
Lab ID:	1309111-007	**Matrix:**	SOIL

Analyses	**Result**	**MDL**	**Rpt Limit**	**Qualifier**	**Units**	**DF**	**Date Analyzed**
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Aluminum	2280	1.29	4.09	N	mg/Kg-dry	1	10/24/2013 2:54:11 PM
Arsenic	ND	1.34	4.09		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Cadmium	0.118	0.091	0.273	J	mg/Kg-dry	1	10/24/2013 2:54:11 PM
Chromium	10.0	2.42	6.82		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Copper	ND	0.303	1.36		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Lead	2.13	0.049	0.136		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Nickel	0.754	0.039	0.136		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Selenium	0.279	0.093	0.273		mg/Kg-dry	1	10/24/2013 2:54:11 PM
Silver	0.060	0.050	0.136	J	mg/Kg-dry	1	10/24/2013 2:54:11 PM
Zinc	5.42	3.77	6.82	J	mg/Kg-dry	1	10/24/2013 2:54:11 PM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	ND	0.0406	0.140	H	mg/Kg-dry	1	10/2/2013 9:07:00 AM
ORGANIC MATTER-WALKLEY BLACK		**OM_WALKLEYBLACK**					Analyst: **hb/df**
Organic Matter - Walkley Black	18.0	0.09	0.20		%	1	10/3/2013 4:00:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **hb**
1" Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
2mm Gradation	ND	0.05	0.10		%	1	10/3/2013 1:00:00 PM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **hb**
% Clay	8.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Sand	88.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
% Silt	4.0	0.1	0.1		%	1	10/3/2013 3:00:00 PM
Soil Class	LOAMY SAND					1	10/3/2013 3:00:00 PM

Qualifiers:				
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below the Reporting Limit
	Limit	Reporting Limit	MDL	Method Detection Limit
	N	Spike Recovery outside accepted recovery limits	ND	Not Detected at the Method Detection Limit (MDL)

MSE Analytical Laboratory

P.O. Box 4078
200 Technology Way
Butte, MT 59701

Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

Date: *28-Oct-13*
Report Date: *25-Oct-13*

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis
Work Order: 1309111
BatchID: 7259

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: ***7259-PB***			*Method:* ***SW7471***		*Batch ID:* ***7259***		*Analysis Date: 10/2/2013 9:07:00 AM*			
Mercury	ND	0.100	mg/Kg							
Sample ID: ***LCS-7259***			*Method:* ***SW7471***		*Batch ID:* ***7259***		*Analysis Date: 10/2/2013 9:07:00 AM*			
Mercury	17.1	1.22	mg/Kg	21.70	78.9	80	120			S*
Sample ID: ***1309111-001A-MS***			*Method:* ***SW7471***		*Batch ID:* ***7259***		*Analysis Date: 10/2/2013 9:07:00 AM*			
Mercury	25.3	1.58	mg/Kg-dry	28.28	89.5	75	125			H
Sample ID: ***1309111-001A-MSD***			*Method:* ***SW7471***		*Batch ID:* ***7259***		*Analysis Date: 10/2/2013 9:07:00 AM*			
Mercury	26.0	1.58	mg/Kg-dry	28.28	92.0	75	125	2.78	35	H

Qualifiers: NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/kg; Nickel 79.2-139 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis
Work Order: 1309111
BatchID: 7262

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: ***7262-PB-FILTERED***			*Method:* ***SW6020***		*Batch ID:* ***7262***		*Analysis Date: 10/24/2013 2:54:11 PM*			
Aluminum	ND	3.00	mg/Kg							
Arsenic	ND	3.00	mg/Kg							
Cadmium	ND	0.200	mg/Kg							
Chromium	ND	5.00	mg/Kg							
Copper	ND	1.00	mg/Kg							
Lead	ND	0.100	mg/Kg							
Nickel	ND	0.100	mg/Kg							
Selenium	ND	0.200	mg/Kg							
Silver	ND	0.100	mg/Kg							
Zinc	ND	5.00	mg/Kg							
Sample ID: ***7262-PB-UNFILTERED***			*Method:* ***SW6020***		*Batch ID:* ***7262***		*Analysis Date: 10/24/2013 2:54:11 PM*			
Aluminum	ND	3.00	mg/Kg							
Arsenic	ND	3.00	mg/Kg							
Cadmium	ND	0.200	mg/Kg							
Chromium	ND	5.00	mg/Kg							
Copper	ND	1.00	mg/Kg							
Lead	ND	0.100	mg/Kg							
Nickel	ND	0.100	mg/Kg							
Selenium	ND	0.200	mg/Kg							
Silver	ND	0.100	mg/Kg							
Zinc	ND	5.00	mg/Kg							
Sample ID: ***LCS-7262***			*Method:* ***SW6020***		*Batch ID:* ***7262***		*Analysis Date: 10/24/2013 2:54:11 PM*			
Aluminum	4530	2.99	mg/Kg	1107	409	80	120			S
Arsenic	110	2.99	mg/Kg	100.8	109	80	120			
Cadmium	195	0.200	mg/Kg	184.6	106	80	120			
Chromium	234	4.99	mg/Kg	180.6	130	80	120			S*
Copper	79.9	0.998	mg/Kg	73.22	109	80	120			
Lead	285	0.100	mg/Kg	250.4	114	80	120			
Nickel	131	0.100	mg/Kg	108.7	121	80	120			S*
Selenium	227	0.200	mg/Kg	212.5	107	80	120			
Silver	70.8	0.100	mg/Kg	59.86	118	80	120			
Zinc	633	4.99	mg/Kg	558.7	113	80	120			
Sample ID: ***LFB***			*Method:* ***SW6020***		*Batch ID:* ***7262***		*Analysis Date: 10/24/2013 2:54:11 PM*			
Aluminum	194	3.00	mg/Kg	200.0	96.8	85	115			
Sample ID: ***1309111-001A-MS***			*Method:* ***SW6020***		*Batch ID:* ***7262***		*Analysis Date: 10/24/2013 2:54:11 PM*			
Aluminum	16400	7.79	mg/Kg-dry	1446	68.7	75	125			NA
Arsenic	181	7.79	mg/Kg-dry	131.6	118	75	125			
Cadmium	281	0.520	mg/Kg-dry	241.1	116	75	125			
Chromium	337	13.0	mg/Kg-dry	235.8	127	75	125			S*

Qualifiers:

NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits

Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/kg; Nickel 79.2-139 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis

Work Order: 1309111
BatchID: 7262

Sample ID: ***1309111-001A-MS*** *Method:* ***SW6020*** *Batch ID:* ***7262*** *Analysis Date: 10/24/2013 2:54:11 PM*

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Copper	223	2.60	mg/Kg-dry	95.64	161	75	125			S
Lead	383	0.260	mg/Kg-dry	327.1	115	75	125			
Nickel	200	0.260	mg/Kg-dry	142.0	119	75	125			
Selenium	305	0.520	mg/Kg-dry	277.5	109	75	125			
Silver	91.5	0.260	mg/Kg-dry	78.18	117	75	125			
Zinc	932	13.0	mg/Kg-dry	729.7	112	75	125			

Sample ID: ***1309111-001A-MSD*** *Method:* ***SW6020*** *Batch ID:* ***7262*** *Analysis Date: 10/24/2013 2:54:11 PM*

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Aluminum	16900	7.76	mg/Kg-dry	1446	105	75	125	3.14	35	NA
Arsenic	189	7.76	mg/Kg-dry	131.6	125	75	125	4.35	35	
Cadmium	281	0.517	mg/Kg-dry	241.1	116	75	125	0.186	35	
Chromium	349	12.9	mg/Kg-dry	235.8	132	75	125	3.58	35	S
Copper	171	2.59	mg/Kg-dry	95.64	106	75	125	26.4	35	
Lead	381	0.259	mg/Kg-dry	327.1	114	75	125	0.645	35	
Nickel	202	0.259	mg/Kg-dry	142.0	121	75	125	1.15	35	
Selenium	312	0.517	mg/Kg-dry	277.5	112	75	125	2.12	35	
Silver	89.8	0.259	mg/Kg-dry	78.18	114	75	125	1.97	35	
Zinc	941	12.9	mg/Kg-dry	729.7	114	75	125	1.01	35	

Sample ID: ***1309111-001A-MST*** *Method:* ***SW6020*** *Batch ID:* ***7262*** *Analysis Date: 10/24/2013 2:54:11 PM*

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Aluminum	17900	7.79	mg/Kg-dry	1446	173	75	125	8.82	35	NA
Arsenic	184	7.79	mg/Kg-dry	131.6	120	75	125	1.35	35	
Cadmium	298	0.519	mg/Kg-dry	241.1	123	75	125	5.75	35	
Chromium	341	13.0	mg/Kg-dry	235.8	129	75	125	1.35	35	S*
Copper	173	2.60	mg/Kg-dry	95.64	109	75	125	25.2	35	
Lead	390	0.260	mg/Kg-dry	327.1	117	75	125	1.82	35	
Nickel	204	0.260	mg/Kg-dry	142.0	122	75	125	2.01	35	
Selenium	304	0.519	mg/Kg-dry	277.5	109	75	125	0.196	35	
Silver	88.7	0.260	mg/Kg-dry	78.18	113	75	125	3.11	35	
Zinc	941	13.0	mg/Kg-dry	729.7	114	75	125	0.935	35	

Qualifiers: NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/Kg; Nickel 79.2-139 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis

Work Order: 1309111
BatchID: R24739

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: ***1309111-006A-D***			*Method:* ***ASTMD422***		*Batch ID:* ***R24739***		*Analysis Date: 10/3/2013 1:00:00 PM*			
1" Gradation	ND	0.10	%					0	35	
2mm Gradation	ND	0.10	%					0	35	

Qualifiers:

NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits

Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/kg; Nickel 79.2-139 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis

Work Order: 1309111
BatchID: R24748

Sample ID: ***1309111-006A-D*** *Method:* ***MSA15-5*** *Batch ID:* ***R24748*** *Analysis Date: 10/3/2013 3:00:00 PM*

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
% Clay	2.0	0.1	%					0	35	
% Sand	96.0	0.1	%					0	35	
% Silt	2.0	0.1	%					0	35	
Soil Class	SAND									

Qualifiers: NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/kg; Nickel 79.2-139 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis

Work Order: 1309111
BatchID: R24797

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: ***PB***			*Method:* ***OM_WALKLE***		*Batch ID:* ***R24797***			***Analysis Date: 10/3/2013 4:00:00 PM***		
Organic Matter - Walkl	ND	0.20	%							
Sample ID: ***LCS***			*Method:* ***OM_WALKLE***		*Batch ID:* ***R24797***			***Analysis Date: 10/3/2013 4:00:00 PM***		
Organic Matter - Walkl	2.14	0.20	%	2.500	85.4	80	120			
Sample ID: ***1309111-001A-D***			*Method:* ***OM_WALKLE***		*Batch ID:* ***R24797***			***Analysis Date: 10/3/2013 4:00:00 PM***		
Organic Matter - Walkl	0.54	0.20	%					12.2	35	

Qualifiers: NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Chromium 127-234 mg/kg; Mercury 11.2-32.2mg/kg; Nickel 79.2-139 mg/kg

Friday, August 16, 2013

Analytical Laboratory

Rami Naddy
AECOM
4303 W Laporte Ave
Fort Collins, CO 80521

RE: Sediment Analysis

Work Order: 1307108

Dear Rami Naddy:

MSE Lab Services received 9 sample(s) on 7/17/2013 for the analyses presented in the following report.

Please find enclosed analytical results for the sample(s) received at the MSE Laboratory.

If you have any questions regarding these test results, please feel free to call.

Sincerely,

Sara Ward

Sara Ward
Laboratory Manager
406-494-7334

Enclosure

Removed pages of this rpt not related to samples from this project.
RBW

8/19/13

2 of 11

MSE Lab Services

Date: *16-Aug-13*

CLIENT:	AECOM	**Client Sample ID:**	LJC (#26895)
Lab Order:	1307108	**Collection Date:**	7/1/2013 11:00:00 AM
Project:	Sediment Analysis		
Lab ID:	1307108-003	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	ND	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

3 of 11

CLIENT: AECOM
Lab Order: 1307108
Project: Sediment Analysis
Lab ID: 1307108-004

Client Sample ID: LSC (#26898)
Collection Date: 7/2/2013 10:00:00 AM
Matrix: SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	1.84	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:

E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

4 of 11

MSE Lab Services **Date:** *16-Aug-13*

CLIENT:	AECOM	**Client Sample ID:**	USC (#26896)
Lab Order:	1307108	**Collection Date:**	7/1/2013 1:00:00 PM
Project:	Sediment Analysis		
Lab ID:	1307108-005	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	ND	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

5 of 11

MSE Lab Services

Date: 16-Aug-13

CLIENT: AECOM
Lab Order: 1307108
Project: Sediment Analysis
Lab ID: 1307108-006

Client Sample ID: LSH (#26894)
Collection Date: 7/1/2013 9:00:00 AM
Matrix: SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	ND	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services **Date:** *16-Aug-13*

CLIENT:	AECOM	**Client Sample ID:**	EFSC (#26897)
Lab Order:	1307108	**Collection Date:**	7/1/2013 3:00:00 PM
Project:	Sediment Analysis		
Lab ID:	1307108-007	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	5.20	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

7 of 11

MSE Lab Services

Date: *16-Aug-13*

CLIENT:	AECOM	**Client Sample ID:**	WFSC (#26900)
Lab Order:	1307108	**Collection Date:**	7/2/2013 2:00:00 PM
Project:	Sediment Analysis		
Lab ID:	1307108-008	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	3.75	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

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CLIENT:	AECOM	**Client Sample ID:**	USH (#26899)
Lab Order:	1307108	**Collection Date:**	7/1/2013 10:00:00 AM
Project:	Sediment Analysis		
Lab ID:	1307108-009	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	2.29	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

MSE Analytical Laboratory

P.O. Box 4078
200 Technology Way
Butte, MT 59701

Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

Date: *16-Aug-13*
Report Date: *16-Aug-13*

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis

Work Order: 1307108
BatchID: 7071

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: ***1307108-003A-D***			*Method:* ***AVS-SEM***		*Batch ID:* ***7071***			*Analysis Date: 7/29/2013 12:03:00 PM*		
Sulfide	ND	1.50	µmoles/g					0	35	
Sample ID: ***1307108-003A-S***			*Method:* ***AVS-SEM***		*Batch ID:* ***7071***			*Analysis Date: 7/29/2013 12:03:00 PM*		
Sulfide	8.78	1.50	µmoles/g	10.86	80.8	80	120			
Sample ID: ***LCS-7071***			*Method:* ***AVS-SEM***		*Batch ID:* ***7071***			*Analysis Date: 7/29/2013 12:03:00 PM*		
Sulfide	8.47	1.50	µmoles/g	8.388	101	85	105			
Sample ID: ***7071-PB***			*Method:* ***AVS-SEM***		*Batch ID:* ***7071***			*Analysis Date: 7/29/2013 12:03:00 PM*		
Sulfide	1.41	1.50	µmoles/g							J

Qualifiers:

NA	Sample conc. is > 4*spike level	S*	Spike Recovery outside limits; within Manufacturer Limits Manufacturer Limits for Aluminum 118 - 3730 mg/kg; Mercury 14.9 - 43.1 mg/kg

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AECOM

CHAIN OF CUSTODY RECORD

Page ____ of ____

Client/Project Name:

Project Location: FCER

Project Number:

Field Logbook No.:

Sampler (Print Name)/(Affiliation): Benjamin Brewster/ADFG Amber Potts/AECOM

Chain of Custody Tape Nos.: 43703

Signature: Amber Potts

Send Results/Report to: Kami Naclay

TAT: SH

Analysis Requested

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	Total Metals (Al, Cr, Ni, Ag, Zn, As, Cd, Cu, Pb, Se)	TOC (Walkley Black)	Mercury	% Coarse Material	Rapid Hydro (% clay, silt, sand)	AVS					Lab I.D.	Remarks
USH (#26899)	7/1/13	1100			500mL	SD	4°C	NA	X	X	X	X	X							
WFSC (#26900)	7/2/13	1400			500mL	SD	4°C	NA	X	X	X	X	X							
LJC (#26895)	7/4/13	1100			4oz	SD	4°C	NA						X						
LSC (#26898)	7/2/13	1000			↓	↓	↓	↓						X						
USC (#26896)	7/1/13	1300			↓	↓	↓	↓						X						
LSH (#26894)	7/1/13	0900			↓	↓	↓	↓						X						
EFSC (#26897)	7/1/13	1500			↓	↓	↓	↓						X						
WFSC (#26900)	7/2/13	1400			2oz	SD	4°C	NA						X						
USH (#26899)	7/1/13	0900			↓	↓	↓	↓						X						

Container Type:
P – Plastic
A – Amber Glass
G – Clear Glass
V – VOA Vial
O – Other
E – Encore

Preservation:
1 – HCl, 4°
2 – H2SO4, 4°
3 – HNO3, 4°
4 – NaOH, 4°
5 – NaOH/ZnAc, 4°
6 – Na2S2O3, 4°
7 – 4°

Matrix Codes:
DW – Drinking Water
WW – Wastewater
GW – Groundwater
SW – Surface Water
ST – Storm Water
W – Water
S – Soil
SL – Sludge
SD – Sediment
SO – Solid
A – Air
L – Liquid
P – Product

Relinquished by: (Print Name)/(Affiliation) Amber Potts/AECOM
Signature: Amber Potts
Date: 7/17/13
Time: 0730

Received by: (Print Name)/(Affiliation) Debbie Ortega ASETA LAB
Signature: Debbie Ortega
Date: 7-17-13
Time: 10:55

Relinquished by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

Received by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

Relinquished by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

Received by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

Analytical Laboratory (Destination):

AECOM Toxicology Lab
4303 W. Laporte Avenue
Fort Collins, CO 80521
(970) 416-0916
(970) 490-2963 (FAX)

MSE

Sample Shipped Via: UPS [✓ FedEx] Courier Other

Temp blank: Yes [✓ No]

Sealed cooler/ice

Serial No. 53534

O:\GRAPHICS\FORMS\Chain of Custody (COC)\Chain-of-Custody_Ft_Collins_10_07.doc

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MSE Lab Services

Sample Receipt Checklist

Client Name AECOM_INC

Date and Time Received: 7/17/2013 12:55:00 PM

Work Order Number 1307108

RcptNo: 1

Received by DO

COC_ID: 1307108

CoolerID:

Checklist completed by Melissa Dirrings 7/17/13
Signature Date

Reviewed by SW 7/18/13
Initials Date

Matrix:

Carrier name FedEx

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shippping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☐	No ☑	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☐	No ☑	
Water - VOA vials have zero headspace?	No VOA vials submitted ☑	Yes ☐	No ☐
Water - pH acceptable upon receipt?	Yes ☐	No ☐	Blank ☐

Adjusted? No

Checked by NA soil Melissa Dirrings 7/17/13

Any No and/or NA (not applicable) response must be detailed in the comments section be

Client contacted

Date contacted:

Person contacted

Contacted by:

Regarding:

Comments: FED EX TEMP=NA SOIL

Corrective Action

AECOM
Environmental Toxicology
4303 West LaPorte Avenue, Fort Collins, Colorado 80521-2154
T 970.416.0916 F 970.490.2963 www.aecom.com

September 16, 2013

Kevin Eppers
Coeur Alaska Inc.
Kensington Gold Mine
3031 Clinton Drive
Suite 202
Juneau, AK 99801

Subject: Analytical results of sediment samples

Dear Mr. Eppers:

Below are the analytical results for the sediment samples collected on July 1st and July 2nd, 2013 by the Alaska Department of Fish and Game and shipped to AECOM. Samples arrived at AECOM on July 10, 2013 and were analyzed for the following parameters.

Parameter	Sample Identification	
	USH (#26899)	WFSC (#26900)
Metals (mg/kg-dry)		
Aluminum	16,700	11,100
Chromium	40.9	24.8
Zinc	94.3	153
Arsenic	41.9	11.1
Cadmium	0.238	0.694
Copper	61.0	49.8
Lead	5.75	7.79
Nickel	33.1	55.5
Selenium	0.433 J	<0.191
Silver	0.203 J	0.123 J
Mercury	<0.0377	0.129 J
Particle Size (%)		
Clay	4.0	2.0
Sand	94.0	96.0
Silt	2.0	2.0
Texture / Soil Class	Sand	Sand
Coarse Material (2 mm)	0.35	0.17
Total Organic Carbon (mg/L)	<0.09	<0.09
Acid Volatile Sulfide (µmoles/g)	2.29	3.75

Note: Metals (Ar, Cd, Cr, Cu, Pb, Se, Zn, Ni, Al, and Ag) analyses were determined by SW-846 Method 6020; Hg by SW-846 7471B (USEPA 1986); Particle size by ASTM Method D422 and Modified ASA 15-5. See attachment for more information.
J = The concentration was below the method reporting limit (MRL) but above the method detection limit (MDL); for samples below the DL, the MDL was reported.

We appreciate the opportunity to provide our services to you and Coeur Alaska Inc. Please do not hesitate to contact us if you have any questions.

Sincerely,

Ashley Romero, M.S.
Data Analyst
ashley.romero@aecom.com

Rami B. Naddy, Ph.D.
Study Director / Environmental Toxicologist
rami.naddy@aecom.com

60297514-100-(103 & 111)
Attachment

Friday, August 16, 2013

Analytical Laboratory

Rami Naddy
AECOM
4303 W Laporte Ave
Fort Collins, CO 80521

RE: Sediment Analysis

Work Order: 1307108

Dear Rami Naddy:

MSE Lab Services received 9 sample(s) on 7/17/2013 for the analyses presented in the following report.

Please find enclosed analytical results for the sample(s) received at the MSE Laboratory.

If you have any questions regarding these test results, please feel free to call.

Sincerely,

Sara Ward

Sara Ward
Laboratory Manager
406-494-7334

Enclosure

MSE Analytical Laboratory
P.O. Box 4078
200 Technology Way
Butte, MT 59701
Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

8/19/13

MSE Lab Services

Date: *16-Aug-13*

CLIENT: AECOM
Lab Order: 1307108
Project: Sediment Analysis
Lab ID: 1307108-001

Client Sample ID: USH(#26899)
Collection Date: 7/1/2013 10:00:00 AM

Matrix: SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **kgw**
Aluminum	16700	4.91	15.6		mg/Kg-dry	4	8/10/2013 12:02:54 AM
Arsenic	41.9	0.113	0.391		mg/Kg-dry	2	8/8/2013 12:55:13 AM
Cadmium	0.238	0.007	0.026		mg/Kg-dry	2	8/8/2013 12:55:13 AM
Chromium	40.9	0.143	0.521		mg/Kg-dry	2	8/8/2013 12:55:13 AM
Copper	61.0	0.107	0.326		mg/Kg-dry	2	8/8/2013 12:55:13 AM
Lead	5.75	0.012	0.052		mg/Kg-dry	2	8/8/2013 12:55:13 AM
Nickel	33.1	0.075	0.260		mg/Kg-dry	2	8/8/2013 12:55:13 AM
Selenium	0.433	0.177	0.521	J	mg/Kg-dry	2	8/8/2013 12:55:13 AM
Silver	0.203	0.096	0.260	J	mg/Kg-dry	2	8/8/2013 12:55:13 AM
Zinc	94.3	0.238	0.781		mg/Kg-dry	2	8/8/2013 12:55:13 AM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	ND	0.0377	0.130		mg/Kg-dry	1	7/24/2013 12:16:00 PM
ORGANIC MATTER-WALKLEY BLACK			**OM_WALKLEYBLACK**				Analyst: **jr**
Organic Matter - Walkley Black	ND	0.09	0.20		%	1	7/30/2013 2:44:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **mp**
1" Gradation	ND	0.05	0.10		%	1	7/22/2013 9:00:00 AM
2mm Gradation	0.35	0.05	0.10		%	1	7/22/2013 9:00:00 AM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **df**
% Clay	4.0	0.1	0.1		%	1	7/23/2013 4:45:00 PM
% Sand	94.0	0.1	0.1		%	1	7/23/2013 4:45:00 PM
% Silt	2.0	0.1	0.1		%	1	7/23/2013 4:45:00 PM
Soil Class	SAND					1	7/23/2013 4:45:00 PM

Qualifiers:

E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *16-Aug-13*

CLIENT:	AECOM	**Client Sample ID:**	WFSC(#26900)
Lab Order:	1307108	**Collection Date:**	7/2/2013 2:00:00 PM
Project:	Sediment Analysis		
Lab ID:	1307108-002	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **kgw**
Aluminum	11100	5.30	16.9		mg/Kg-dry	4	8/10/2013 12:02:54 AM
Arsenic	11.1	0.122	0.421		mg/Kg-dry	2	8/8/2013 12:55:13 AM
Cadmium	0.694	0.007	0.028		mg/Kg-dry	2	8/8/2013 12:55:13 AM
Chromium	24.8	0.154	0.562		mg/Kg-dry	2	8/8/2013 12:55:13 AM
Copper	49.8	0.115	0.351		mg/Kg-dry	2	8/8/2013 12:55:13 AM
Lead	7.79	0.013	0.056		mg/Kg-dry	2	8/8/2013 12:55:13 AM
Nickel	55.5	0.081	0.281		mg/Kg-dry	2	8/8/2013 12:55:13 AM
Selenium	ND	0.191	0.562		mg/Kg-dry	2	8/8/2013 12:55:13 AM
Silver	0.123	0.103	0.281	J	mg/Kg-dry	2	8/8/2013 12:55:13 AM
Zinc	153	0.257	0.843		mg/Kg-dry	2	8/8/2013 12:55:13 AM
MERCURY IN SOIL/SEDIMENT - SW846 7471B			**SW7471**	**SW7471A**			Analyst: **jc**
Mercury	0.129	0.0409	0.141	J	mg/Kg-dry	1	7/24/2013 12:16:00 PM
ORGANIC MATTER-WALKLEY BLACK			**OM_WALKLEYBLACK**				Analyst: **jr**
Organic Matter - Walkley Black	ND	0.09	0.20		%	1	7/30/2013 2:44:00 PM
PERCENT COARSE MATERIAL			**ASTMD422**				Analyst: **mp**
1" Gradation	ND	0.05	0.10		%	1	7/22/2013 9:00:00 AM
2mm Gradation	0.17	0.05	0.10		%	1	7/22/2013 9:00:00 AM
RAPID HYDROMETER (2 HOUR) MOD ASA 15-5			**MSA15-5**				Analyst: **df**
% Clay	2.0	0.1	0.1		%	1	7/23/2013 4:45:00 PM
% Sand	96.0	0.1	0.1		%	1	7/23/2013 4:45:00 PM
% Silt	2.0	0.1	0.1		%	1	7/23/2013 4:45:00 PM
Soil Class	SAND					1	7/23/2013 4:45:00 PM

Qualifiers:	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT:	AECOM	**Client Sample ID:**	LJC (#26895)
Lab Order:	1307108	**Collection Date:**	7/1/2013 11:00:00 AM
Project:	Sediment Analysis		
Lab ID:	1307108-003	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	ND	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT: AECOM
Lab Order: 1307108
Project: Sediment Analysis
Lab ID: 1307108-004

Client Sample ID: LSC (#26898)
Collection Date: 7/2/2013 10:00:00 AM

Matrix: SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	1.84	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT:	AECOM	**Client Sample ID:**	USC (#26896)
Lab Order:	1307108	**Collection Date:**	7/1/2013 1:00:00 PM
Project:	Sediment Analysis		
Lab ID:	1307108-005	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	ND	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:

E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT:	AECOM	**Client Sample ID:**	LSH (#26894)
Lab Order:	1307108	**Collection Date:**	7/1/2013 9:00:00 AM
Project:	Sediment Analysis		
Lab ID:	1307108-006	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	ND	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT:	AECOM	**Client Sample ID:**	EFSC (#26897)
Lab Order:	1307108	**Collection Date:**	7/1/2013 3:00:00 PM
Project:	Sediment Analysis		
Lab ID:	1307108-007	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	5.20	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT:	AECOM	**Client Sample ID:**	WFSC (#26900)
Lab Order:	1307108	**Collection Date:**	7/2/2013 2:00:00 PM
Project:	Sediment Analysis		
Lab ID:	1307108-008	**Matrix:**	SOIL

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	3.75	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

CLIENT:	AECOM	**Client Sample ID:**	USH (#26899)
Lab Order:	1307108	**Collection Date:**	7/1/2013 10:00:00 AM
Project:	Sediment Analysis		
Lab ID:	1307108-009	**Matrix:**	SOIL

Analyses	**Result**	**MDL**	**Rpt Limit**	**Qualifier**	**Units**	**DF**	**Date Analyzed**
ACID VOLATILE SULFIDE-SIM. EXT. METALS			**AVS-SEM**	**AVS-SEM**			Analyst: **kgw**
Sulfide	2.29	1.40	1.50		µmoles/g	1	7/29/2013 12:03:00 PM

Qualifiers:

E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below the Reporting Limit	Limit	Reporting Limit
MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis
Work Order: 1307108
BatchID: 6978

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
*Sample ID: **6978-PB-FILTERED***			*Method: **SW6020***		*Batch ID: **6978***		*Analysis Date: 8/8/2013 12:55:13 AM*			
Arsenic	ND	6.00	mg/Kg							
Cadmium	ND	0.400	mg/Kg							
Chromium	ND	10.0	mg/Kg							
Copper	ND	2.00	mg/Kg							
Lead	ND	0.200	mg/Kg							
Nickel	ND	0.200	mg/Kg							
Selenium	ND	0.400	mg/Kg							
Silver	ND	0.200	mg/Kg							
Zinc	ND	10.0	mg/Kg							
*Sample ID: **6978-PB-UNFILTERED***			*Method: **SW6020***		*Batch ID: **6978***		*Analysis Date: 8/8/2013 12:55:13 AM*			
Arsenic	ND	6.00	mg/Kg							
Cadmium	ND	0.400	mg/Kg							
Chromium	ND	10.0	mg/Kg							
Copper	ND	2.00	mg/Kg							
Lead	ND	0.200	mg/Kg							
Nickel	ND	0.200	mg/Kg							
Selenium	ND	0.400	mg/Kg							
Silver	ND	0.200	mg/Kg							
Zinc	ND	10.0	mg/Kg							
*Sample ID: **LCS-6978***			*Method: **SW6020***		*Batch ID: **6978***		*Analysis Date: 8/8/2013 12:55:13 AM*			
Arsenic	93.0	5.98	mg/Kg	101.0	92.1	80	120			
Cadmium	172	0.398	mg/Kg	186.0	92.2	80	120			
Chromium	193	9.96	mg/Kg	180.0	107	80	120			
Copper	71.2	1.99	mg/Kg	73.50	96.9	80	120			
Lead	240	0.199	mg/Kg	251.0	95.5	80	120			
Nickel	113	0.199	mg/Kg	109.0	104	80	120			
Selenium	197	0.398	mg/Kg	213.0	92.4	80	120			
Silver	59.0	0.199	mg/Kg	57.40	103	80	120			
Zinc	507	9.96	mg/Kg	555.0	91.4	80	120			
*Sample ID: **1307108-001A-MS***			*Method: **SW6020***		*Batch ID: **6978***		*Analysis Date: 8/8/2013 12:55:13 AM*			
Arsenic	172	7.85	mg/Kg-dry	132.1	98.3	75	125			
Cadmium	238	0.523	mg/Kg-dry	243.2	97.6	75	125			
Chromium	237	13.1	mg/Kg-dry	235.4	83.2	75	125			
Copper	162	2.62	mg/Kg-dry	96.11	105	75	125			
Lead	330	0.262	mg/Kg-dry	328.2	98.7	75	125			
Nickel	154	0.262	mg/Kg-dry	142.5	84.6	75	125			
Selenium	279	0.523	mg/Kg-dry	278.5	99.8	75	125			
Silver	77.3	0.262	mg/Kg-dry	75.06	103	75	125			
Zinc	768	13.1	mg/Kg-dry	725.7	92.8	75	125			

Qualifiers: NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Aluminum 118 - 3730 mg/kg; Mercury 14.9 - 43.1 mg/kg

MSE Analytical Laboratory

P.O. Box 4078
200 Technology Way
Butte, MT 59701

Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

Date: 16-Aug-13
Report Date: 16-Aug-13

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis

Work Order: 1307108
BatchID: 6978

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: ***1307108-001A-MSD***			*Method:* ***SW6020***	*Batch ID:* ***6978***			*Analysis Date: 8/8/2013 12:55:13 AM*			
Arsenic	174	7.77	mg/Kg-dry	132.2	99.9	75	125	1.27	20	
Cadmium	223	0.518	mg/Kg-dry	243.4	91.4	75	125	6.55	20	
Chromium	217	13.0	mg/Kg-dry	235.6	74.9	75	125	8.60	20	
Copper	144	2.59	mg/Kg-dry	96.19	85.9	75	125	11.9	20	
Lead	329	0.259	mg/Kg-dry	328.5	98.5	75	125	0.113	20	
Nickel	142	0.259	mg/Kg-dry	142.6	76.3	75	125	7.90	20	
Selenium	269	0.518	mg/Kg-dry	278.7	96.5	75	125	3.36	20	
Silver	73.5	0.259	mg/Kg-dry	75.12	97.6	75	125	4.96	20	
Zinc	743	13.0	mg/Kg-dry	726.3	89.4	75	125	3.28	20	
Sample ID: ***1307108-001A-MST***			*Method:* ***SW6020***	*Batch ID:* ***6978***			*Analysis Date: 8/8/2013 12:55:13 AM*			
Arsenic	163	7.81	mg/Kg-dry	132.2	91.5	75	125	6.34	20	
Cadmium	263	0.521	mg/Kg-dry	243.4	108	75	125	9.94	20	
Chromium	264	13.0	mg/Kg-dry	235.6	94.6	75	125	10.7	20	
Copper	148	2.60	mg/Kg-dry	96.19	90.9	75	125	8.63	20	
Lead	325	0.260	mg/Kg-dry	328.5	97.3	75	125	1.26	20	
Nickel	162	0.260	mg/Kg-dry	142.6	90.5	75	125	5.39	20	
Selenium	266	0.521	mg/Kg-dry	278.7	95.4	75	125	4.49	20	
Silver	79.0	0.260	mg/Kg-dry	75.12	105	75	125	2.23	20	
Zinc	744	13.0	mg/Kg-dry	726.3	89.4	75	125	3.21	20	
Sample ID: ***6978-PB-FILTERED***			*Method:* ***SW6020***	*Batch ID:* ***6978***			*Analysis Date: 8/10/2013 12:02:54 AM*			
Aluminum	ND	6.00	mg/Kg							
Sample ID: ***6978-PB-UNFILTERED***			*Method:* ***SW6020***	*Batch ID:* ***6978***			*Analysis Date: 8/10/2013 12:02:54 AM*			
Aluminum	ND	6.00	mg/Kg							
Sample ID: ***LCS-6978***			*Method:* ***SW6020***	*Batch ID:* ***6978***			*Analysis Date: 8/10/2013 12:02:54 AM*			
Aluminum	834	5.98	mg/Kg	1100	75.8	80	120			S*
Sample ID: ***1307108-001A-MS***			*Method:* ***SW6020***	*Batch ID:* ***6978***			*Analysis Date: 8/10/2013 12:02:54 AM*			
Aluminum	13800	15.7	mg/Kg-dry	1440	-201	75	125			NA
Sample ID: ***1307108-001A-MSD***			*Method:* ***SW6020***	*Batch ID:* ***6978***			*Analysis Date: 8/10/2013 12:02:54 AM*			
Aluminum	12700	15.5	mg/Kg-dry	1440	-278	75	125	8.37	20	NA
Sample ID: ***1307108-001A-MST***			*Method:* ***SW6020***	*Batch ID:* ***6978***			*Analysis Date: 8/10/2013 12:02:54 AM*			
Aluminum	13300	15.6	mg/Kg-dry	1440	-240	75	125	4.15	20	NA

Qualifiers:

NA	Sample conc. is > 4*spike level
S*	Spike Recovery outside limits; within Manufacturer Limits Manufacturer Limits for Aluminum 118 - 3730 mg/kg; Mercury 14.9 - 43.1 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis

Work Order: 1307108
BatchID: 6987

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: ***6987-PB***			*Method:* ***SW7471***		*Batch ID:* ***6987***			*Analysis Date: 7/24/2013 12:16:00 PM*		
Mercury	ND	0.100	mg/Kg							
Sample ID: ***LCS-6987***			*Method:* ***SW7471***		*Batch ID:* ***6987***			*Analysis Date: 7/24/2013 12:16:00 PM*		
Mercury	17.1	4.69	mg/Kg	29.00	58.8	80	120			S*
Sample ID: ***1307108-001A-MS***			*Method:* ***SW7471***		*Batch ID:* ***6987***			*Analysis Date: 7/24/2013 12:16:00 PM*		
Mercury	25.1	5.45	mg/Kg-dry	37.95	66.1	75	125			S*
Sample ID: ***1307108-001A-MSD***			*Method:* ***SW7471***		*Batch ID:* ***6987***			*Analysis Date: 7/24/2013 12:16:00 PM*		
Mercury	29.4	6.44	mg/Kg-dry	37.95	77.4	75	125	15.7	20	

Qualifiers:

NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Aluminum 118 - 3730 mg/kg; Mercury 14.9 - 43.1 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis

Work Order: 1307108
BatchID: 7071

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
*Sample ID: **1307108-003A-D***			*Method: **AVS-SEM***		*Batch ID: **7071***		*Analysis Date: 7/29/2013 12:03:00 PM*			
Sulfide	ND	1.50	µmoles/g					0	35	
*Sample ID: **1307108-003A-S***			*Method: **AVS-SEM***		*Batch ID: **7071***		*Analysis Date: 7/29/2013 12:03:00 PM*			
Sulfide	8.78	1.50	µmoles/g	10.86	80.8	80	120			
*Sample ID: **LCS-7071***			*Method: **AVS-SEM***		*Batch ID: **7071***		*Analysis Date: 7/29/2013 12:03:00 PM*			
Sulfide	8.47	1.50	µmoles/g	8.388	101	85	105			
*Sample ID: **7071-PB***			*Method: **AVS-SEM***		*Batch ID: **7071***		*Analysis Date: 7/29/2013 12:03:00 PM*			
Sulfide	1.41	1.50	µmoles/g							J

Qualifiers:

NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Aluminum 118 - 3730 mg/kg; Mercury 14.9 - 43.1 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis
Work Order: 1307108
BatchID: R23958

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
*Sample ID: **1307108-001A-D***			*Method: **ASTMD422***		*Batch ID: **R23958***		*Analysis Date: 7/22/2013 9:00:00 AM*			
1" Gradation	ND	0.10	%					0	35	
2mm Gradation	0.28	0.10	%					22.4	35	

Qualifiers: NA Sample conc. Is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Aluminum 118 - 3730 mg/kg; Mercury 14.9 - 43.1 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis

Work Order: 1307108
BatchID: R23978

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: ***1307125-001A-D***			*Method:* ***MSA15-5***		*Batch ID:* ***R23978***			*Analysis Date: 7/23/2013 4:45:00 PM*		
% Clay	14.0	0.1	%					15.4	35	
% Sand	68.0	0.1	%					0	35	
% Silt	18.0	0.1	%					10.5	35	
Soil Class	SANDY LOAM									

Qualifiers:

NA Sample conc. is > 4*spike level

S* Spike Recovery outside limits; within Manufacturer Limits
Manufacturer Limits for Aluminum 118 - 3730 mg/kg; Mercury 14.9 - 43.1 mg/kg

QA/QC SUMMARY REPORT

Client: AECOM
Project: Sediment Analysis

Work Order: 1307108
BatchID: R24047

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
*Sample ID: **1307143-001A-D***			*Method: **OM_WALKLE***	*Batch ID: **R24047***			*Analysis Date: 7/30/2013 2:44:00 PM*			
Organic Matter - Walkl	ND	0.20	%					0	35	
*Sample ID: **PB***			*Method: **OM_WALKLE***	*Batch ID: **R24047***			*Analysis Date: 7/30/2013 2:44:00 PM*			
Organic Matter - Walkl	ND	0.20	%							
*Sample ID: **LCS Q6169***			*Method: **OM_WALKLE***	*Batch ID: **R24047***			*Analysis Date: 7/30/2013 2:44:00 PM*			
Organic Matter - Walkl	0.26	0.20	%	0.2620	101	70.7	109			

Qualifiers:

NA	Sample conc. is > 4*spike level	S*	Spike Recovery outside limits; within Manufacturer Limits Manufacturer Limits for Aluminum 118 - 3730 mg/kg; Mercury 14.9 - 43.1 mg/kg

AECOM

CHAIN OF CUSTODY RECORD

Page ____ of ____

Client/Project Name:	Project Location: FCEL	Analysis Requested
Project Number:	Field Logbook No.:	
Sampler (Print Name)/(Affiliation): Benjamin Brewster/ADFG Amber Bills/AECOM	Chain of Custody Tape Nos.: 43703	
Signature: Amber Bills	Send Results/Report to: Kathi Maday TAT: Std	

Container Type
P – Plastic
A – Amber Glass
G – Clear Glass
V – VOA Vial
O – Other
E – Encore

Preservation
1 – HCl, 4°
2 – H2SO4, 4°
3 – HNO3, 4°
4 – NaOH, 4°
5 – NaOH/ZnAc, 4°
6 – Na2S2O3, 4°
7 – 4°

Matrix Codes:
DW – Drinking Water
WW – Wastewater
GW – Groundwater
SW – Surface Water
ST – Storm Water
W – Water
S – Soil
SL – Sludge
SD – Sediment
SO – Solid
A – Air
L – Liquid
P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	Total Metals (Al, Cr, Ni, Ag, Zn, As, Cd, Cu, Pb, Se)	TOC (Walkley Black)	Mercury	% Coarse Material	Rapid Hydro (%clay, sand, silt)	AVS					Lab I.D.	Remarks
USH (#26899)	7/1/13	1000			500mL	SD	4°C	NA	X	X	X	X	X							
NFSC (#26900)	7/2/13	1400			500mL	SD	4°C	NA	X	X	X	X	X							
LTC (#26895)	7/1/13	1100			4oz	SD	4°C	NA						X						
LSC (#26898)	7/2/13	1000			↓	↓	↓	↓						X						
USC (#26896)	7/1/13	1300			↓	↓	↓	↓						X						
LSH (#26894)	7/1/13	0900			↓	↓	↓	↓						X						
EFSC (#26897)	7/1/13	1500			↓	↓	↓	↓						X						
NFSC (#26900)	7/2/13	1400			2oz	SD	4°C	NA						X						
USH (#26899)	7/1/13	1000			↓	↓	↓	↓						X						

Relinquished by: (Print Name)/(Affiliation) Amber Bills/AECOM Signature: Amber Bills	Date: 7/12/13 Time: 0930	Received by: (Print Name)/(Affiliation) Debbie Ortega ROSETTA LAB Signature:	Date: 7-17-13 Time: 10:55	Analytical Laboratory (Destination): AECOM Toxicology Lab 4303 W. Laporte Avenue Fort Collins, CO 80521 (970) 416-0916 (970) 490-2963 (FAX) MCE
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:	
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Signature:	Date: Time:	Sample Shipped Via: UPS [✓ FedEx] Courier Other Temp blank: Yes [✓ No]

Sealed cooler/ice

Serial No. 53534

MSE Lab Services

Sample Receipt Checklist

Client Name AECOM_INC

Date and Time Received: 7/17/2013 12:55:00 PM

Work Order Number 1307108

RcptNo: 1

Received by DO

COC_ID: 1307108

CoolerID:

Checklist completed by Melissa Dirrings 7/17/13 (Signature / Date)

Reviewed by SW 7/18/13 (Initials / Date)

Matrix:

Carrier name FedEx

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shippping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☐	No ☑	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☐	No ☑	
Water - VOA vials have zero headspace?	No VOA vials submitted ☑	Yes ☐	No ☐
Water - pH acceptable upon receipt?	Yes ☐	No ☐	Blank ☐

Adjusted? No

Checked by NA soil

7/17/13 Melissa Dirrings

Any No and/or NA (not applicable) response must be detailed in the comments section be

Client contacted ______ Date contacted: ______ Person contacted ______

Contacted by: ______ Regarding: ______

Comments: FED EX TEMP=NA SOIL

Corrective Action ______

APPENDIX F: SPAWNING SUBSTRATE QUALITY DATA

Appendix F.–Lower Slate Creek Spawning Substrate Quality Data, 2011 – 2013.

Slate Creek Sample Point 1, Sampled on 8/17/2011

	Volume (mL/L) Retained Per Sieve (Sieve Size in mm)									Sample Depth (cm)
Sample No.	101.6	50.8	25.4	12.7	6.35	1.68	0.42	0.15	Imhoff	
1	0	0	470	260	360	425	225	20	22	18.5
2	0	70	460	250	200	280	100	25	8	20
3	0	280	240	210	290	440	100	70	20.5	18.5
4	0	0	350	350	175	1425	525	55	68	22.5

Slate Creek Sample Point 2, Sampled on 8/17/2011

	Volume (mL/L) Retained Per Sieve (Sieve Size in mm)									Sample Depth (cm)
Sample No.	101.6	50.8	25.4	12.7	6.35	1.68	0.42	0.15	Imhoff	
1	0	130	305	200	205	350	200	20	11.5	20
2	0	120	320	405	335	740	415	85	53	22.5
3	0	400	350	295	290	540	200	40	17.5	22.5
4	0	100	450	580	320	390	160	15	28	21

Slate Creek Sample Point 1, Sampled on 7/09/2012

	Volume (mL/L) Retained Per Sieve (Sieve Size in mm)									Sample Depth (cm)
Sample No.	101.6	50.8	25.4	12.7	6.35	1.68	0.42	0.15	Imhoff	
1	1050	140	140	280	190	395	95	15	24	20
2	0	0	200	225	140	325	140	15	24	20
3	0	515	310	225	250	580	240	27	65	21
4	0	570	510	260	290	750	415	53	54	20

Slate Creek Sample Point 2, Sampled on 7/09/2012

	Volume (mL/L) Retained Per Sieve (Sieve Size in mm)									Sample Depth (cm)
Sample No.	101.6	50.8	25.4	12.7	6.35	1.68	0.42	0.15	Imhoff	
1	0	250	380	270	260	475	195	23	46.5	20
2	600	75	395	295	180	375	135	15	18.5	20
3	0	450	340	370	340	590	295	30	18	20
4	0	0	320	460	285	545	300	28	16.5	19

Slate Creek Sample Point 1, Sampled on 7/02/2013

	Volume (mL/L) Retained Per Sieve (Sieve Size in mm)									Sample Depth (cm)
Sample No.	101.6	50.8	25.4	12.7	6.35	1.68	0.42	0.15	Imhoff	
1	0	400	460	430	320	365	145	25	66	22.5
2	0	150	400	250	245	515	225	36	53	20
3	0	800	325	320	255	445	205	25	60	17.5
4	0	275	565	385	245	495	250	19	28	20

Slate Creek Sample Point 2, Sampled on 7/02/2013

	Volume (mL/L) Retained Per Sieve (Sieve Size in mm)									Sample Depth (cm)
Sample No.	101.6	50.8	25.4	12.7	6.35	1.68	0.42	0.15	Imhoff	
1	0	310	490	440	505	640	410	35	107.5	20
2	0	420	270	240	215	560	150	34	42	22.5
3	0	550	885	375	290	570	290	45	107.8	18.75
4	0	785	230	340	240	580	330	30	46.5	21.25

APPENDIX G: ADULT SALMON COUNT DATA

Appendix Gl.–Lower Slate Creek weekly pink salmon counts by reach, 2013.

	7/15/2013 Pink Salmon Counts				**7/22/2013 Pink Salmon Counts**				**7/29/2013 Pink Salmon Counts**			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-100m	0	0	0	0	0	0	0	0	5	5	5	1
100-200m	0	0	0	0	2	2	2	0	0	0	0	1
200-300m	0	0	0	0	2	2	2	0	30	26	28	1
300-400m	0	0	0	0	4	3	3	0	8	7	7	2
400-500m	0	0	0	0	0	0	0	0	26	16	21	0
500-600m	0	0	0	0	0	0	0	0	0	0	0	0
600-700m	0	0	0	0	0	0	0	0	6	4	5	0
700-800m	0	0	0	0	0	0	0	0	0	0	0	0
800-900m	0	0	0	0	0	0	0	0	0	0	0	0
900-barrier	0	0	0	0	0	0	0	0	**0**	**0**	**0**	0
Total	**0**	**0**	**0**	**0**	**8**	**7**	**7**	**0**	**75**	**58**	**66**	**5**

	8/5/2013 Pink Salmon Counts				**8/12/2013 Pink Salmon Counts**				**8/19/2013 Pink Salmon Counts**			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-100m	400	351	375	0	19	16	17	14	100	93	96	50
100-200m	2	2	2	5	343	268	305	100	62	59	60	75
200-300m	122	109	115	10	89	125	107	150	250	291	270	150
300-400m	37	38	37	7	70	75	72	25	81	93	87	300
400-500m	37	47	42	0	91	117	104	0	133	176	154	50
500-600m	12	11	11	3	153	166	159	15	159	177	168	75
600-700m	17	15	16	5	77	82	79	26	250	245	247	55
700-800m	6	6	6	0	20	19	19	0	72	93	82	35
800-900m	0	0	0	0	2	2	2	0	36	34	35	0
900-barrier	0	0	0	0	0	0	0	0	0	0	0	0
Total	**633**	**579**	**604**	**30**	**864**	**870**	**864**	**330**	**1143**	**1261**	**1199**	**790**

	8/26/2013 Pink Salmon Counts				**9/2/2013 Pink Salmon Counts**				**9/9/2013 Pink Salmon Counts**			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-100m	51	36	43	65	12	13	12	15	0	0	0	2
100-200m	52	59	55	45	7	13	10	6	17	15	15	0
200-300m	170	165	167	55	50	49	49	14	6	7	6	2
300-400m	85	84	84	0	3	10	6	12	2	3	2	0
400-500m	20	34	27	50	7	7	7	7	1	1	1	0
500-600m	24	36	30	26	3	3	3	25	2	2	2	0
600-700m	45	48	46	20	6	8	7	0	1	1	1	0
700-800m	12	7	9	15	2	5	3	0	0	0	0	0
800-900m	9	14	11	0	0	0	0	0	0	0	0	0
900-barrier	0	0	0	0	0	0	0	0	0	0	0	0
Total	**468**	**483**	**472**	**276**	**90**	**108**	**97**	**79**	**29**	**29**	**27**	**4**

	9/9/2013 Pink Salmon Counts				**9/16/2013 Pink Salmon Counts**			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-100m	0	0	0	0	0	0	0	0
100-200m	1	1	1	0	1	1	1	0
200-300m	0	0	0	0	0	0	0	0
300-400m	0	0	0	0	0	0	0	0
400-500m	0	0	0	0	0	0	0	0
500-600m	0	0	0	0	0	0	0	0
600-700m	0	0	0	0	0	0	0	0
700-800m	0	0	0	0	0	0	0	0
800-900m	0	0	0	0	0	0	0	0
900-barrier	0	0	0	0	0	0	0	0
Total	1	1	1	0	**1**	**1**	**1**	**0**

Appendix G2.–Lower Slate Creek weekly coho salmon counts by reach, 2013.

	9/16/2013 Coho Salmon Counts				**9/23/2013 Coho Salmon Counts**				**10/1/2013 Coho Salmon Counts**			
Stream Rea	**Obs. 1**	**Obs. 2**	**Mean**	**Carcasses**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcasses**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-100m	0	-	-	0	0	-	-	0	0	-	-	0
100-200m	0	-	-	0	0	-	-	0	0	-	-	0
200-300m	0	-	-	0	0	-	-	0	0	-	-	0
300-400m	0	-	-	0	0	-	-	0	0	-	-	0
400-500m	0	-	-	0	0	-	-	0	0	-	-	0
500-600m	0	-	-	0	0	-	-	0	2	-	-	0
600-700m	0	-	-	0	1	-	-	0	0	-	-	0
700-800m	0	-	-	0	5	-	-	0	2	-	-	0
800-900m	0	-	-	0	5	-	-	0	0	-	-	0
900-barrier	0	-	-	0	1	-	-	0	8	-	-	0
Total	**0**	**-**	**-**	**0**	**12**	**-**	**-**	**0**	**12**	**-**	**-**	**0**

	10/15/2013 Coho Salmon Counts			
Stream Rea	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-100m	0	-	-	0
100-200m	0	-	-	0
200-300m	0	-	-	0
300-400m	0	-	-	0
400-500m	0	-	-	0
500-600m	0	-	-	0
600-700m	0	-	-	0
700-800m	1	-	-	0
800-900m	1	-	-	0
900-barrier	**0**	-	-	0
Total	**2**	**-**	**-**	**0**

Appendix G3.–Lower Johnson Creek weekly pink salmon counts by reach, 2013.

	7/15/2013 Pink Salmon Counts				**7/22/2013 Pink Salmon Counts**				**7/30/2013 Pink Salmon Counts**			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	0	0	0	0	2	2	2	0	110	101	105	0
Lace-JM	10	6	8	0	0	0	0	0	150	175	162	0
JM-Trap	6	1	3	0	35	35	35	0	280	220	250	0
Trap-#4	6	6	6	0	15	7	11	0	150	230	190	0
#4-#7	50	35	42	0	150	86	118	0	460	512	486	0
#7-#10	0	0	0	0	35	14	24	0	650	800	725	100
#10-Power	0	0	0	0	15	6	10	0	450	164	307	50
Power-LF	0	0	0	0	0	0	0	0	20	9	14	0
LF-#15	0	0	0	0	0	0	0	0	15	7	11	0
#15-Falls pool	0	0	0	0	0	0	0	0	0	0	0	0
Total	**72**	**48**	**59**	**0**	**252**	**150**	**200**	**0**	**2285**	**2218**	**2250**	**150**

	8/6/2013 Pink Salmon Counts				**8/13/2013 Pink Salmon Counts**				**8/20/2013 Pink Salmon Counts**			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	100	28	64	0	95	105	100	50	130	109	119	15
Lace-JM	300	205	252	0	50	55	52	0	210	134	172	25
JM-Trap	200	183	191	0	600	255	427	0	157	167	162	0
Trap-#4	320	340	330	0	380	170	275	0	310	256	283	0
#4-#7	350	195	272	0	340	230	285	0	230	266	248	252
#7-#10	460	160	310	50	510	465	487	0	410	256	333	0
#10-Power	10	7	8	0	220	235	227	0	226	192	209	0
Power-LF	5	0	2	0	3	10	6	0	17	2	9	0
LF-#15	20	35	27	0	18	10	14	0	27	17	22	0
#15-Falls pool	0	0	0	0	0	0	0	0	0	0	0	0
Total	**1765**	**1153**	**1456**	**50**	**2216**	**1535**	**1873**	**50**	**1717**	**1399**	**1557**	**292**

	8/27/2013 Pink Salmon Counts				**9/2/2013 Pink Salmon Counts**				**9/10/2013 Pink Salmon Counts**			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	1	1	1	2	0	0	0	0	0	0	0	0
Lace-JM	20	4	12	0	0	0	0	0	0	0	0	0
JM-Trap	50	66	58	0	15	19	17	0	30	44	37	0
Trap-#4	80	115	98	0	45	60	52	0	30	50	40	0
#4-#7	140	106	123	0	13	0	6	0	10	4	7	0
#7-#10	140	140	140	0	45	44	44	0	4	15	9	0
#10-Power	120	75	98	0	25	23	24	0	7	1	4	0
Power-LF	5	3	4	0	0	0	0	0	0	0	0	0
LF-#15	15	12	14	0	4	9	6	0	0	0	0	0
#15-Falls pool	0	0	0	0	1	0	0	0	0	0	0	0
Total	**571**	**522**	**545**	**2**	**148**	**155**	**149**	**0**	**81**	**114**	**97**	**0**

Appendix G4.–Lower Johnson Creek weekly chum salmon counts by reach, 2013.

	7/15/2013 Chum Salmon Counts				7/22/2013 Chum Salmon Counts				7/30/2013 Chum Salmon Counts			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	0	0	0	0	0	0	0	0	0	0	0	0
Lace-JM	0	0	0	0	0	0	0	0	1	1	1	0
JM-Trap	1	1	1	0	0	0	0	0	0	0	0	0
Trap-#4	1	1	1	0	0	0	0	0	0	0	0	0
#4-#7	0	0	0	0	0	0	0	0	15	4	9	0
#7-#10	0	0	0	0	0	0	0	0	2	2	2	0
#10-Power	0	0	0	0	0	0	0	0	0	0	0	0
Power-LF	0	0	0	0	0	0	0	0	0	0	0	0
LF-#15	0	0	0	0	0	0	0	0	0	0	0	0
#15-Falls pool	0	0	0	0	0	0	0	0	0	0	0	0
Total	**2**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**18**	**7**	**12**	**0**

	8/6/2013 Chum Salmon Counts				8/13/2013 Chum Salmon Counts			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	0	0	0	0	0	0	0	0
Lace-JM	0	0	0	0	0	0	0	0
JM-Trap	0	0	0	0	0	0	0	0
Trap-#4	0	0	0	0	0	0	0	0
#4-#7	0	0	0	0	0	0	0	0
#7-#10	0	0	0	0	3	3	3	0
#10-Power	0	0	0	0	0	0	0	0
Power-LF	0	0	0	0	0	0	0	0
LF-#15	0	0	0	0	0	0	0	0
#15-Falls pool	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**3**	**3**	**3**	**0**

Appendix G5.–Lower Johnson Creek weekly coho salmon counts by reach, 2013.

	9/24/2013 Coho Salmon Counts				10/1/2013 Coho Salmon Counts				10/15/2013 Coho Salmon Counts			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	0	-	-	0	0	-	-	0	0	-	-	0
Lace-JM	0	-	-	0	0	-	-	0	0	-	-	0
JM-Trap	8	-	-	1	9	-	-	0	0	-	-	0
Trap-#4	6	-	-	0	1	-	-	0	0	-	-	0
#4-#7	5	-	-	0	3	-	-	0	3	-	-	0
#7-#10	0	-	-	0	1	-	-	0	0	-	-	0
#10-Power	3	-	-	0	0	-	-	0	3	-	-	0
Power-LF	0	-	-	0	2	-	-	0	2	-	-	0
LF-#15	0	-	-	0	0	-	-	0	10	-	-	0
#15-Falls pool	0	-	-	0	0	-	-	0	1	-	-	0
Total	**22**	**-**	**-**	**1**	**16**	**-**	**-**	**0**	**19**	**-**	**-**	**0**

	10/22/2013 Coho Salmon Counts			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	0	-	-	0
Lace-JM	0	-	-	0
JM-Trap	0	-	-	0
Trap-#4	0	-	-	0
#4-#7	1	-	-	0
#7-#10	0	-	-	0
#10-Power	5	-	-	0
Power-LF	2	-	-	0
LF-#15	1	-	-	0
#15-Falls pool	0	-	-	0
Total	**9**	**-**	**-**	**0**

Appendix G6.–Lower Sherman Creek weekly pink salmon counts by reach, 2013.

	7/15/2013 Pink Salmon Counts				7/22/2013 Pink Salmon Counts				7/30/2013 Pink Salmon Counts			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	0	0	0	0	2	2	2	0	110	101	105	0
Lace-JM	10	6	8	0	0	0	0	0	150	175	162	0
JM-Trap	6	1	3	0	35	35	35	0	280	220	250	0
Trap-#4	6	6	6	0	15	7	11	0	150	230	190	0
#4-#7	50	35	42	0	150	86	118	0	460	512	486	0
#7-#10	0	0	0	0	35	14	24	0	650	800	725	100
#10-Power	0	0	0	0	15	6	10	0	450	164	307	50
Power-LF	0	0	0	0	0	0	0	0	20	9	14	0
LF-#15	0	0	0	0	0	0	0	0	15	7	11	0
#15-Falls pool	0	0	0	0	0	0	0	0	0	0	0	0
Total	**72**	**48**	**59**	**0**	**252**	**150**	**200**	**0**	**2285**	**2218**	**2250**	**150**

	8/6/2013 Pink Salmon Counts				8/13/2013 Pink Salmon Counts				8/20/2013 Pink Salmon Counts			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	100	28	64	0	95	105	100	50	130	109	119	15
Lace-JM	300	205	252	0	50	55	52	0	210	134	172	25
JM-Trap	200	183	191	0	600	255	427	0	157	167	162	0
Trap-#4	320	340	330	0	380	170	275	0	310	256	283	0
#4-#7	350	195	272	0	340	230	285	0	230	266	248	252
#7-#10	460	160	310	50	510	465	487	0	410	256	333	0
#10-Power	10	7	8	0	220	235	227	0	226	192	209	0
Power-LF	5	0	2	0	3	10	6	0	17	2	9	0
LF-#15	20	35	27	0	18	10	14	0	27	17	22	0
#15-Falls pool	0	0	0	0	0	0	0	0	0	0	0	0
Total	**1765**	**1153**	**1456**	**50**	**2216**	**1535**	**1873**	**50**	**1717**	**1399**	**1557**	**292**

	8/27/2013 Pink Salmon Counts				9/2/2013 Pink Salmon Counts				9/10/2013 Pink Salmon Counts			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	1	1	1	2	0	0	0	0	0	0	0	0
Lace-JM	20	4	12	0	0	0	0	0	0	0	0	0
JM-Trap	50	66	58	0	15	19	17	0	30	44	37	0
Trap-#4	80	115	98	0	45	60	52	0	30	50	40	0
#4-#7	140	106	123	0	13	0	6	0	10	4	7	0
#7-#10	140	140	140	0	45	44	44	0	4	15	9	0
#10-Power	120	75	98	0	25	23	24	0	7	1	4	0
Power-LF	5	3	4	0	0	0	0	0	0	0	0	0
LF-#15	15	12	14	0	4	9	6	0	0	0	0	0
#15-Falls pool	0	0	0	0	1	0	0	0	0	0	0	0
Total	**571**	**522**	**545**	**2**	**148**	**155**	**149**	**0**	**81**	**114**	**97**	**0**

Appendix G7.–Lower Sherman Creek weekly chum salmon counts by reach, 2013.

	7/22/2013 Chum Salmon Counts				7/29/2013 Pink Salmon Counts				8/5/2013 Chum Salmon Counts			
Stream R	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-50m	0	0	0	0	0	0	0	0	5	5	5	0
50-100m	1	1	1	0	0	0	0	0	0	0	0	0
100-150m	0	0	0	0	0	0	0	0	0	0	0	0
150-200m	0	0	0	0	4	4	4	0	1	1	1	0
200-250m	0	0	0	0	0	0	0	0	0	0	0	0
250-300m	1	1	1	0	0	0	0	0	0	0	0	0
300-350m	0	0	0	0	0	0	0	0	0	0	0	0
350-Falls	0	0	0	0	0	0	0	0	0	0	0	0
Total	**2**	**2**	**2**	**0**	**4**	**4**	**4**	**0**	**6**	**6**	**6**	**0**