Department of Fish and Game





DIVISION OF HABITAT Southeast Region Office

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February 28, 2017

Coeur Alaska, Inc. ATTN: Kevin Eppers 3031 Clinton Dr., Suite 202 Juneau, AK 99801

Dear Mr. Eppers:

RE: Technical Report No. 17-02, Aquatic Studies at Kensington Gold Mine, 2016

I have attached the technical report the Alaska Department of Fish and Game Division of Habitat completed for Coeur Alaska. The technical report satisfies the requirements of your 2005 Plan of Operations and Alaska Department of Environmental Conservation Alaska Pollutant Discharge Elimination System Permit No. AK0050571.

Thank you for the opportunity to work with you on this project. If you have any questions, please contact Kate Kanouse at (907) 465-4290.

Sincerely,

Jackie Timothy Southeast Regional Supervisor

Email cc:

Al Ott, ADF&G Habitat, Fairbanks All staff, ADF&G Habitat, Juneau Kyle Moselle, ADNR OPMP, Juneau Alan Nakanishi, ADEC DOW, Anchorage Matthew Reece, USFS, Juneau

Aquatic Studies at Kensington Gold Mine, 2016

By Katrina M. Kanouse and Johnny Zutz



February 2017

Alaska Department of Fish and Game



Division of Habitat

Symbols and Abbreviations

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Weights and measures (metric)		General		Measures (fisheries)	
centimeter	cm	Alaska Administrative		fork length	FL
deciliter	dL	Code	AAC	mideye-to-fork	MEF
gram	g	all commonly accepted		mideye-to-tail fork	METF
hectare	ha	abbreviations	e.g., Mr., Mrs.,	standard length	SL
kilogram	kg		AM, PM, etc.	total length	TL
kilometer	km	all commonly accepted		-	
liter	L	professional titles	e.g., Dr., Ph.D.,	Mathematics, statistics	
meter	m		R.N., etc.	all standard mathematical	
milliliter	mL	at	@	signs, symbols and	
millimeter	mm	compass directions:		abbreviations	
		east	Е	alternate hypothesis	H _A
Weights and measures (English)		north	Ν	base of natural logarithm	е
cubic feet per second	ft ³ /s	south	S	catch per unit effort	CPUE
foot	ft	west	W	coefficient of variation	CV
gallon	gal	copyright	©	common test statistics	(F, t, χ^2 , etc.)
inch	in	corporate suffixes:		confidence interval	CI
mile	mi	Company	Co.	correlation coefficient	
nautical mile	nmi	Corporation	Corp.	(multiple)	R
ounce	OZ	Incorporated	Inc.	correlation coefficient	
pound	lb	Limited	Ltd.	(simple)	r
quart	qt	District of Columbia	D.C.	covariance	cov
yard	yd	etalii (and others)	et al.	degree (angular)	0
-	•	et cetera (and so forth)	etc.	degrees of freedom	df
Time and temperature		exempli gratia		expected value	Ε
day	d	(for example)	e.g.	greater than	>
degrees Celsius	°C	Federal Information		greater than or equal to	≥
degrees Fahrenheit	°F	Code	FIC	harvest per unit effort	HPUE
degrees kelvin	Κ	idest (that is)	i.e.	less than	<
hour	h	latitude or longitude	lat. or long.	less than or equal to	\leq
minute	min	monetary symbols		logarithm (natural)	ln
second	S	(U.S.)	\$,¢	logarithm (base 10)	log
		months (tables and		logarithm (specify base)	\log_{2} etc.
Physics and chemistry		figures): first three		minute (angular)	
all atomic symbols		letters	Jan,,Dec	no data	ND
alternating current	AC	registered trademark	®	not significant	NS
ampere	А	trademark	тм	null hypothesis	Ho
calorie	cal	United States		percent	%
direct current	DC	(adjective)	U.S.	probability	Р
hertz	Hz	United States of		probability of a type I error	
horsepower	hp	America (noun)	USA	(rejection of the null	
hydrogen ion activity	pН	U.S.C.	United States	hypothesis when true)	α
(negative log of)			Code	probability of a type II error	
parts per million	ppm	U.S. state	use two-letter	(acceptance of the null	
parts per thousand	ppt,		abbreviations	hypothesis when false)	β
	‰		(e.g., AK, WA)	second (angular)	"
volts	V			standard deviation	SD
watts	W			standard error	SE
				variance	
				population	Var
				sample	var

TECHNICAL REPORT NO. 17-02

AQUATIC STUDIES AT KENSINGTON GOLD MINE, 2016

by

Katrina M. Kanouse

and

Johnny Zutz

Alaska Department of Fish and Game Division of Habitat, Southeast Region 802 W. 3rd Street, Douglas, Alaska, 99824

February 2017

This investigation was fully financed by Coeur Alaska, Inc.

Cover: Johnson Creek headwaters at Lions Head Mountain.

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Coeur Alaska, Inc. provided financial support and Kensington Gold Mine environmental staff Kevin Eppers, Pete Strow, Ryan Bailey, Sierra Lammers, and Kelsey Stockert provided logistical support and discharge and water quality data.

Division of Habitat staff Greg Albrecht, Evan Fritz, and Nicole Legere assisted with data collection, Mr. Albrecht processed periphyton samples, and Mr. Albrecht and Katrina Lee identified benthic macroinvertebrates. Matthew Kern of Alder Grove Farms also identified benthic macroinvertebrates. Division of Commercial Fisheries staff Ben Williams and Sara Miller performed the fish population statistical analyses, and Division of Habitat Operations Manager Dr. Al Ott and Southeast Regional Supervisor Jackie Timothy reviewed and edited the report.

Thank you all for your contribution.

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 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 data throughout the year, and help identify, assess, and resolve issues at the mine as they arise.

The National Weather Service reports 2016 was one of the warmest years on record for Juneau, and while total precipitation (163 cm) was normal, total snowfall (69 cm) was about 70% below normal (K. Vaughan, Observation Program Leader, National Weather Service, Juneau, personal communication).

Since August 2011, Coeur staff has sampled surface waters monthly in and around the tailings treatment facility (TTF) for ammonia, chlorophyll *a*, nitrate, nitrite, organic carbon, phosphorus, potassium, and sulfur to investigate the cause of algal blooms in the TTF. Sample sites included the TTF, upstream of the TTF at the outlet of Upper Slate Lake,^a the TTF water treatment plant effluent (Outfall 002), and downstream of Outfall 002 in East Fork Slate Creek^b. During 2016, phosphorus and chlorophyll *a* concentrations were occasionally detected in the TTF and were generally similar to concentrations observed in 2015. In the Outfall 002 effluent, ammonia, nitrate, potassium, and sulfur concentrations continued to be greater than background Upper Slate Lake concentrations. Organic carbon concentrations were greatest in Upper Slate Lake and nitrite was not detected in any of the samples, as in previous years.

The July 2016 mean periphyton density for each sample site was similar to or greater than previous July mean densities. We also sampled periphyton in Lower Slate Creek and East Fork Slate Creek in April to continue monitoring for changes that may occur from the TTF, and found a similar mean density compared to previous spring sampling results for each site.^c

Mean benthic macroinvertebrate density at each site was similar to previous years, except the mean density for East Fork Slate Creek and Lower Sherman Creek. At East Fork Slate Creek, we observed the lowest mean density and the greatest proportion of sensitive insects since we began sampling in 2011, largely due to fewer pea clams present. At Lower Sherman Creek, the benthic macroinvertebrate communities were again dominated by worms with few sensitive insects present.

Beginning in winter 2013/2014, Coeur staff observed a white substance occasionally present on the Sherman Creek streambed downstream of Outfall 001, which became persistent in fall 2014. We have worked with Coeur and ADEC staffs to investigate the cause and extent of the white substance and sampled benthic macroinvertebrates to document abundance and community composition near Outfall 001. In April 2016, we sampled benthic macroinvertebrates upstream and downstream of Outfall 001 in Middle Sherman Creek and again found fewer organisms and a smaller proportion of sensitive insects among the samples collected downstream of the outfall. With Coeur and ADEC, we will continue to monitor Sherman Creek in 2017. We have not

^a Coeur's water quality monitoring station MLA.

^b Coeur's water quality monitoring station SLA.

^c Not required.

observed a white substance on the Lower Slate Creek or East Fork Slate Creek stream beds since summer 2014.

The 2016 Upper Slate Creek Dolly Varden char *Salvelinus malma* population was similar to the 2011–2015 populations. For the fourth year in a row we did not capture Dolly Varden char during the East Fork Slate Creek resident fish survey, however, one week following the survey we captured 32 Dolly Varden char in the diversion pipeline plunge pool, about 50 m upstream of the survey reach. Based on our experience, East Fork Slate Creek provides a corridor for downstream fish migration and resident fish population studies do not provide reliable information to assess stream health or determine whether TTF operations impact resident fish populations.

We observed low pink salmon *Oncorhynchus gorbuscha* returns in the lower reaches of Slate, Johnson, and Sherman Creeks in 2016, consistent with parent year low returns in 2014 and region-wide low pink salmon returns in 2016 (M. Sogge, Commercial Fisheries Area Management Biologist, ADF&G, Haines, personal communication). In Lower Slate Creek, we observed the greatest number of chum salmon *O. keta* since we began surveying in 2011, and in Lower Sherman Creek, pink and chum salmon arrived in the system near the end of August, several weeks late. We cannot quantify marine survival factors impacting adult salmon returns, so we are unable to attribute changes in adult salmon abundance to construction and operation of the Kensington Gold Mine. We again recommend the USFS and the Berners Bay working group discontinue the spawning salmon survey requirement.

The geometric mean particle size of pink salmon spawning gravel in Lower Slate Creek has increased by several millimeters at both sample sites since we began sampling in 2011, and the 2016 sampling results were within the range of values observed 2011–2015.

Most metals, arsenic, and selenium concentrations in sediment samples from each of the five sample sites were similar to or less than previous results. The 2016 East Fork Slate Creek sediment sample contained the greatest arsenic concentration observed since sampling began in 2010 and the 2016 Lower Johnson Creek sediment sample contained the greatest silver concentration observed since 2010 (Aquatic Science Inc. 2011). Arsenic, copper, nickel, and zinc concentrations at all sampling sites remain near or above the guidelines for freshwater sediments (Buchman 2008; MacDonald et al. 2000), including the upstream reference site Upper Slate Creek, except in Lower Johnson Creek where nickel and zinc concentrations were below the guidelines in recent years.

Among the five sediment samples we submitted to a private laboratory for 10-day chronic toxicity testing, midge survival on the Lower Sherman Creek sediment sample was significantly ($p \le 0.05$) less than survival on the control sediment. There were no significant differences in amphipod survival or growth on the five test sediments compared to the control.

INTRODUCTION

The Kensington Gold Mine is located near Berners Bay in Southeast Alaska (Figure 1), about 72 km north of Juneau and 56 km south of Haines within the City and Borough of Juneau and the Tongass National Forest (Tetra Tech Inc. et al. 2004a, 2004b). The mine is owned and operated by Coeur Alaska, Inc., a wholly owned subsidiary of Coeur Mining Inc.



Figure 1.–Kensington Gold Mine project area map.

The underground mine began producing gold concentrate for export on June 24, 2010. Tailings are disposed underground as paste backfill and in the TTF as slurry through a pipeline from the mill. Mine infrastructure is located in three drainages that support resident and anadromous fish: the TTF in the Slate Creek drainage; the waste rock pile, camp and mill facilities in the Johnson Creek drainage; and the waste rock pile and mine water treatment facility in the Sherman Creek drainage.

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, Plan of Operations (Coeur 2005) monitoring requirements, the U.S. Environmental Protection Agency National Pollutant Elimination Discharge System Permit No. AK-005057-1 (Timothy and Kanouse 2012, Appendix A), and the ADEC Alaska Pollutant Elimination System (APDES) Permit No.AK0050571 (Timothy and Kanouse 2012, Appendix A). Contractor reports include Aquatic Science Inc. (1998, 1999, 2000, 2001a, 2001b, 2002, 2004), Archipelago Marine Research Ltd. (1991), Dames and Moore (1991), Earthworks Technology, Inc. (2002), EVS Environment Consultants (2000), 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 Aquatic Science Inc. (2006, 2007, 2008, 2009a, 2009b, 2009c, 2009d, 2011), Brewster (2016), Kanouse (2015), and Timothy and Kanouse (2012, 2013, 2014). Results of the TTF environmental monitoring studies completed during project operation are in Willson-Naranjo and Kanouse (2016).

The Division of Habitat has completed the aquatic studies required for the Kensington Gold Mine in Slate, Johnson, and Sherman Creeks since 2011. The APDES Permit requires sampling periphyton, benthic macroinvertebrates (BMI), resident fish, and sediment. We assess stream health using estimates of periphyton density and community composition, BMI density and community composition, sediment metals concentrations, and pink salmon spawning substrate composition. The Division of Habitat also completes the resident Dolly Varden char population and sediment toxicity studies required by the APDES permit, and adult salmon counts required in the project Plan of Operations (Coeur 2005).

PURPOSE

The purpose of this technical report is to summarize the 2016 aquatic study data and document the condition of biological communities and sediments in the Slate, Johnson, and Sherman Creeks near mine development and operations. This report satisfies the aquatic study requirements in the project Plan of Operations (Coeur 2005) and APDES Permit AK0050571.

AQUATIC STUDIES

We completed the Kensington Gold Mine aquatic studies required in the project Plan of Operations (Coeur 2005) and APDES Permit AK0050571 (Table 1).

Location	Description	Aquatic Study	Frequency
Lower Slate	1 km reach between the	Periphyton density and composition	1/year
Creek	stream mouth in Slate	Benthic macroinvertebrate density and composition	1/year
	Cove and a 25 m waterfall.	Adult salmon counts	Seasonally
		Spawning substrate quality	1/year
		Sediment metals concentrations and toxicity	1/year
West Fork Slate	A tributary to Lower Slate	Periphyton density and composition	1/year
Creek	Creek, upstream of a waterfall and mine influence.	Benthic macroinvertebrate density and composition	1/year
East Fork Slate	A tributary to Lower Slate	Periphyton density and composition	1/year
Creek	Creek, 1 km reach	Benthic macroinvertebrate density and composition	1/year
	between the TTF plunge	Resident fish population and condition	1/year
	pool and waterfall at	Sediment metals concentrations and toxicity	1/year
	Lower Slate Creek.		
Upper Slate	A tributary to Upper Slate	Periphyton density and composition	1/year
Creek	Lake and upstream of	Benthic macroinvertebrate density and composition	1/year
	mine influence.	Resident fish population and condition	1/year
		Sediment metals concentrations and toxicity	1/year
Lower Johnson	1.5 km reach between the	Adult salmon counts	Seasonally
Creek	stream mouth in Berners Bay and a 30 m waterfall.	Sediment metals concentrations and toxicity	1/year
Upper Johnson	Upstream of Bridge #2 to	Benthic macroinvertebrate density and composition	1/year
Creek	the headwaters, adjacent to		
	the upper camp and mill		
	bench.		
Lower Sherman	360 m reach between the	Periphyton density and composition	1/year
Creek	stream mouth in Lynn	Benthic macroinvertebrate density and composition	1/year
	Canal and a 15 m	Adult salmon counts	Seasonally
	waterfall.	Sediment metals concentrations and toxicity	1/year

Table 1.-2016 aquatic studies required by the Plan of Operations and APDES permit.

STUDY AREA

Slate Creek Drainage

Slate Creek drains a 10.5 km² watershed into Slate Cove on the northwest side of Berners Bay (Coeur 2005; Figure 2). Two waterfalls about 1 km upstream of the mouth of Lower Slate Creek prevent upstream fish migration to the East and West Forks. West Fork Slate Creek is on river right^d. East Fork Slate Creek is on river left and flows between the TTF dam plunge pool and the waterfall at Lower Slate Creek. Coeur operates the TTF in Lower Slate Lake and discharges TTF water treatment plant effluent (Outfall 002) to East Fork Slate Creek. Upstream of the TTF, a concrete dam diverts water from Upper Slate Lake through a diversion pipeline and into East Fork Slate Creek at the TTF dam plunge pool, bypassing the TTF. Upper Slate Creek is the inlet to Upper Slate Lake.

^d The terms "river right" and "river left" reference looking downstream.

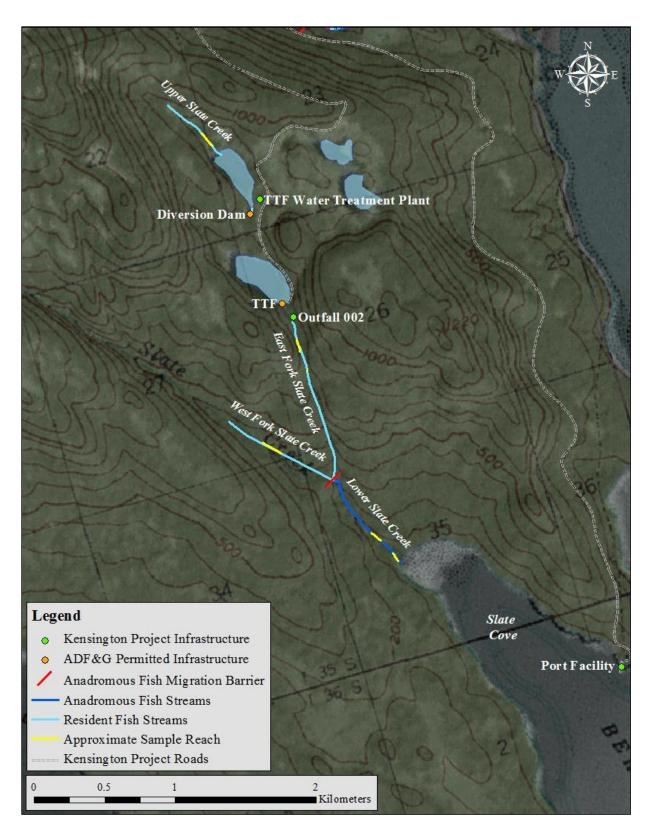


Figure 2.–Slate Creek map.

Lower Slate Creek

Lower Slate Creek provides spawning habitat for chum, coho, and pink salmon, and eulachon *Thaleichthys pacificus*, and rearing habitat for coho salmon (Stream No. 115-20-10030; Johnson and Litchfield 2016). We have also documented juvenile Dolly Varden char and adult cutthroat trout *O. clarkii* in the system (Timothy and Kanouse 2012).

Lower Slate Creek is a mixture of waters from the East and West Forks, Outfall 002, and Upper Slate Lake. We sample periphyton, BMIs, pink salmon spawning substrate, and sediment at Sample Point 1 (SP1; Figure 3), pink salmon spawning substrate again at Sample Point 2 (SP2), and count adult salmon throughout Lower Slate Creek.



Figure 3.–Lower Slate Creek SP1.

West Fork Slate Creek

West Fork Slate Creek (Figure 4) supports Dolly Varden char (Timothy and Kanouse 2014) and is not influenced by the mine. We sample periphyton and BMIs about 600 m upstream of the waterfall at Lower Slate Creek.



Figure 4.–West Fork Slate Creek.

East Fork Slate Creek

East Fork Slate Creek (Figure 5) provides a corridor for Dolly Varden char and threespine stickleback *Gasterosteus cognatus* emigrating from Upper Slate Lake, currently via the diversion pipeline and formerly via Lower Slate Lake. East Fork Slate Creek is a mixture of Outfall 002 and drainage from Upper Slate Lake. We sample periphyton, BMIs, resident fish, and sediments in East Fork Slate Creek within 200 m downstream of the TTF.



Figure 5.–East Fork Slate Creek.

Upper Slate Creek

Upper Slate Creek (Figure 6) supports Dolly Varden char and is not influenced by the mine. We sample periphyton, BMIs, resident fish, and sediments in Upper Slate Creek within 100 m of Upper Slate Lake.



Figure 6.–Upper Slate Creek.

Johnson Creek Drainage

Johnson Creek drains a 14.6 km² watershed to the Lace River on the northwest shore of Berners Bay (Coeur 2005; Figure 7). A waterfall about 1.5 km upstream of the Lower Johnson Creek mouth prevents upstream fish migration. Middle Johnson Creek is the 2.5 km reach between the waterfall and Jualin Road Bridge #2. Upper Johnson Creek is the reach upstream of Jualin Road Bridge #2 to the headwaters.

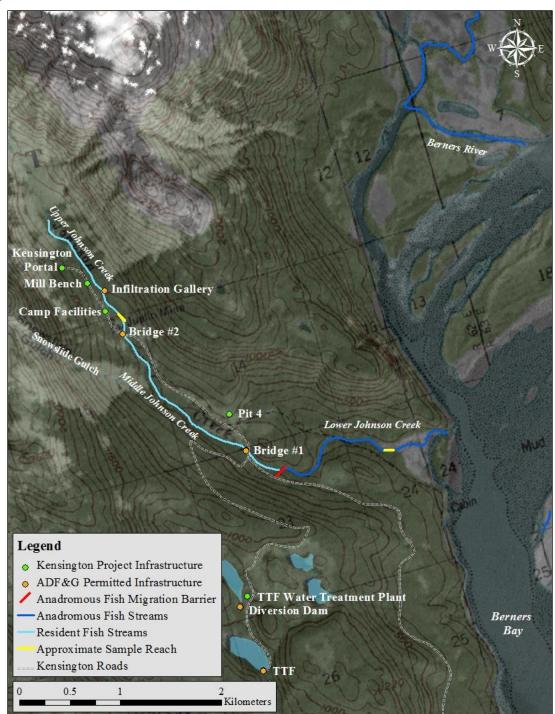


Figure 7.–Johnson Creek map.

Lower Johnson Creek

Lower Johnson Creek provides spawning and rearing habitat for chum, coho, and pink salmon (Stream No. 115-20-10030; Johnson and Litchfield 2016). We have also documented juvenile Dolly Varden char and cutthroat trout (Timothy and Kanouse 2012). Lower Johnson Creek is a mixture of drainages near and from mine infrastructure in Middle^e and Upper Johnson Creeks. We sample sediment about 600 m upstream from the mouth and count adult salmon throughout Lower Johnson Creek (Figure 8).



Figure 8.–Lower Johnson Creek.

Upper Johnson Creek

Upper Johnson Creek supports Dolly Varden char and flows adjacent to the camp facilities, mill bench, Kensington and Jualin adits, and waste rock pile. An infiltration gallery collects water from Upper Johnson Creek near the mill bench to support the camp. We sample BMIs about 50 m upstream of Bridge #2 (Figure 9).



Figure 9.–Upper Johnson Creek.

^e Mine facilities include the domestic wastewater treatment plant, warehouse, reclamation material and acid generating rock storage piles, bridges, and Pit 4; drainages include Snowslide Gulch, the domestic wastewater outfall, and storm water discharges; aquatic studies are not required in Middle Johnson Creek.

Sherman Creek Drainage

Sherman Creek drains a 10.84 km^2 watershed to the east shore of Lynn Canal (Coeur 2005; Figure 10). A waterfall about 360 m upstream from the Lower Sherman Creek mouth prevents upstream fish migration. Middle Sherman Creek is the 2 km reach between the waterfall and the Comet Beach road bridge. Upper Sherman Creek is the reach upstream of the bridge to the headwaters.

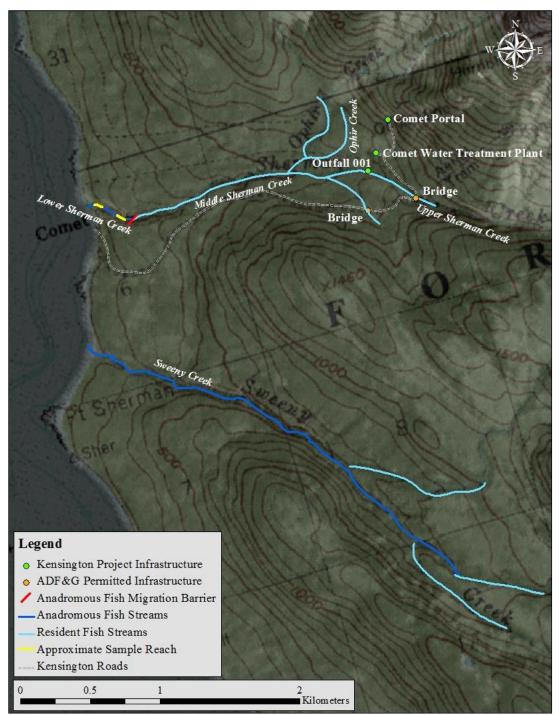


Figure 10.–Sherman Creek map.

Lower Sherman Creek

Lower Sherman Creek provides spawning habitat for chum and pink salmon (Stream No.115-31-10330; Johnson and Litchfield 2016). We have also documented juvenile Dolly Varden char in the system (Timothy and Kanouse 2012). Lower Sherman Creek is a mixture of drainages near and from mine infrastructure in Middle Sherman Creek^f and its tributaries. We sample periphyton and BMIs at Sample Points 1 and 2 (SP1, SP2), sediment at SP1, and count adult salmon throughout Lower Sherman Creek (Figures 11, 12).



Figure 11.–Lower Sherman Creek SP1.



Figure 12.–Lower Sherman Creek SP2.

Table 2 presents the coordinates for each sample site, and Tables 3–5 present the coordinates for adult salmon count reach markers in Lower Slate Creek, Lower Johnson Creek, and Lower Sherman Creek.

^f Mine facilities include the Comet water treatment plant, waste rock pile, bridges and culverts; drainages include Ivanhoe Creek, Ophir Creek, South Fork Sherman Creek, and Comet water treatment plant Outfall 001; aquatic studies are not required in Middle or Upper Sherman Creeks.

Location	Sample Site	Latitude	Longitude
Lower Slate Creek	Periphyton and Benthic Macroinvertebrates	58.7905	-135.0345
	Adult Salmon Counts	Table 3	
	Spawning Substrate		
	Sample Point 1	58.7905	-135.0345
	Sample Point 2	58.7920	-135.0360
	Sediment Metals and Toxicity	58.7905	-135.0345
West Fork Slate Creek	Periphyton and Benthic Macroinvertebrates	58.7993	-135.0457
East Fork Slate Creek	Periphyton and Benthic Macroinvertebrates	58.8045	-135.0381
	Resident Fish (center of 90 m reach)	58.8042	-135.0382
	Sediment Metals and Toxicity	58.8053	-135.0383
Upper Slate Creek	Periphyton and Benthic Macroinvertebrates	58.8189	-135.0415
	Resident Fish (center 90 m of reach)	58.8196	-135.0418
	Sediment Metals and Toxicity	58.8189	-135.0416
Lower Johnson Creek	Adult Salmon Counts	Table 4	
	Sediment Metals and Toxicity	58.8235	-135.0024
Upper Johnson Creek	Benthic Macroinvertebrates	58.8407	-135.0450
Lower Sherman Creek	Periphyton and Benthic Macroinvertebrates		
	Sample Point 1	58.8687	-135.1413
	Sample Point 2	58.8674	-135.1381
	Adult Salmon Counts	Table 5	
	Sediment Metals and Toxicity	58.8687	-135.1413

Table 2.–2016 aquatic study sample sites.

Note: WGS84 datum.

T /*		
Location	Latitude	Longitude
100 m	58.7884	-135.0324
200 m	58.7893	-135.0337
300 m	58.7905	-135.0349
400 m	58.7915	-135.0359
500 m	58.7922	-135.0361
600 m	58.7930	-135.0368
700 m	58.7936	-135.0379
800 m	58.7944	-135.0384
900 m	58.7953	-135.0385
Falls	58.7964	-135.0389

Table	3.–Lower	Slate	Creek	adult
salmon co	ount reach m	arkers.		

Location	Latitude	Longitude
Lace	58.8215	-135.0010
Mouth	58.8236	-134.9987
Trap	58.8235	-135.0007
#4	58.8236	-135.0039
#7	58.8243	-135.0072
#10	58.8254	-135.0109
Power House	58.8259	-135.0148
Log Falls	58.8258	-135.0168
#15	58.8252	-135.0190
Falls	58.8243	-135.0201

Table	4Lower	Johnson	Creek	adult	
salmon co	ount reach r	narkers.			

Table 5.–Lower Sherman Creek adult salmon count reach markers.

T	T	T 1/1
Location	Latitude	Longitude
50 m	58.8687	-135.1416
100 m	58.8687	-134.1408
150 m	58.8684	-135.1401
200 m	58.8682	-135.1394
250 m	58.8679	-135.1388
300 m	58.8675	-135.1383
350 m	58.8673	-135.1374
Falls	58.8671	-135.1367

MONITORING SCHEDULE

Table 6 presents the dates we collected data in 2016, by site.

Table 6.–2016 aquatic studies sampling schedule.

Aquatic Study	Lower Slate	West Fork Slate	East Fork Slate	Upper Slate	Lower Johnson	Upper Johnson	Lower Sherman	Middle Sherman
Periphyton	4/26		4/25					
	7/26	7/26	7/25	7/25			7/25	
Benthic Macroinvertebrates	4/26	4/26	4/25	4/25		4/27	4/27	4/27
Resident Fish			8/8	8/10				
Adult Salmon Counts	7/19–				7/18-		7/19–	
	10/26				10/26		8/29	
Spawning Substrate	7/5							
Sediment Metals	7/5		7/6	7/6	8/8		7/6	
Sediment Toxicity	7/5		7/6	7/6	8/8		7/6	

Note: Cells highlighted in gray indicate the sampling was not required by the APDES permit or Plan of Operations.

METHODS

We annually review data sets to ensure accuracy and consistency with methods modifications, and report corrections and updates in the document and appendices. The most recent technical report presents the current data sets and should be used to analyze data from previous years. In this report, we

- corrected two errors in the 2014 periphyton data set and included three 2011 chlorophyll a values previously not reported;
- excluded Dolly Varden char measuring less than 40 mm FL from the Upper Slate Creek and East Fork Slate Creek mean fish condition calculations, and updated the 2011–2015 data sets;
- discontinued using the 2.5 peak count multiplier for Lower Johnson Creek adult pink and chum salmon aerial counts and updated the 2011–2015 data; and
- corrected calculation errors and updated the 2011–2015 Lower Slate Creek spawning substrate data.

PERIPHYTON DENSITY AND COMMUNITY COMPOSITION

Requirement APDES 1.5.3.5.2

Periphyton is composed of primary producing organisms such as algae, cyanobacteria, and heterotrophic microbes, and detritus, attached to the submerged surfaces of aquatic ecosystems. Algal density and community structure are influenced by water and sediment quality through physical, chemical, and biological disturbances that change throughout the year (Barbour et al. 1999). The concentration of chlorophyll a pigment in periphyton samples provides an estimate of active algal biomass (density), while concentrations of chlorophylls b and c estimate the composition of algal organisms present, such as green algae that produce chlorophyll b, and diatoms and brown algae that produce chlorophyll c.

The APDES permit requires monitoring periphyton density and community composition in Lower Slate Creek, East Fork Slate Creek, and Lower Sherman Creek annually between late-June and early-August and not within three weeks following peak discharge to detect changes over time. The APDES permit also requires monitoring periphyton biomass and community composition at reference sites in West Fork Slate Creek and Upper Slate Creek at the same time to detect variations due to natural factors, such as mineral seeps, climate, and stream flow.

Sample Collection and Analysis

We collected 10 smooth, flat, undisturbed, and perennially wetted rocks from submerged cobbles in riffle habitats in less than 0.45 m water depth at each sample site. We placed a 5×5 cm square of high-density foam on each rock and scrubbed the area around the foam with a toothbrush to remove algae and other organisms outside the covered area, then rinsed the rock by dipping it in the stream while holding the foam in place.

We removed the foam square and scrubbed the sample area with a rinsed toothbrush over a 1 μ m, 47 mm glass fiber filter attached to a vacuum pump. We used 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 pumped most of the water through the filter and added a few

drops^g of saturated magnesium carbonate (MgCO₃) solution to the filter to prevent acidification and conversion of chlorophyll to phaeophytin, before we pumped the sample dry. We removed the glass fiber filter, folded it in half with the sample on the inside, and wrapped it in a white coffee filter to absorb additional water. We placed the samples in a sealed, labeled plastic bag with desiccant and stored the samples in a light-proof cooler containing frozen icepacks during transportation, in a camp freezer while onsite, and in a -20° C freezer until we processed them in an ADF&G laboratory.

We followed U.S. Environmental Protection Agency (1997) protocol for chlorophyll extraction and measurement, determining instrument and estimated detection limits, and data analysis.^h We removed the samples from the freezer, cut them into small pieces, and placed the filter pieces for each sample into individual centrifuge tubes containing 10 mL of 90% buffered acetone. We capped the centrifuge tubes, placed them in a rack, covered them with aluminum foil, and stored them in a refrigerator for less than 24 h to extract the chlorophyll. We centrifuged the samples for 20 min at 1,600 rpm and read them on a Shimadzu UV-1800 Spectrophotometer at optical densities (OD) 664 nm, OD 647 nm, and OD 630 nm, and used an acetone blank to correct for the solvent. We also read the samples at OD 750 nm to correct for turbidity. We treated each sample with 80 μ L of 0.1 N hydrochloric acid to convert the chlorophyll to phaeophytin, and read each sample again at OD 665 nm and OD 750 nm.

We used trichromatic equations to estimate chlorophylls *a*, *b*, and *c* concentration, and corrected chlorophyll *a* concentration when phaeophytin was detected. If chlorophyll *a* was not detected in a sample, we report the concentration at the estimated detection limit and do not report values for chlorophylls *b* or *c*. The 2016 chlorophyll *a* concentration estimated detection limit was 0.19 mg/m².

Data Presentation

For each site and by year, we present a table of mean chlorophylls a, b, and c density, illustrate mean chlorophyll a density and mean proportion of chlorophylls a, b, and c in figures, and provide the 2011–2016 data in Appendix A.

BENTHIC MACROINVERTEBRATE DENSITY AND COMMUNITY COMPOSITION

Requirement APDES 1.5.3.2

BMIs classified in the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), collectively known as EPT taxa, have complex and short life cycles and many genera are sensitive to changes in water and sediment quality (Barbour et al. 1999). These organisms are secondary producers, feed on periphyton and other macroinvertebrates, and provide an important food source for fish.

^g This measurement is not exact as the amount of water used to saturate the magnesium carbonate solution is not exact and fixes the sample regardless of the concentration and without affecting sample integrity.

^h Except we store the samples longer than 3.5 weeks and we cut the sample filters, rather than homogenize them, to reduce risk of acetone exposure.

The APDES permit requires monitoring BMI density and community composition in Lower Slate Creek, East Fork Slate Creek, Upper Johnson Creek, and Lower Sherman Creek annually between late-March and late-May after spring breakup and before peak snowmelt to detect changes over time. The APDES permit also requires monitoring at reference sites in West Fork Slate Creek and Upper Slate Creek at the same time to detect variations due to natural factors.

Sample Collection and Analysis

We opportunistically sampled BMIs using a Surber stream bottom sampler in riffle and run habitats with cobble substrate measuring less than 20 cm along the longest axis, and varying flow velocities (Barbour et al. 1999), collecting six samples at each site. Sampling only riffles and runs, habitats that support greater BMI densities and number of taxa, reduces variability in the data.

The Surber stream bottom sampler has a 0.093 m^2 sample area and a 0.3 mm mesh net and cod end. After securing the frame on the substrate, we scrubbed rocks within the sample area with a brush and disturbed gravels, sand, and silt to about 10 cm depth to dislodge macroinvertebrates into the net. We rinsed the net in the stream to ensure all organisms floated into the cod end of the Surber sampler, transferred each sample from the cod end to labeled 500 mL plastic bottles, and preserved the samples in 95% ethanol at a ratio of three parts ethanol to one part sample.

Biologists used an elutriator system and 0.5 mm and 0.3 mm sieves to sort macroinvertebrates from debris,^{i,j} and identified organisms to the lowest practical taxonomic level^kusing Merritt and Cummins (1996) and Stewart and Oswood (2006). Habitat Biologist Greg Albrecht provided quality assurance and control by verifying macroinvertebrate identification of five samples.

We calculated benthic macroinvertebrate density (per m^2) for each sample by dividing the number of macroinvertebrates by 0.093 m², the Surber sampling area. We estimated mean BMI density for each site by calculating the mean density among the six samples. We report taxa richness as the number of taxonomic groups identified to the lowest practical level, and exclude terrestrial¹ organisms from all calculations.

Shannon Diversity (H) and Evenness (E) Indices provide measures of taxonomic diversity and abundance equality. We calculate these indices using the following equations given in Magurran (1988):

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

ⁱ Gordon Willson-Naranjo and Greg Albrecht, Habitat Biologists, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Benthic macroinvertebrate elutriation trials amendment; dated 12/17/2013.

^j Katrina Lee, Administrative Assistant, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Benthic macroinvertebrate sample enumeration procedures; dated 6/28/2016.

^k Insects of the orders Ephemeroptera, Plecoptera, Trichoptera, and Diptera to genus, except nonbiting midges to family Chironomidae, and all others to class or order.

¹ Including adult terrestrial insects of the orders Ephemeroptera, Plecoptera, Trichoptera, and Diptera.

and

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

where P_i is the number of macroinvertebrates per taxonomic group divided by the total number of macroinvertebrates in the sample, and S is the number of taxonomic groups in the sample.^m A single taxa macroinvertebrate community has an H value of 0, which increases with the number of taxa (richness) and abundance equality (evenness). The Evenness calculation normalizes the H value to a number between 0 and 1, with an E value of 1 indicating all taxa are equally abundant.

Data Presentation

For each site and by year, we present a table summarizing mean BMI density, total taxa, total EPT taxa, percent EPT, and mean Shannon Diversity and Evenness scores, illustrate mean density in a figure, and provide the 2011–2016 data summary in Appendix B.

Resident Fish Population

Requirement APDES 1.5.3.3

The APDES Permit requires estimating resident fish populations by species and habitat types in 360 m reaches in East Fork Slate Creek and Upper Slate Creek so that comparisons can be made between years within each reach, and estimating the variability of the data, including minimum detectable differences between years and the precision of the 95% CI.

Sample Collection and Analysis

In 2011, habitat biologists surveyed East Fork Slate Creek and Upper Slate Creek habitats in about the same 360 m reaches surveyed by Aquatic Science Inc. (2011) using the habitat types described in Bisson et al. (1982). Based on the results of the surveys, we selected a 90 m sampling reach in each creek representative of the habitat types present. Though Bisson et al. (1982) subdivides three main habitat types for precision to detect environmental change, following Aquatic Science Inc. (2011) we counted only the three main habitat types: riffles (steepest bed slopes, shallowest water depths, and a poorly defined thalweg); pools (deepest areas where water surface slope is near zero); and glides (immediately downstream of pools with negative bed slope and positive water surface slope). The East Fork Slate Creek and Upper Slate Creek dominated by bedrock, cobble, and boulder substrate. Channels of this type are stable and habitat features are unlikely to change.

We sampled resident fish populations using a modificationⁿ of a depletion method described by Bryant (2000). We isolated sample reaches using 3.17 mm mesh nets and secured them to the stream bottom and stream banks with rocks. We saturated the 90 m reaches with 6.35 mm and 3.17 mm soft and wire mesh minnow traps baited with disinfected salmon eggs contained in punctured plastic bags, following methods described in Magnus et al. (2006).

^m Assuming all taxonomic groups are represented.

ⁿ We sampled shorter reaches, used more minnow traps, and completed three passes instead of four.

Beginning at the downstream end of each reach, we opportunistically set baited minnow traps in all habitat types where water depth and flow allowed. We recorded the habitat type in which each trap was set, and moved away from the sampling reach so fish were not disturbed while the traps soaked for 1.5 h. We retrieved each trap and recorded fish captured by habitat type, then retained fish in an aerated bucket for processing. We removed the used bait bag, then rebaited and reset each trap in the same place as quickly as possible. We let the traps soak another 1.5 h, and completed the sequence a third time.

We anesthetized fish in an aerated bucket using 9 mg/L AQUI-S 20E (10% eugenol), measured and recorded FL to the nearest 1 mm, weight to the nearest 0.1 g, and species (Pollard et al. 1997). Prior to weighing each fish, we tared the scale and emptied the measuring tray to minimize water weight. We retained fish in a perforated plastic bucket secured in the creek downstream of the sample reach during the study, and returned all fish to the stream upon study completion.

We collected the data while meeting assumptions of closure and of equal probability of capture (Lockwood and Schneider 2000) during the three passes by ensuring the following:

- Fish emigration and immigration during the sampling period was negligible.
 - We isolated sample reaches using fine mesh nets having a cork and lead line.
 - \circ We secured the net to the streambed with rocks along the lead line.
- All fish were equally vulnerable to capture during a pass.
 - We set baited minnow traps in all habitat types where water depth and flow allowed.
- Fish did not become more wary of capture with each pass.
 - We maintained trap numbers and placement during all three passes.
 - We limited the instream field crew to two biologists.
 - We completed all three capture events as quickly possible.
 - To avoid disturbing fish, we moved away from sampling reaches while the traps soaked 1.5 h during all three passes.
- Collection effort and conditions which affect collection efficiency remained constant.
 - We retrieved traps beginning at the downstream end of each reach.
 - We moved upstream setting, retrieving and replacing traps as quickly as possible.
 - We timed each pass exactly 1.5 h.
 - For the second and third passes, we removed the used bait bag, inserted a new bait bag, and reset each trap in the same location.

We estimated 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% CI.

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, all passes. Let *n* represent the predicted population of fish, using *T* as the initial value tested. Using *X*, we calculated the MLE, *N*, by repeated estimations of *n*. The MLE is the smallest integer value of *n* greater than or equal to *T* which satisfies^o the following:

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

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,

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

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

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

We determined the SE of *N* by calculating the square root of the variance of *N*, and the 95% CI for the MLE using ± 2 (SE). Because we sample a 90 m reach, we multiplied the MLE and 95% CI by four to extrapolate the data to a 360 m sample reach. The size of the 95% CI depends on the number of captures each pass; a small 95% CI results when fewer captures steadily occur with each pass, and a large 95% CI results when captures do not steadily decrease and when the number of fish captured on the second or third pass exceeds the number of fish captured on the second or third pass exceeds the number of fish captured on the generated from samples from small populations if few fish were captured (e.g. ≤ 20) during the three passes; in these cases, we present the number of fish captured on the second or MLE. We determined the precision of the estimate by expressing the 95% CI as a percentage of the MLE.

Calculating a MLE using three-pass depletion data relies on equal capture probability among passes (Bryant 2000; Carle and Strub 1978; Lockwood and Schneider 2000). To evaluate equal capture probability, we used the goodness of fit test (White et al. 1982) recommended by Lockwood and Schneider (2000), which follows the χ^2 test form. We first calculated 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 calculated χ^2 ,

$$\chi^{2} = \frac{[C_{1} - E(C_{1})]^{2}}{E(C_{1})} + \frac{[C_{2} - E(C_{2})]^{2}}{E(C_{2})} + \frac{[C_{3} - E(C_{3})]^{2}}{E(C_{3})}$$

^o 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).

We compare the χ^2 test result against $\chi^2_{0.95}$ with one degree of freedom (Lockwood and Schneider (2000), and if the χ^2 value is lower, the goodness of fit test suggests we achieved equal capture probability; if not, the MLE will be biased low.

We used Monte-Carlo simulations to assess the power of the three-pass depletion studies to detect changes in abundance of small (N < 200) fish populations. We simulated 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 estimated the abundance of each population using the techniques described in Lockwood and Schneider (2000). We used 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 evaluated significance at $\alpha = 0.05$. To assess power we conducted 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 was performed. We estimate power as the proportion of simulations where the null hypothesis was rejected (Timothy and Kanouse 2014).

Data Presentation

For each site and by year, we illustrate resident fish population by 360 m reach and by habitat type in figures, and we include the fish capture data, population by reach and by habitat type, statistical analyses results, and length frequency diagram of captured fish 2011–2016 in Appendix C.

RESIDENT FISH CONDITION

Requirement APDES 1.5.3.3

Age, sex, season, maturation, diet, gut contents, fat reserve, and muscular development affect fish condition. The APDES permit requires comparing fish condition by reach and by year in East Fork Slate Creek and Upper Slate Creek.

Sample Collection and Analysis

We used the FL and weight data of Dolly Varden char captured during the resident fish population studies, excluding fish measuring less than 40 mm FL.^p We calculated Fulton's condition factor (K) for each fish using the equation given in Anderson and Neumann (1996), where the fish weight (W) is divided by the cubed length (L), and the product multiplied by 100,000:

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

Data Presentation

For each site, we present mean Dolly Varden char condition and provide the 2016 data and the 2011–2016 mean fish condition data in Appendix C.

^p We reviewed the 2011–2015 data set and determined Dolly Varden char less than 40 mm FL usually have flawed weight measurements, which may be due to excess water present during measurement.

ADULT SALMON COUNTS

Requirement Plan of Operations

The Plan of Operations (Coeur 2005) requires weekly surveys of adult chum, coho, and pink salmon in Lower Slate Creek, Lower Johnson Creek, and Lower Sherman Creek throughout the spawning season.

Sample Collection

We surveyed Slate Creek, Johnson Creek, and Sherman Creek downstream of fish migration barriers once per week between mid-July and late-August and counted the number of live adult pink salmon, chum salmon, and carcasses. We surveyed Slate and Sherman Creeks by foot, Johnson Creek by helicopter, and verified three aerial survey counts with foot counts. We also surveyed Slate and Johnson Creeks once per week from late-September through October to count the number of live adult coho salmon and carcasses. To improve coho salmon observations, we snorkeled and recorded underwater videos with a GoPro in large pools and around large woody debris, habitats where adult coho salmon tend to occur.

We began each survey at the stream mouth, moving upstream by section and ending at the fish migration 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 independently recorded the number of live fish and carcasses by species in each section during the foot and aerial surveys, using polarized glasses as necessary to improve visibility. We also recorded weather and flow conditions during each survey.

We used the average of the two biologists' counts to estimate the total number of fish by species for each reach and survey, and rounded down all intermediate numbers to whole numbers in the calculations.^q Comparing the 2016 Lower Johnson Creek aerial and foot count data, our mean underestimation of pink salmon counted was a factor of 2.4.^r

Data Presentation

For each site, we present figures of the weekly adult pink salmon count and by distribution, and provide the 2011–2016 count by species in a table. The 2016 data and pink salmon count by statistical week 2011–2016 are in Appendix D.

SPAWNING SUBSTRATE COMPOSITION

Requirement APDES 1.5.3.5.1

The APDES permit requires annually sampling pink salmon spawning substrate during early-July at Lower Slate Creek SP1 and SP2 to detect change in composition over time. We calculate the geometric mean particle size, an index of substrate textural composition, for each sample and among samples collected at each site each year.

^q We no longer multiply the Lower Johnson Creek mean weekly aerial counts for each reach by a factor of 2.5 to account for adult salmon not seen, and we updated the 2011–2015 data reflecting this change.

 ^r Previous mean aerial underestimation factors were 3.1 (2011), 1.8 (2012), 2.1 (2013), 1.5 (2014), and 2.0 (2015).
 Pilot skill, visibility, and weather affect count accuracy and observer confidence decreases with faster helicopter speed and downstream orientation.

Sample Collection

We collected four sediment samples at two locations in Lower Slate Creek using a McNeil sampler, which has a 15 cm basal core diameter and 25 cm core depth. We selected sample sites with substrate measuring less than 10 cm, the maximum gravel size used by pink salmon (Lotspeich and Everest 1981; Kondolf and Wolman 1993), and where the stream gradient was 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 pushed the McNeil sampler into the substrate until the sample core was buried, then transferred the sediments to a bucket. We wet-sieved samples onsite using sieve sizes 101.6, 50.8, 25.4, 12.7, 6.35, 1.68, 0.42, and 0.15 mm and measured the contents of each sieve to the nearest 25 mL by the volume of water displaced in 600 mL and 1 L plastic beakers.^s We transferred the fines that passed through the 0.15 mm sieve to Imhoff cones, allowed 10 min settling time, and measured the sediment volume to the nearest 1 mL using the Imhoff cone gradations.

For the fines that pass through the 0.15 mm sieve, we converted sediment wet weights to dry weights using standards identified by Zollinger (1981). For all other sediments, we converted wet weights to dry weights using a correction factor derived from Shirazi et al. (1979), assuming a gravel density of 2.6 g/cm³ (Aquatic Science Inc. 2011). We calculated 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,

$$d_g = d_1^{w1} \times d_2^{w2} \times d_3^{w3} \dots d_n^{wn}$$

Data Presentation

For each site and by year, we present a table of the geometric mean particle size and include the 2011–2016 data in Appendix E.

SEDIMENT METALS CONCENTRATIONS

Requirement APDES 1.5.2

Sediment metals concentrations are influenced by a variety of factors, such as geochemical composition and weathering within the watershed, sediment grain size, organic content, and development (Tchounwou et al. 2012) and heavy metals in sediments can decrease BMI taxa richness and change the composition of BMI communities (Qu et al. 2010).

The APDES permit requires annually sampling fine sediments in Lower Slate Creek, East Fork Slate Creek, Upper Slate Creek, Lower Johnson Creek, and Lower Sherman Creek for particle size, total solids, total volatile solids, total sulfide, total organic carbon, and total concentrations of silver (Ag), aluminum (Al), arsenic (As) cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb), selenium (Se), and zinc (Zn).

^s Except we measure the contents of the 0.15 mm sieve to the nearest 1 mL using an Imhoff cone.

Sample Collection and Analysis

Wearing latex gloves, we opportunistically collected sand and silt at each site within actively flowing channels and retained the top 4 cm of sediment in three glass jars provided by the laboratory.^t We stored the samples in a cooler with frozen icepacks during transport and in a Juneau ADF&G laboratory fridge until we shipped them to the ALS Environmental laboratory in Kelso, Washington for analyses.

We shipped the samples in a cooler with frozen icepacks via overnight air freight, and maintained written chain of custody documentation.^u ALS Environmental measured particle size, total solids, total volatile solids, total sulfide, total organic carbon, and total concentrations of Ag, Al, As, Cd, Cu, Fe, Hg, Pb, Se, and Zn on a dry-weight basis using the methods listed in Table 7. The laboratory provided Tier II quality assurance and quality control information, including results for matrix spikes^v, sample blanks, and sample duplicates.

Table 7.–Sediment tests, analytes, and methods.	
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Test Description	Analyte	Method
Standard test method for particle-size analysis of soils	Particle size determination	ASTM D422
Puget Sound Estuary Program sediment total organic carbon	Total organic carbon	PSEP TOC
Total solids on liquids, modified for solids	Total solids	160.3 Modified
Puget Sound Estuary Program sediment sulfide	Total sulfide	PSEP Sulfide
Total volatile solids, modified for solids	Total volatile solids	160.4 Modified
Mercury in solid or semisolid waste	Hg	7471B
Determination of trace elements in waters and wastes by ICP/MS	Ag, Al, As, Cd, Cr, Cu, Ni, Pb, Se, Zn	200.8

Data Presentation

For each site, we present the 2016 concentration data in a figure and illustrate the 2011–2016 data by analyte in a figure. We compare the data with the Screening Quick Reference Tables (SQuiRTs) for inorganics in freshwater sediment guidelines developed by the National Oceanic and Atmospheric Administration (NOAA; Buchman 2008; MacDonald et al. 2000), specifically the threshold effects concentrations (TEC) and the probable effects concentrations (PEC). The guidelines are based on results of controlled laboratory bioassays, wherein metals concentrations below the TEC rarely affect aquatic life survival and growth, and metals concentrations above the PEC can affect aquatic life survival and growth. We provide the 2011–2016 sediment data by site and by year and include the 2016 laboratory reports in Appendix F.

^t In 2015, we discontinued sieving sediments during collection to avoid washing contaminants from the sample.

^u Despite our effort to schedule field work and shipping as close as possible, ALS Environmental received all sediment samples past the 7-day hold time limit for total volatile solids and total sulfide, as in previous years.

^v The Al spike recovery exceeded the control criteria on the 2016 Lower Slate Creek sediment sample because the analyte concentration was significantly greater than the added spike concentration, which frequently occurs for matrix spikes on Kensington Gold Mine stream sediment samples due to natural Al concentrations in systems near the project.

SEDIMENT TOXICITY

Requirement APDES 1.5.2.3

The APDES permit requires laboratory toxicity testing of Lower Slate Creek, East Fork Slate Creek, Upper Slate Creek, Lower Johnson Creek, and Lower Sherman Creek sediments using the amphipod *Hyalella azteca* and midge *Chironomus dilutus* following method EPA/600/R-94/024.

Sample Collection and Analysis

Wearing latex gloves, we opportunistically collected sand and silt within actively flowing channels at each site and retained the top 4 cm of sediment in three glass jars provided by the laboratory. Between sites, we rinsed our sampling equipment in stream water. We stored the samples in a cooler with frozen icepacks during transport and in a Juneau ADF&G laboratory fridge until we shipped them to the CH2M Hill Applied Sciences Laboratory^w in Corvallis, OR for analyses.

We shipped the samples in a cooler with frozen icepacks via overnight air freight,^x and maintained written chain of custody documentation. Laboratory staff recommended, and followed, the updated bioassay method EPA/600/R-99/064 with the organisms *H. azteca* and *C. tentans* (B. Muckey, Bioassay Laboratory Manager, CH2M Hill Applied Sciences Laboratory, Corvallis, personal communication). For the control sediment, laboratory staff collected sediment from Beaver Creek, upstream of Yaquina Bay near Newport, OR, and press sieved the sediment to remove organisms prior to initiating the experiments.

Data Presentation

For each site, we present the 2016 organism survival and growth results. We provide the 2016 laboratory report in Appendix F.

^w CH2M Hill Applied Sciences Laboratory of Corvallis, OR, has performed the 10-day chronic sediment bioassays since 2014; AECOM Environmental Toxicology Laboratory of Fort Collins, CO, performed the bioassays 2011– 2013.

^x Though we shipped the 2016 coolers via FedEx overnight priority delivery, the cooler containing Johnson Creek sediments arrived at the laboratory one day late and the temperature inside the cooler was outside the holding range recommended in the toxicity test method, as in previous years. Since the holding temperature range is a recommendation and not a requirement, we agreed with the laboratory's recommendation to proceed with testing (M. Stanaway, Laboratory Project Manager, CH2M Hill Applied Sciences Laboratory, Corvallis, OR, personal communication).

RESULTS

SLATE CREEK

Lower Slate Creek

Periphyton Density and Composition

The 2016 Lower Slate Creek mean chlorophyll *a* density was 5.26 mg/m², within the range observed since 2011 (Table 8). Figure 13 presents the minimum, mean, and maximum chlorophyll *a* density from samples collected each year, and Figure 14 presents the mean proportion of chlorophylls *a*, *b*, and *c* each year.

Table 8.–Lower Slate Creek mean chlorophylls *a*, *b*, and *c* density, 2011–2016.

	7/29/2011	7/25/2012	7/31/2013	7/30/2014	7/28/2015	7/26/2016
Chlorophyll $a (mg/m^2)$	5.15	2.31	12.59	4.00	2.16	5.26
Chlorophyll $b (mg/m^2)$	0.43	0.05	0.00	0.85	0.10	0.21
Chlorophyll $c (mg/m^2)$	0.26	0.18	1.64	0.30	0.21	0.62

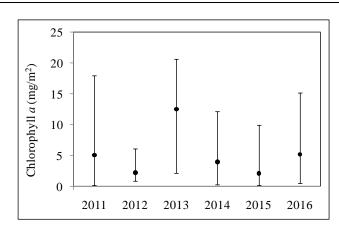


Figure 13.–Lower Slate Creek chlorophyll *a* density, 2011–2016.

Note: Minimum, mean, and maximum values presented.

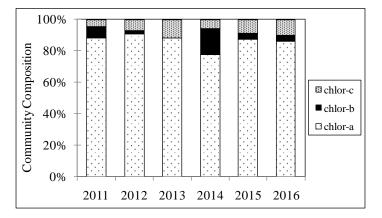


Figure 14.–Lower Slate Creek mean proportion of chlorophylls *a*, *b*, and *c*, 2011–2016.

Benthic Macroinvertebrate Density and Community Composition

Among the 2016 Lower Slate Creek BMI samples, we identified 24 taxa and estimate density at 3,394 BMI/m², of which 15% were EPT insects (Table 9, Figure 15), the lowest proportion of EPT insects observed since 2011. The Shannon Diversity and Evenness scores were similar to previous years, and the dominant taxon was Diptera: Chironomidae representing 51% of the samples, also similar to previous years.

	5/4/2011	5/2/2012	4/30/2013	4/30/2014	4/27/2015	4/26/2016
Mean BMI/m ²	2,057	3,154	2,581	4,136	3,407	3,394
Total BMI Taxa	29	32	27	32	26	24
Number of EPT Taxa	13	17	16	17	13	11
% EPT	14%	38%	51%	19%	24%	15%
Shannon Diversity Score	0.51	0.69	0.85	0.64	0.70	0.65
Evenness Score	0.48	0.58	0.70	0.52	0.58	0.57

Table 9.-Lower Slate Creek BMI data summary, 2011-2016.

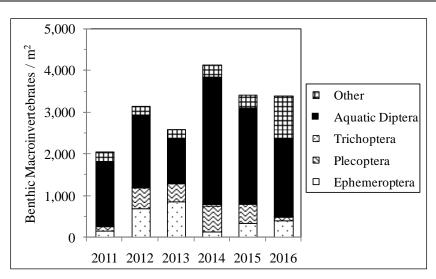


Figure 15.–Lower Slate Creek BMI mean density and community composition, 2011–2016.

Adult Salmon Counts

We counted 79 live pink salmon, 45 live chum salmon, and 2 live coho salmon in Lower Slate Creek during the 2016 spawning season. Figure 16 presents the pink salmon count for each survey, and Figure 17 shows the distribution of pink salmon by reach. Table 10 presents the 2011–2016 adult salmon count.

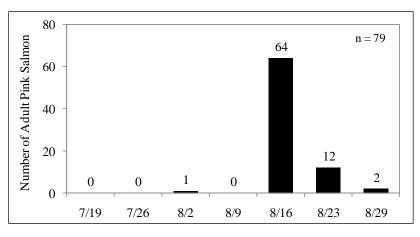


Figure 16.–2016 Lower Slate Creek weekly pink salmon count.

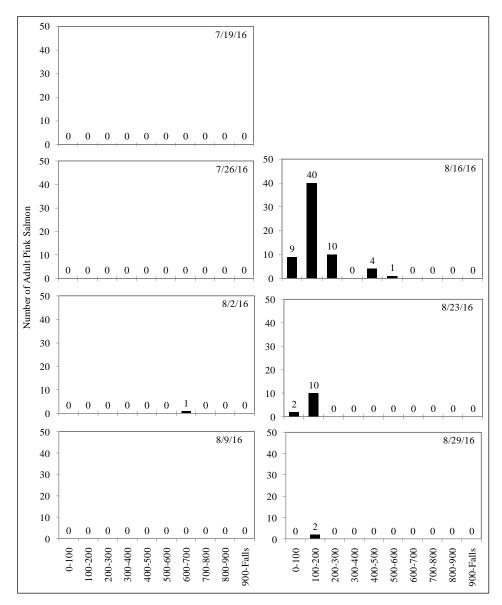


Figure 17.–2016 Lower Slate Creek weekly pink salmon distribution.

	2011	2012	2013	2014	2015	2016
Pink Salmon	6,275	7,272	3,337	41	7,580	79
Chum Salmon	61	1	1	0	13	45
Coho Salmon	0	0	26	5	0	2

Table 10.-Lower Slate Creek adult salmon count, 2011-2016.

Spawning Substrate Composition

Sample Points 1 and 2

The geometric mean particle size among samples collected at Lower Slate Creek SP1 and SP2 was 13.6 mm and 11.6 mm, both within the range of sizes observed at each site since 2011 (Table 11).

Table 11.–Lower Slate	Creek SP1 and SP	2 geometric mean	particle sizes	(mm), 2011–2016.
	creen or r und or	= Sconneurie mieuri	particle billeb	(1111), 2011 2010.

	2011	2012	2013	2014	2015	2016
Sample Point 1	10.3	10.8	14.2	12.9	13.3	13.6
Sample Point 2	11.1	11.2	13.2	16.5	17.5	11.6

Sediment Metals Concentrations

The 2016 Lower Slate Creek sediment metals, As, and Se concentrations were within the range observed 2011–2015. Figure 18 presents the 2016 results and Figure 19 presents the 2011–2016 data. The As, Cu, Ni, and Zn concentrations remain above NOAA's freshwater sediment guidelines (Buchman 2008; MacDonald et al. 2000).

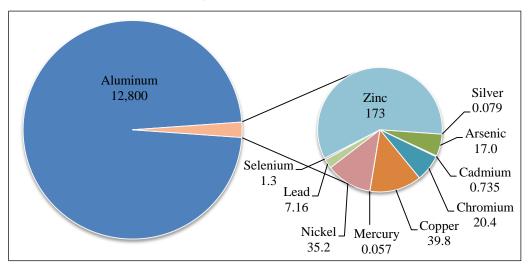


Figure 18.–2016 Lower Slate Creek sediment metals concentrations (mg/kg).

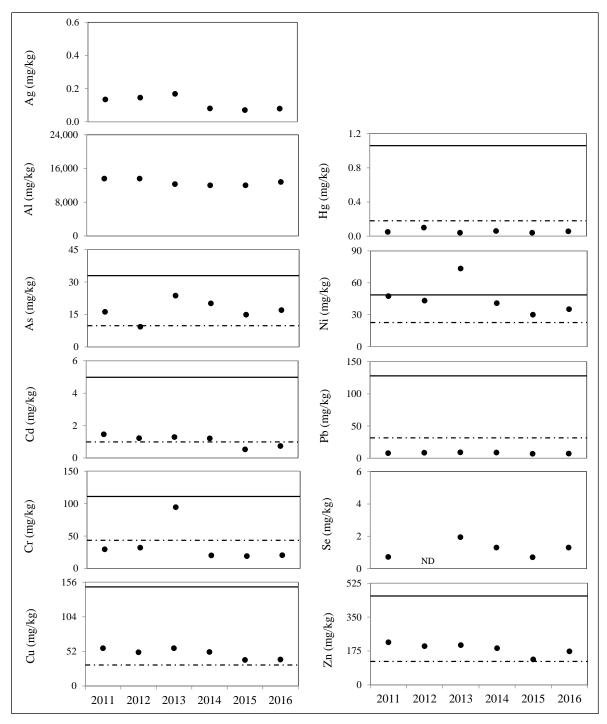


Figure 19.–Lower Slate Creek sediment metals concentrations, 2011–2016.

Note: The dashed line represents the TEC and the solid line represents the PEC for each analyte in freshwater sediments (Buchman 2008; MacDonald et al. 2000); guidelines are not published for Ag, Al, and Se; ND = not detected.

Sediment Toxicity

There were no significant ($p \le 0.05$) reductions in *H. azteca* or *C. tentans* growth or survival between the laboratory control sediment and the 2016 Lower Slate Creek sediment sample.

West Fork Slate Creek

Periphyton Density and Composition

The 2016 West Fork Slate Creek mean chlorophyll *a* density was 4.93 mg/m², the greatest observed since 2011 (Table 12). Figure 20 presents minimum, mean, and maximum chlorophyll *a* density from samples collected each year and Figure 21 presents the mean proportion of chlorophylls *a*, *b*, and *c* each year.

Table 12.–West Fork Slate Creek mean chlorophylls a, b, and c density, 2011–2016.

	7/29/2011	7/25/2012	7/31/2013	7/30/2014	7/28/2015	7/26/2016
Chlorophyll $a (mg/m^2)$	3.92	1.01	4.22	0.77	0.92	4.93
Chlorophyll $b (mg/m^2)$	0.00	0.00	0.00	0.00	0.03	0.00
Chlorophyll $c (mg/m^2)$	0.27	0.10	0.61	0.06	0.06	0.66

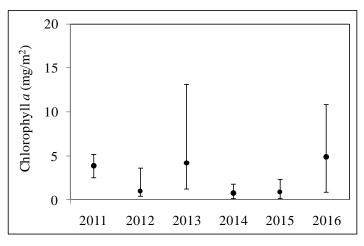


Figure 20.–West Fork Slate Creek chlorophyll *a* density, 2011–2016.

Note: Minimum, mean, and maximum values presented.

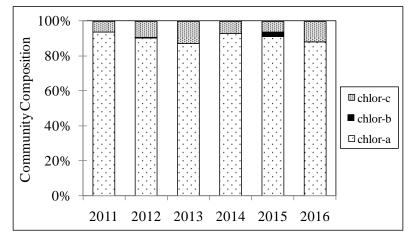


Figure 21.–West Fork Slate Creek mean proportion of chlorophylls *a*, *b*, and *c*, 2011–2016.

Benthic Macroinvertebrate Density and Community Composition

Among the 2016 West Fork Slate Creek BMI samples, we identified 25 taxa and estimate density at 1,470 BMI/m², of which 77% were EPT insects (Table 13, Figure 22), all within the range observed in previous years. The Shannon Diversity and Evenness scores were also similar to previous years, and the dominant taxa were Ephemeroptera: *Baetis*, representing 38% of the samples, and Diptera: Chironomidae representing 18% of the samples.

	5/4/2011	5/2/2012	4/30/2013	4/30/2014	4/27/2015	4/26/2016
Mean BMI/m ²	502	1,819	2,446	973	2,634	1,470
Total BMI Taxa	21	31	28	29	28	25
Number of EPT Taxa	11	21	18	17	16	15
% EPT	80%	80%	90%	71%	82%	77%
Shannon Diversity Score	0.63	0.84	0.73	0.91	0.82	0.72
Evenness Score	0.78	0.71	0.61	0.79	0.71	0.69

Table 13.-West Fork Slate Creek BMI data summary, 2011-2016.

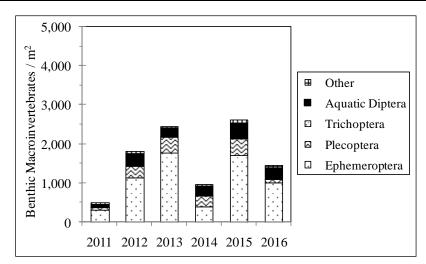


Figure 22.–West Fork Slate Creek BMI mean density and community composition, 2011–2016.

East Fork Slate Creek

East Fork Slate Creek discharge is dependent on Upper Slate Lake discharge, routed through the diversion pipeline bypassing the TTF, and effluent discharge^y from the TTF water treatment plant. East Fork Slate Creek mean daily discharges^z during July 2016 were lower than previous years, except during the last week of the month (Figure 23; unpublished data obtained from K. Eppers, Environmental Superintendent, Coeur Alaska Inc., Juneau). The minimum, median, and maximum mean daily discharges three weeks prior to sampling periphyton were the lowest observed since we began sampling in 2011 (Figure 24).

^y Outfall 002 began discharging to East Fork Slate Creek in December 2010.

² Calculated by combining the diversion pipeline Parshall flume and TTF water treatment plant Outfall 002 mean daily discharge data (unpublished data obtained from K. Eppers, Environmental Superintendent, Coeur Alaska Inc., Juneau, AK).

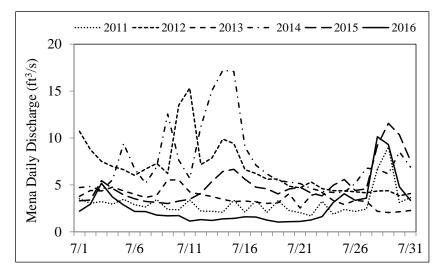
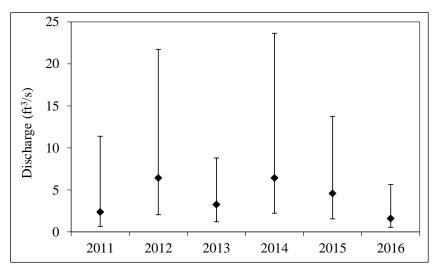
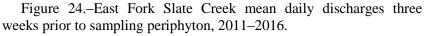


Figure 23.–East Fork Slate Creek July mean daily discharges, 2011–2016.

Note: Combined Parshall flume and TTF water treatment plant Outfall 002 discharge data.





Note: Minimum, median, and maximum mean daily discharges presented.

Periphyton Density and Composition

The 2016 East Fork Slate Creek mean chlorophyll *a* density was 1.21 mg/m^2 , the second lowest observed since 2011 (Table 14). Figure 25 presents the minimum, mean, and maximum chlorophyll *a* density from samples collected each year and Figure 26 presents the mean proportion of chlorophylls *a*, *b*, and *c* each year.

	7/28/2011	7/24/2012	7/30/2013	7/30/2014	7/27/2015	7/25/2016
Chlorophyll $a (mg/m^2)$	8.84	5.08	2.28	0.27	1.56	1.21
Chlorophyll $b (mg/m^2)$	1.56	0.57	0.06	0.02	0.00	0.00
Chlorophyll $c (mg/m^2)$	0.24	0.18	0.20	0.03	0.15	0.15

Table 14.–East Fork Slate Creek mean chlorophylls *a*, *b*, and *c* density, 2011–2016.

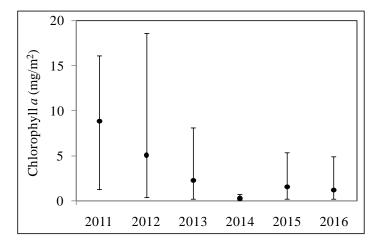


Figure 25.–East Fork Slate Creek chlorophyll *a* density, 2011–2016.

Note: Minimum, mean, and maximum values presented.

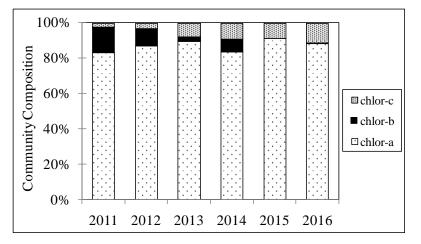


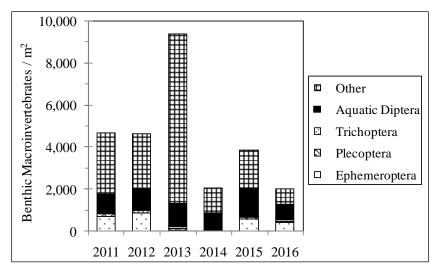
Figure 26.–East Fork Slate Creek mean proportion of chlorophylls *a*, *b*, and *c*, 2011–2016.

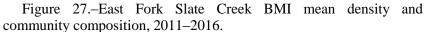
Benthic Macroinvertebrate Density and Community Composition

Among the 2016 East Fork Slate Creek BMI samples, we identified 21 taxa and estimate density at 2,002 BMI/m², of which 28% were EPT insects (Table 15, Figure 27); the lowest number of taxa and density, yet the greatest proportion^{aa} of EPT insects we have observed since 2011. The Shannon Diversity and Evenness scores were similar to the 2015 scores and greater than previous years. The dominant taxa were Diptera: Chironomidae, representing 26% of the samples, and Bivalvia: *Pisidium*, representing 23% of the samples.

	5/12/2011	4/27/2012	4/29/2013	4/30/2014	4/29/2015	4/25/2016
Mean BMI/m ²	4,688	4,633	9,407	2,048	3,854	2,002
Total BMI Taxa	27	33	33	24	28	21
Number of EPT Taxa	15	17	17	9	16	11
% EPT	19%	23%	2.5%	2.0%	18%	28%
Shannon Diversity Score	0.64	0.78	0.57	0.70	0.92	0.92
Evenness Score	0.54	0.61	0.47	0.63	0.72	0.78

Table 15.–East Fork Slate Creek BMI data summary, 2011–2016.





Resident Fish Population and Condition

We did not capture Dolly Varden char during the 2016 East Fork Slate Creek survey, therefore the population estimate was 0 fish, the same as the previous three years (Figures 28, 29).

^{aa} Largely due to fewer pea clams (Bivalvia: *Pisidium*).

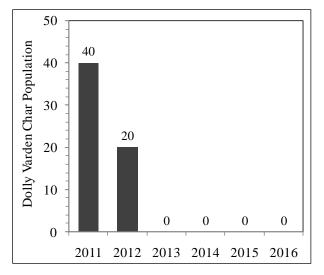


Figure 28.–East Fork Slate Creek Dolly Varden char population, 2011–2016.

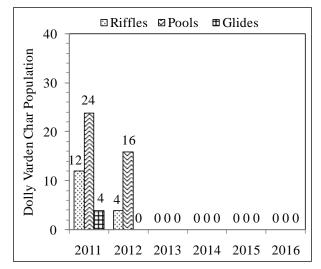


Figure 29.–East Fork Slate Creek Dolly Varden char population by habitat type, 2011–2016.

Sediment Metals Concentrations

Sediment metals, As, and Se concentrations in the 2016 East Fork Slate Creek sediment sample are illustrated in Figure 30, and Figure 31 presents the 2011–2016 data. The 2016 contained a greater concentration of As than previous years, while concentrations of metals and Se were within the range observed 2011–2015. The As, Cd, Cu, Ni, and Zn concentrations remain above NOAA's freshwater sediment guidelines (Buchman 2008; MacDonald et al. 2000).

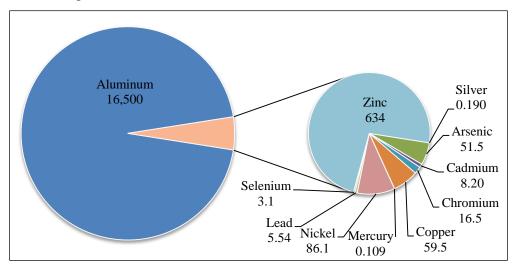


Figure 30.-2016 East Fork Slate Creek sediment metals concentrations (mg/kg).

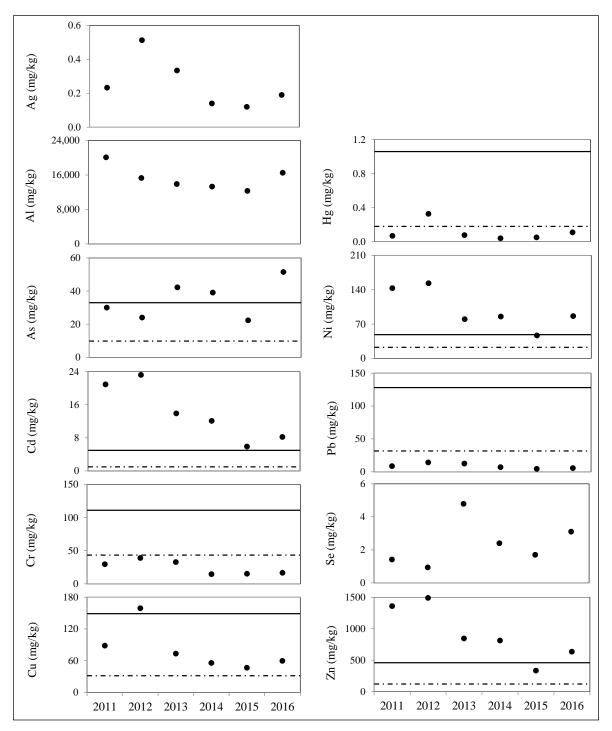


Figure 31.-East Fork Slate Creek sediment metals concentrations, 2011-2016.

Note: The dashed line represents the TEC and the solid line represents the PEC for each analyte in freshwater sediments (Buchman 2008; MacDonald et al. 2000); guidelines are not published for Ag, Al, and Se; ND = not detected.

Sediment Toxicity

There were no significant ($p \le 0.05$) reductions in *H. azteca* or *C. tentans* growth or survival between the laboratory control sediment and the 2016 East Fork Slate Creek sediment sample.

Upper Slate Creek

Periphyton Density and Composition

The 2016 Upper Slate Creek mean chlorophyll *a* density was 3.86 mg/m², the greatest observed since 2011 (Table 16). Figure 32 presents the minimum, mean, and maximum chlorophyll *a* density from samples collected each year and Figure 33 presents the mean proportion of chlorophylls *a*, *b*, and *c* each year.

Table 16.–Upper Slate Creek mean chlorophylls *a*, *b*, and *c* density, 2011–2016.

	7/29/2011	7/24/2012	7/30/2013	7/30/2014	7/27/2015	7/25/2016
Chlorophyll $a (mg/m^2)$	0.76	1.26	2.13	1.09	0.63	3.86
Chlorophyll $b (mg/m^2)$	0.00	0.00	0.00	0.00	0.00	0.02
Chlorophyll $c (mg/m^2)$	0.05	0.07	0.13	0.06	0.09	0.42

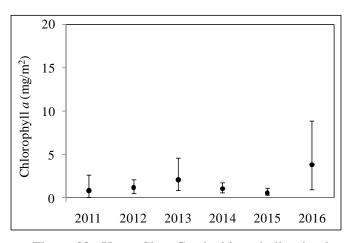


Figure 32.–Upper Slate Creek chlorophyll *a* density, 2011–2016.

Note: Minimum, mean, and maximum values presented.

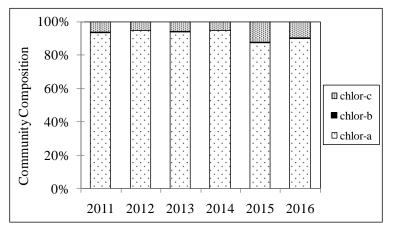


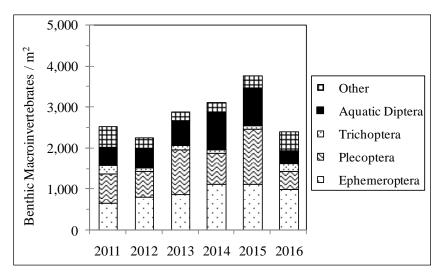
Figure 33.–Upper Slate Creek mean proportion of chlorophylls *a*, *b*, and *c*, 2011–2016.

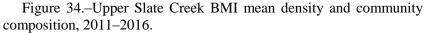
Benthic Macroinvertebrate Density and Community Composition

Among the 2016 Upper Slate Creek BMI samples, we identified 28 taxa and estimate density at 2,398 BMI/m², of which 68% were EPT insects (Table 17, Figure 34); a lower number of taxa and density we have observed since 2011. The Shannon Diversity and Evenness scores were greater than previous years. The dominant taxa were Ephemeroptera: *Baetis*, representing 18% of the samples, Plecoptera: *Despaxia*, representing 11% of the samples, and Diptera: Chironomidae, representing 11% of the samples.

	5/12/2011	4/27/2012	4/29/2013	4/28/2014	4/29/2015	4/25/2016
Mean BMI/m ²	2,523	2,256	2,880	3,125	3,776	2,398
Total BMI Taxa	33	39	34	36	31	28
Number of EPT Taxa	18	21	20	20	19	15
% EPT	63%	68%	72%	63%	68%	68%
Shannon Diversity Score	0.97	1.04	1.02	1.03	0.98	1.06
Evenness Score	0.76	0.79	0.78	0.76	0.74	0.82

Table 17.-Upper Slate Creek BMI data summary, 2011-2016.





Resident Fish Population and Condition

The 2016 Upper Slate Creek Dolly Varden char population estimate was 168 ± 48 fish^{bb}, similar to populations observed since 2011 (Figure 35). As in previous years, we captured more Dolly Varden char in pools than riffles or glides (Figure 36), and captured fish represented several age classes. Mean fish condition was 1.2, greater than previous years.

^{bb} The goodness of fit X^2 test indicates we achieved equal capture probability between passes.

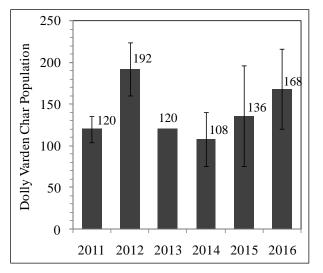


Figure 35.–Upper Slate Creek Dolly Varden char population, 2011–2016.

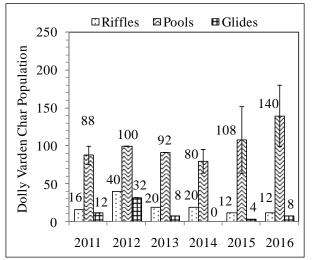


Figure 36.–Upper Slate Creek Dolly Varden char population by habitat type, 2011–2016.

Sediment Metals Concentrations

Sediment metals, As, and Se concentrations in the 2016 Upper Slate Creek sediment sample are shown in Figure 37, and Figure 38 presents the 2011–2016 data. The 2016 sample contained lower concentrations of Al, Cd, Cr, Cu, Ni and Pb than previous years and concentrations of other metals, As and Se were within the range observed 2011–2015. The As, Cr, Cu, and Ni concentrations remain above NOAA's freshwater sediment guidelines (Buchman 2008; MacDonald et al. 2000).

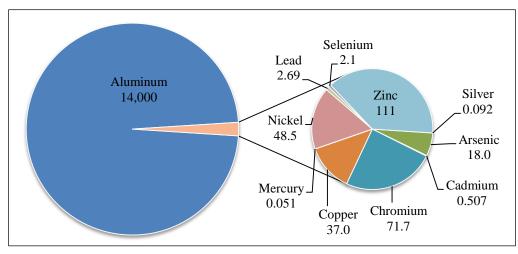


Figure 37.–2016 Upper Slate Creek sediment metals concentrations (mg/kg).

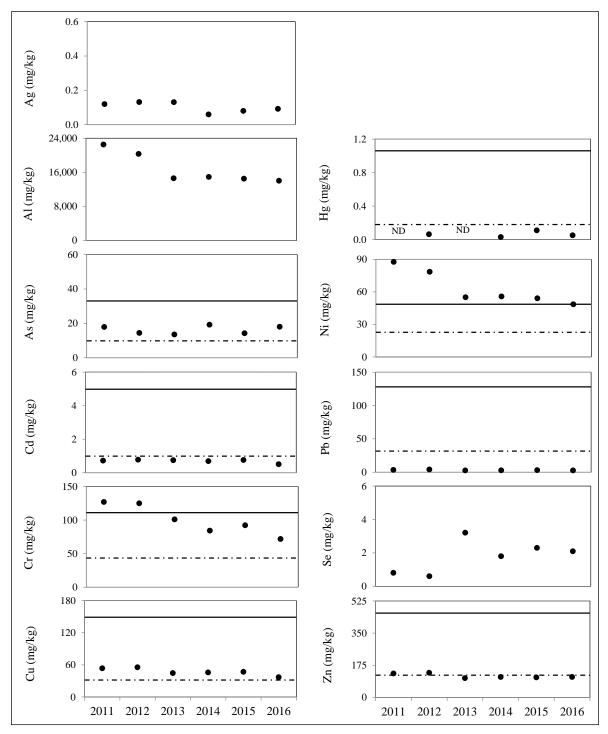


Figure 38.–Upper Slate Creek sediment metals concentrations, 2011–2016.

Note: The dashed line represents the TEC and the solid line represents the PEC for each analyte in freshwater sediments (Buchman 2008; MacDonald et al. 2000); guidelines are not published for Ag, Al, and Se; ND = not detected.

Sediment Toxicity

There were no significant ($p \le 0.05$) reductions in *H. azteca* or *C. tentans* growth or survival between the laboratory control sediment and the 2016 Upper Slate Creek sediment sample.

JOHNSON CREEK

Lower Johnson Creek

Adult Salmon Counts

We counted 428 live adult pink salmon, 39 live chum salmon, and 24 live coho salmon in Lower Johnson Creek during the 2016 spawning season. Figure 39 presents the pink salmon count for each survey, and Figure 40 shows the distribution of pink salmon by reach. Table 18 presents 2011–2016 adult salmon count.

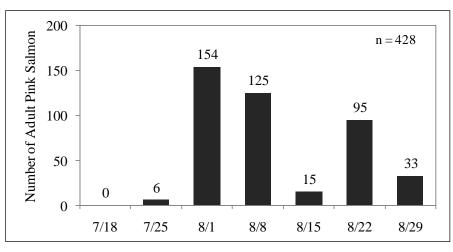


Figure 39.–2016 Lower Johnson Creek weekly pink salmon count.

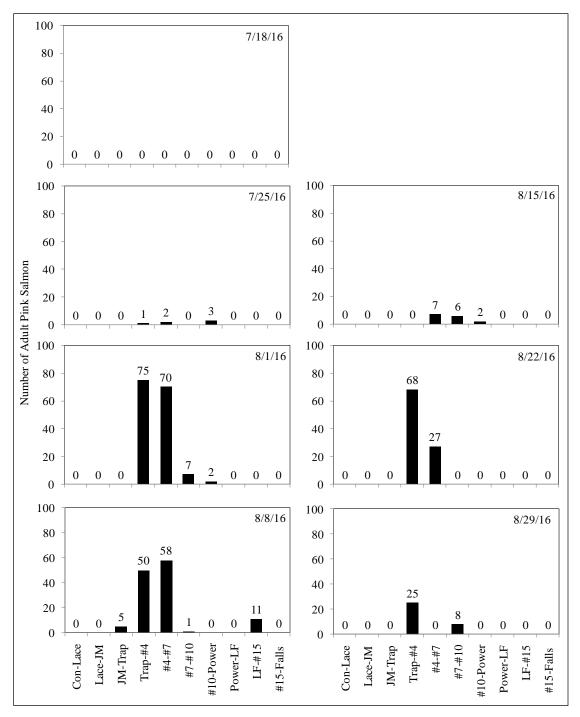


Figure 40.–2016 Lower Johnson Creek weekly pink salmon distribution.

Table 18Lower Johnson Creek adult salmon count, 2	2011–2016.
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	2011	2012	2013	2014	2015	2016
Pink Salmon	17,509	5,016	8,186	189	51,325	428
Chum Salmon	18	99	17	3	0	39
Coho Salmon	33	90	64	107	88	24

Sediment Metals Concentrations

Sediment metals, As, and Se concentrations in the 2016 Lower Johnson Creek sediment sample are shown in Figure 41, and Figure 42 presents the 2011–2016 data. The 2016 sample contained a greater concentration of Ag and lower concentrations of Al, Ni and Zn than previous years, and the concentrations of other metals and As, and Se were within the range observed 2011–2015. As and Cu concentrations remain above NOAA's freshwater sediment guidelines (Buchman 2008; MacDonald et al. 2000). Se was not detected for the sixth year in a row.

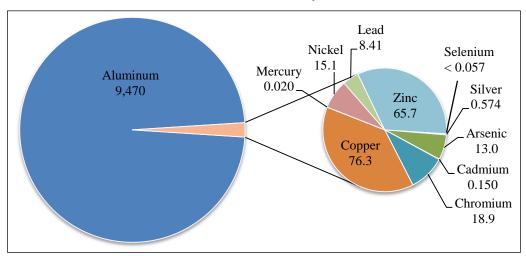


Figure 41.–2016 Lower Johnson Creek sediment metals concentrations (mg/kg).

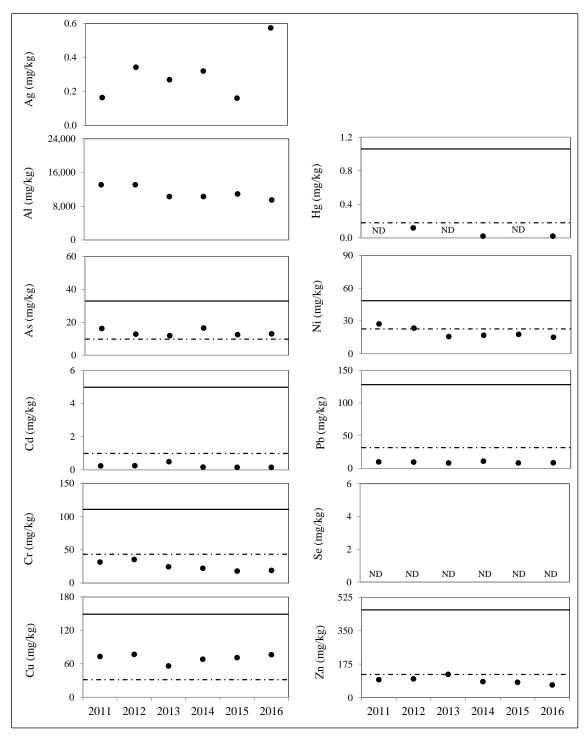


Figure 42.-Lower Johnson Creek sediment metals concentrations, 2011-2016.

Note: The dashed line represents the TEC and the solid line represents the PEC for each analyte in freshwater sediments(Buchman 2008; MacDonald et al. 2000); guidelines are not published for Ag, Al, and Se; ND = not detected.

Sediment Toxicity

There were no significant ($p \le 0.05$) reductions in *H. azteca* or *C. tentans* growth or survival between the laboratory control sediment and the 2016 Lower Johnson Creek sediment sample.

Upper Johnson Creek

Benthic Macroinvertebrate Density and Community Composition

Among the 2016 Upper Johnson Creek BMI samples, we identified 32 taxa and estimate density at 3,681 BMI/m², of which 71% were EPT insects (Table 19, Figure 43), all within ranges observed since 2011. The Shannon Diversity and Evenness scores were also similar to previous years. The dominant taxa were Ephemeroptera: *Baetis*, representing 30% of the samples, and Diptera: Chironomidae, representing 22% of the samples.

	5/3/11	4/26/12	4/29/13	4/29/14	4/28/15	4/27/16
Mean BMI/m ²	3,735	3,968	5,265	2,658	2,789	3,681
Total BMI Taxa	24	28	34	32	28	32
Number of EPT Taxa	14	14	24	21	17	21
% EPT	55%	64%	65%	69%	71%	71%
Shannon Diversity Score	0.76	0.81	0.74	0.74	0.87	0.88
Evenness Score	0.66	0.68	0.59	0.59	0.71	0.70

Table 19.-Upper Johnson Creek BMI data summary, 2011-2016.

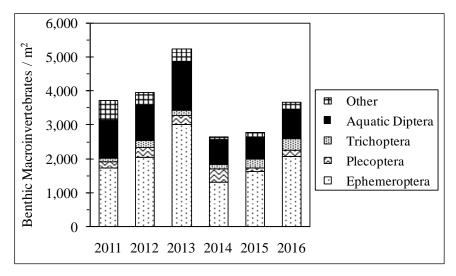


Figure 43.–Upper Johnson Creek BMI mean density and community composition, 2011–2016.

SHERMAN CREEK

Lower Sherman Creek

Periphyton Density and Composition

Sample Point 1

The 2016 Lower Sherman Creek SP1 mean chlorophyll *a* density was 3.70 mg/m^2 , within the range observed since 2011 (Table 20). Figure 44 presents the minimum, mean, and maximum chlorophyll *a* density from samples collected each year and Figure 45 presents the mean proportion of chlorophylls *a*, *b*, and *c* each year.

Table 20.–Lower Sherman Creek SP1 mean chlorophylls *a*, *b*, and *c* density, 2011–2016.

	7/28/2011	7/26/2012	7/29/2013	7/28/2014	7/27/2015	7/25/2016
Chlorophyll $a (mg/m^2)$	7.60	2.54	3.69	1.34	1.36	3.70
Chlorophyll $b (mg/m^2)$	0.69	0.93	0.00	0.00	0.00	0.74
Chlorophyll $c (mg/m^2)$	0.49	0.08	0.51	0.18	0.17	0.33

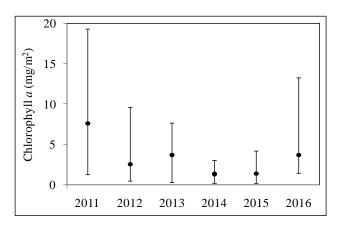


Figure 44.–Lower Sherman SP1 chlorophyll *a* density, 2011–2016.

Note: Minimum, mean, and maximum values presented.

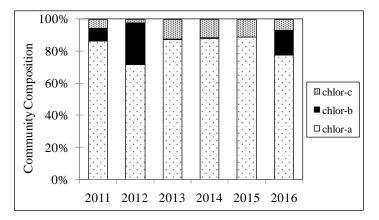


Figure 45.–Lower Sherman SP1 mean proportion of chlorophylls *a*, *b*, and *c*, 2011–2016.

Sample Point 2

The 2016 Lower Sherman Creek SP2 mean chlorophyll *a* density was 1.42 mg/m^2 , similar to the mean observed in 2014 and 2015 (Table 21). Figure 46 presents the minimum, mean, and maximum chlorophyll *a* density from samples collected each year and Figure 47 presents the mean proportion of chlorophylls *a*, *b*, and *c* each year.

	7/28/2011	7/26/2012	7/29/2013	7/28/2014	7/27/2015	7/25/2016
Chlorophyll $a (mg/m^2)$	5.61	0.67	2.87	1.32	1.62	1.42
Chlorophyll $b (mg/m^2)$	0.02	0.01	0.00	0.00	0.15	0.04
Chlorophyll $c (mg/m^2)$	0.32	0.09	0.32	0.12	0.27	0.18

Table 21.-Lower Sherman Creek SP2 mean chlorophylls a, b, and c density, 2011–2016.

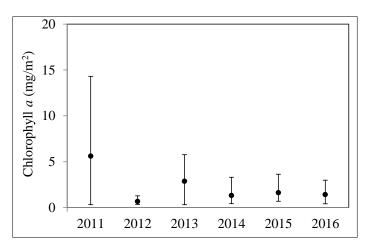


Figure 46.–Lower Sherman SP2 chlorophyll *a* density, 2011–2016.

Note: Minimum, mean, and maximum values presented.

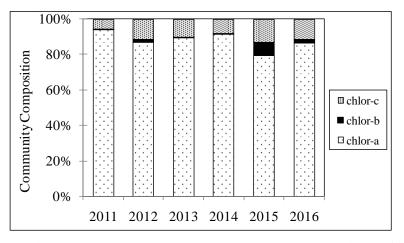


Figure 47.–Lower Sherman SP2 mean proportion of chlorophylls *a*, *b*, and *c*, 2011–2016.

Benthic Macroinvertebrate Density and Community Composition

Sample Point 1

Among the 2016 Lower Sherman Creek SP1 BMI samples, we identified 26 taxa and estimate density at 6,839 BMI/m², of which 4% were EPT insects (Table 22, Figure 48); the greatest density and lowest proportion^{cc} of EPT insects we have observed since 2011. The Shannon Diversity and Evenness scores were lower than previous years and the dominant taxon was Annelida: Oligochaeta, representing 83% of the samples.

	5/4/11	4/30/12	5/1/13	4/29/14	4/28/15	4/27/16
Mean BMI/m ²	1,118	2,733	1,796	3,023	1,651	6,839
Total BMI Taxa	26	31	28	30	26	26
Number of EPT Taxa	15	18	16	13	13	13
% EPT	32%	66%	64%	14%	27%	4%
Shannon Diversity Score	0.76	0.74	0.85	0.71	0.84	0.32
Evenness Score	0.71	0.62	0.71	0.57	0.70	0.27

Table 22.-Lower Sherman Creek SP1 BMI data summary, 2011-2016.

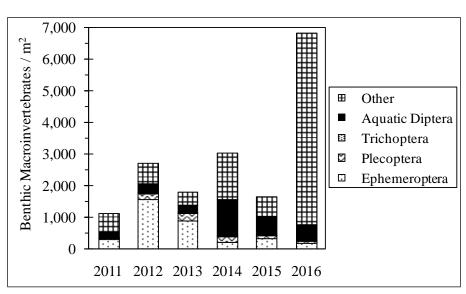


Figure 48.–Lower Sherman Creek SP1 BMI mean density and community composition, 2011–2016.

^{cc} Largely due to an increase in the number of aquatic worms (Oligochaeta); three of the six BMI samples we collected contained pink salmon fry, coinciding with the greatest worm densities among the six samples.

Sample Point 2

Among 2016 Lower Sherman Creek SP2 BMI samples, we identified 23 taxa and estimate density at 1,873 BMI/m², of which 12% were EPT insects (Table 23, Figure 49), similar to the 2014 and 2015 sample results and due in part to an increase in the number of aquatic worms (Oligochaeta). The Shannon Diversity and Evenness scores were the lowest observed since 2011, and the dominant taxon was Annelida: Oligochaeta, representing 65% of the samples.

	5/3/11	4/30/12	4/30/13	4/29/14	4/28/15	4/27/16
Mean BMI/m ²	1,651	2,823	3,385	1,185	1,609	1,873
Total BMI Taxa	30	37	39	28	23	23
Number of EPT Taxa	17	26	25	16	13	13
% EPT	76%	79%	72%	12%	25%	12%
Shannon Diversity Score	0.93	0.70	0.84	0.70	0.77	0.53
Evenness Score	0.76	0.57	0.65	0.62	0.66	0.49

Table 23.-Lower Sherman Creek SP2 BMI data summary, 2011-2016.

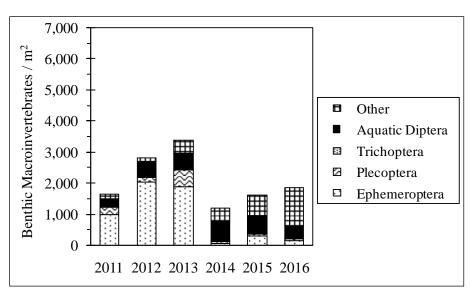


Figure 49.–Lower Sherman Creek SP2 BMI mean density and community composition, 2011–2016.

Adult Salmon Counts

We counted 26 live adult pink salmon and 5 live chum salmon in Lower Sherman Creek during the 2016 spawning season.^{dd} Figure 50 presents the pink salmon count for each survey, and Figure 51 shows the distribution of pink salmon by reach. Table 24 presents the 2011–2016 adult salmon count.

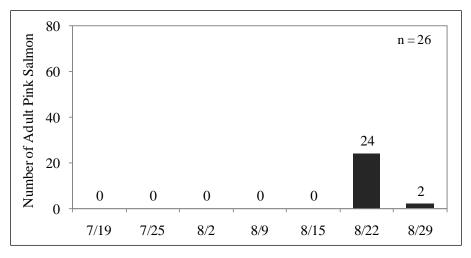


Figure 50.–2016 Lower Sherman Creek weekly pink salmon count.

^{dd} On August 15 we were only able to survey the lower 150 m due to high flow and poor visibility, and on August 29 we surveyed by helicopter because the Comet Beach road was closed.

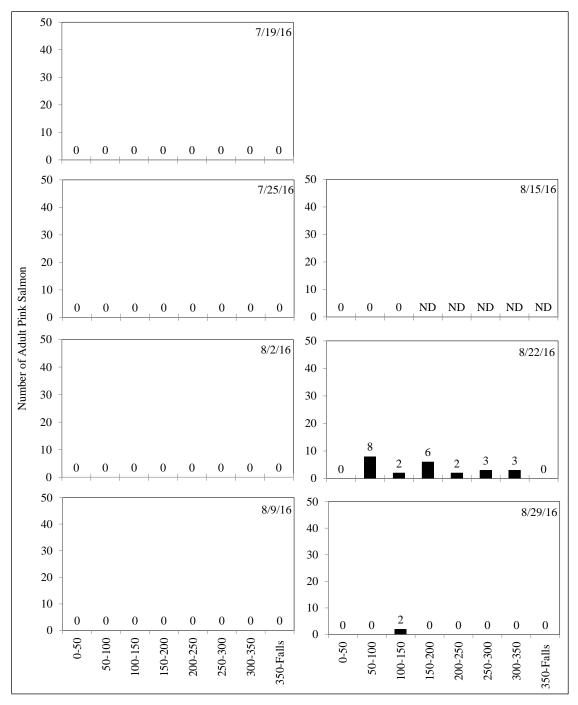


Figure 51.–2016 Lower Sherman Creek weekly pink salmon distribution.

	2011	2012	2013	2014	2015	2016
Pink Salmon	4,624	1,608	4,981	70	2,798	26
Chum Salmon	0	0	12	0	1	5

Sediment Metals Concentrations

Sediment metals, As, and Se concentrations in the 2016 Lower Sherman Creek sediment sample are shown in Figure 52, and Figure 53 presents the 2011–2016 data. The 2016 sample contained lower concentrations of Ag, Al, As, Cr and Pb than previous years, and the concentrations of other metals and Se were within the range observed 2011–2015. The As, Cu, Ni, and Zn concentrations remain above NOAA's freshwater sediment guidelines (Buchman 2008; MacDonald et al. 2000).

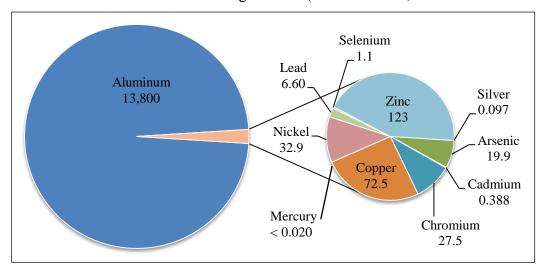


Figure 52.–2016 Lower Sherman Creek sediment metals concentrations (mg/kg).

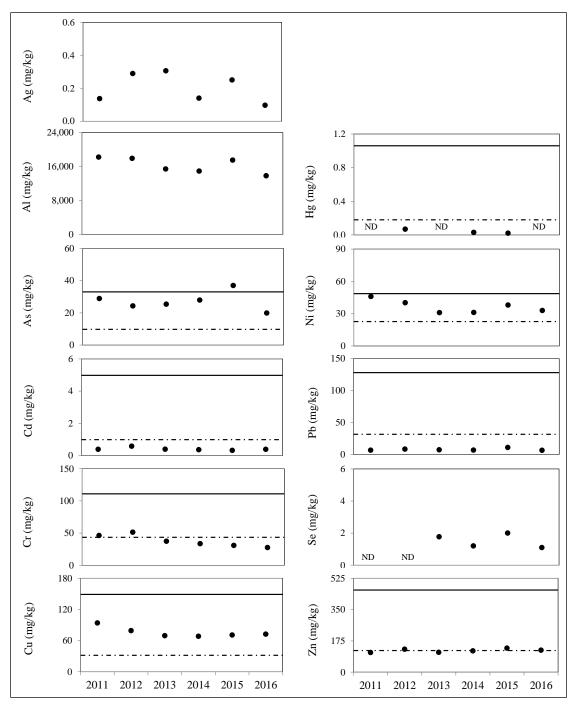


Figure 53.-Lower Sherman Creek sediment metals concentrations, 2011–2016.

Note: The dashed line represents the TEC and the solid line represents the PEC for each analyte in freshwater sediments(Buchman 2008; MacDonald et al. 2000); guidelines are not published for Ag, Al, and Se; ND = not detected.

Sediment Toxicity

C. tentans survival on the 2016 Lower Sherman Creek sediment sample was significantly ($p \le 0.05$) lower than on the control sediment. *H. Azteca* growth and survival on the 2016 sediment sample were not significantly ($p \le 0.05$) different than on the control sediment.

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ee This publication is actually the resident fish survey report.

^{ff} This publication is actually the invertebrate tissue analysis.

^{gg} Actually published February 2010.

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APPENDIX A: PERIPHYTON DATA

		July 2011			July 2012			July 2013			July 2014		
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	
	0.21	0.05	0.00	1.60	0.13	0.07	14.10	0.00	1.56	0.37	0.00	0.0	
	1.28	0.02	0.11	4.06	0.00	0.39	20.72	0.00	3.11	9.29	3.22	0.48	
	0.85	0.01	0.07	2.03	0.00	0.18	10.89	0.00	1.01	1.45	0.00	0.23	
	3.31	0.08	0.25	0.96	0.00	0.04	17.84	0.00	2.66	12.18	5.27	0.38	
	11.85	3.11	0.30	2.56	0.04	0.22	2.14	0.00	0.24	0.75	0.00	0.0	
	18.05	0.42	0.91	0.92	0.00	0.01	6.09	0.00	0.95	4.70	0.00	0.6	
	0.72	0.13	0.00	1.49	0.13	0.13	15.49	0.00	1.99	2.88	0.00	0.49	
	0.43	0.05	0.00	2.35	0.12	0.19	12.71	0.00	1.58	1.82	0.00	0.15	
	8.54	0.39	0.58	6.19	0.05	0.54	11.32	0.00	1.87	0.73	0.00	0.07	
	6.30	0.03	0.38	0.96	0.00	0.06	14.63	0.00	1.46	5.87	0.00	0.5	
mean	5.15	0.43	0.26	2.31	0.05	0.18	12.59	0.00	1.64	4.00	0.85	0.30	
max	18.05	3.11	0.91	6.19	0.13	0.54	20.72	0.00	3.11	12.18	5.27	0.6	
min	0.21	0.01	0.00	0.92	0.00	0.01	2.14	0.00	0.24	0.37	0.00	0.0	
		July 2015			April 2016			July 2016					
mg/m²	chlor-a		chlor-c	chlor-a			chlor-a	chlor-b	chlor-c				
	0.45	0.10	0.01	1.82	0.00	0.37	0.60	0.00	0.12				
	3.06	0.00	0.28	2.88	0.00	0.54	15.27	0.00	2.14				
	0.95	0.09	0.04	3.95	0.00	0.43	6.41	0.00	0.97				
	0.85	0.00	0.06	3.17	0.00	0.52	2.35	0.00	0.22				
	0.72	0.13	0.00	3.26	0.00	0.48	9.51	0.76	0.88				
	2.24	0.44	0.12	1.47	0.00	0.23	2.88	0.66	0.20				
	9.93	0.00	1.13	2.71	0.00	0.46	3.52	0.00	0.40				
	0.19	-	-	0.78	0.00	0.06	2.03	0.00	0.28				
	2.88	0.14	0.28	2.14	0.07	0.19	5.34	0.67	0.36				
	0.32	0.01	0.00	5.23	0.00	0.86	4.70	0.00	0.65				
mean	2.16	0.10	0.21	2.74	0.01	0.41	5.26	0.21	0.62				
max	9.93	0.44	1.13	5.23	0.07	0.86	15.27	0.76	2.14				
min	0.19	0.00	0.00	0.78	0.00	0.06	0.60	0.00	0.12				

Appendix A.1.–Lower Slate Creek chlorophylls *a*, *b*, and *c* density, 2011–2016.

Note: Bolded values are the spectrophotometer estimated detection limit, chlorophyll a not detected.

• •								-				
		July 2011			July 2012			July 2013			July 2014	
mg/m²	chlor-a	chlor-b	chlor-c									
	2.52	0.00	0.19	1.15	0.00	0.04	4.70	0.00	0.74	0.32	0.00	0.01
	4.70	0.00	0.43	0.41	0.00	0.08	1.39	0.00	0.16	0.19	0.00	0.00
	2.78	0.00	0.26	0.53	0.00	0.02	13.14	0.00	2.19	0.75	0.00	0.05
	3.35	0.00	0.04	0.64	0.00	0.16	4.38	0.00	0.47	0.88	0.00	0.00
	4.27	0.00	0.25	3.62	0.00	0.24	1.28	0.00	0.11	1.60	0.00	0.19
	4.91	0.00	0.42	0.85	0.00	0.14	3.10	0.00	0.50	0.23	0.00	0.03
	3.95	0.00	0.27	0.96	0.01	0.07	3.74	0.00	0.53	0.41	0.00	0.00
	3.10	0.00	0.25	0.41	0.00	0.08	2.03	0.00	0.33	0.33	0.00	0.02
	4.38	0.00	0.39	0.60	0.00	0.12	5.02	0.00	0.67	1.18	0.00	0.13
	5.23	0.00	0.20	0.96	0.00	0.06	3.40	0.00	0.36	1.82	0.00	0.15
mean	3.92	0.00	0.27	1.01	0.00	0.10	4.22	0.00	0.61	0.77	0.00	0.06
max	5.23	0.00	0.43	3.62	0.01	0.24	13.14	0.00	2.19	1.82	0.00	0.19
min	2.52	0.00	0.04	0.41	0.00	0.02	1.28	0.00	0.11	0.19	0.00	0.00
		July 2015			July 2016							
mg/m²	chlor-a	chlor-b	chlor-c	chlor-a	chlor-b	chlor-c						
	1.34	0.00	0.21	7.48	0.00	1.16						
	0.92	0.00	0.01	4.70	0.00	0.71						
	0.77	0.02	0.03	3.22	0.00	0.25						
	0.54	0.05	0.00	5.34	0.00	0.61						
	0.19	-	-	2.67	0.00	0.34						
	1.64	0.00	0.04	3.31	0.00	0.45						
	2.35	0.00	0.21	4.27	0.00	0.44						
	0.53	0.12	0.00	0.92	0.00	0.01						
	0.56	0.00	0.06	10.89	0.00	1.64						
	0.32	0.05	0.00	6.51	0.00	0.95						
	0.00	0.00										

0.66

1.64

0.01

Appendix A.2.–West Fork Slate Creek chlorophylls *a*, *b*, and *c* density, 2011–2016.

Note: Bolded values are the spectrophotometer estimated detection limit, chlorophyll a not detected.

4.93

10.89

0.92

0.92

2.35

0.19

mean

max

min

0.03

0.12

0.00

0.06

0.21

0.00

0.00

0.00

		July 2011			July 2012			July 2013			July 2014	
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
	9.51	2.16	0.24	11.53	3.24	0.28	8.12	0.00	0.67	0.14	4 0.00	0.0
	9.18	0.02	0.20	0.41	0.04	0.04	0.24	-	-	0.64	4 0.00	0.0
	1.28	0.03	0.00	0.88	0.00	0.05	1.07	0.03	0.07	0.05	5 -	
	5.13	1.15	0.11	0.50	0.00	0.03	0.32	0.07	0.00	0.7	5 0.14	0.10
	16.02	0.18	0.44	3.42	0.00	0.11	0.64	0.10	0.00	0.05	5 -	
	8.86	1.94	0.70	0.64	0.08	0.05	5.02	0.16	0.35	0.3	7 0.00	0.0
	4.70	0.70	0.13	18.58	0.00	0.66	0.43	0.00	0.03	0.05	5 -	
	16.13	5.35	0.28	13.67	2.32	0.57	6.41	0.11	0.50	0.1	1 0.00	0.00
	4.91	0.49	0.12	0.69	0.00	0.00	0.32	0.00	0.00	0.53	3 0.00	0.0
	12.71	3.59	0.15	0.43	0.00	0.00	 0.24	-	-	0.05	5 -	
mean	8.84	1.56	0.24	5.08	0.57	0.18	 2.28	0.06	0.20	0.2	7 0.02	0.0
max	16.13	5.35	0.70	18.58	3.24	0.66	8.12	0.16	0.67	0.7	5 0.14	0.1
min	1.28	0.02	0.00	0.41	0.00	0.00	0.24	0.00	0.00	0.03	5 0.00	0.0
		July 2015			April 2016			July 2016				
mg/m²	chlor-a	chlor-b	chlor-c	chlor-a	chlor-b	chlor-c	 chlor-a	chlor-b	chlor-c			
	0.85	0.00	0.12	0.32	0.00	0.09	0.23	0.00	0.03			
	0.19	-	-	1.07	0.00	0.04	4.91	0.00	0.69			
	1.92	0.00	0.09	10.04	0.00	1.53	0.75	0.00	0.05			
	0.96	0.00	0.09	2.98	0.00	0.48	1.42	0.00	0.14			
	1.60	0.00	0.22	1.82	0.25	0.15	0.85	0.02	0.17			
	5.34	0.00	0.55	0.77	0.01	0.13	1.56	0.00	0.12			
	2.14	0.00	0.09	1.15	0.00	0.24	0.64	0.00	0.08			
	0.37	0.00	0.00	0.87	0.00	0.11	0.19	-	-			
	0.92	0.00	0.11	0.19			0.87	0.00	0.02			
	1.28	0.00	0.08	0.55	0.00	0.12	 0.64	0.00	0.06			
mean	1.56	0.00	0.15	1.98	0.03	0.32	 1.21	0.00	0.15			
max	5.34	0.00	0.55	10.04	0.25	1.53	4.91	0.02	0.69			
min	0.19	0.00	0.00	0.19	0.00	0.04	0.19	0.00	0.02			

Appendix A.3.–East Fork Slate Creek chlorophylls *a*, *b*, and *c* density, 2011–2016.

Note: Bolded values are the spectrophotometer estimated detection limit, chlorophyll *a* not detected.

		July 2011			July 2012				
mg/m²	chlor-a	chlor-b	chlor-c		chlor-a	chlor-b	chlor-c		
	0.41	0.00	0.00		2.03	0.00	0.14		
	0.32	0.00	0.04		0.96	0.00	0.09		
	0.96	0.01	0.07		0.75	0.00	0.00		
	0.11	0.00	0.00		0.50	0.00	0.03		
	2.67	0.00	0.26		2.03	0.00	0.14		
	0.28	0.00	0.00		1.07	0.00	0.14		
	0.60	0.00	0.12		0.55	0.00	0.02		
	1.14	0.00	0.01		1.71	0.00	0.06		
	0.53	0.00	0.00		2.14	0.00	0.12		
-	0.60	0.00	0.02		0.83	0.00	0.00		
mean	0.76	0.00	0.05		1.26	0.00	0.07		
max	2.67	0.01	0.26		2.14	0.00	0.14		
min	0.11	0.00	0.00		0.50	0.00	0.00		
-		July 2015				July 2016			
mg/m²	chlor-a	chlor-b	chlor-c		chlor-a	chlor-b	chlor-c		
	0.37	0.00	0.08		1.15	0.00	0.07		
	0.64	0.00	0.08		8.86	0.00	1.12		
	0.64	0.00	0.07		1.52	0.00	0.06		
	0.51	0.00	0.06		5.34	0.00	0.93		
	0.43	0.00	0.08		2.85	0.00	0.14		
	0.55	0.00	0.28		1.01	0.00	0.09		
	0.64	0.00	0.02		4.81	0.00	0.40		
	0.64	0.00	0.08		2.40	0.16	0.21		
	0.69	0.00	0.00		4.49	0.00	0.36		
-	1.17	0.00	0.13		6.19	0.00	0.79		
mean	0.63	0.00	0.09	-	3.86	0.02	0.42		
max	1.17	0.00	0.28		8.86	0.16	1.12		
min	0.37	0.00	0.00		1.01	0.00	0.06		

Appendix A.4.–Upper Slate Creek chlorophylls *a*, *b*, and *c* density, 2011–2016.

July 2013

chlor-b

0.00

0.01

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.01

0.00

chlor-c

0.27

0.07

0.13

0.12

0.11

0.20

0.01

0.20

0.00

0.20

0.13

0.27

0.00

chlor-a

1.82

0.85

2.94

1.39

2.99

4.59

0.85

2.03

0.85

2.94

2.13

4.59

0.85

July 2014

chlor-b

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

chlor-c

0.11

0.07

0.06

0.15

0.00

0.01

0.07

0.00

0.01

0.12

0.06

0.15

0.00

chlor-a

0.92

1.20

1.52

1.82

0.85

0.64

1.18

0.96

0.64

1.17

1.09

1.82

		July 2011			July 2012			July 2013			July 2014	
mg/m²	chlor-a	chlor-b	chlor-c									
	1.28	0.00	0.05	1.07	0.00	0.14	4.06	0.00	0.38	2.46	0.00	0.30
	5.34	0.00	0.36	2.88	0.87	0.16	5.55	0.00	0.73	0.74	0.00	0.10
	5.98	0.00	0.54	0.41	0.04	0.04	0.24	-	-	0.19	0.00	0.00
	3.84	0.10	0.48	2.67	1.27	0.00	4.67	0.00	0.55	0.92	0.00	0.14
	15.59	3.98	0.17	0.60	0.00	0.12	7.69	0.00	0.89	0.83	0.00	0.15
	11.11	2.64	0.28	1.07	0.00	0.11	7.37	0.00	0.62	2.99	0.00	0.47
	19.33	0.00	1.65	3.63	1.56	0.03	0.24	-	-	1.39	0.00	0.17
	7.26	0.00	0.74	9.61	4.12	0.08	2.67	0.00	0.35	2.46	0.00	0.25
	1.92	0.04	0.19	2.99	1.43	0.02	0.75	0.03	0.08	0.45	0.01	0.04
-	4.38	0.17	0.44	0.43	0.00	0.06	ND	ND	ND	0.96	0.00	0.16
mean	7.60	0.69	0.49	2.54	0.93	0.08	3.69	0.00	0.51	1.34	0.00	0.18
max	19.33	3.98	1.65	9.61	4.12	0.16	7.69	0.03	0.89	2.99	0.01	0.47
min	1.28	0.00	0.05	0.41	0.00	0.00	0.24	0.00	0.08	0.19	0.00	0.00
		July 2015			July 2016							
mg/m²	chlor-a	chlor-b	chlor-c	chlor-a	chlor-b	chlor-c						
	0.28	0.00	0.03	3.31	0.52	0.31						
	0.19	-	-	4.27	0.00	0.76						
	0.92	0.00	0.11	1.39	0.00	0.16						
	0.64	0.00	0.01	2.14	0.00	0.37						
	2.67	0.00	0.31	2.28	0.00	0.32						
	0.79	0.00	0.00	13.24	6.47	0.31						
	2.78	0.00	0.32	2.78	0.13	0.23						
	0.19	-	-	2.24	0.00	0.31						
	4.17	0.00	0.49	3.31	0.12	0.35						
-	1.01	0.00	0.09	2.03	0.20	0.17						
mean	1.36	0.00	0.17	3.70	0.74	0.33						

0.76

0.16

Appendix A.5.–Lower Sherman Creek SP1 chlorophylls *a*, *b*, and *c* density, 2011–2016.

Note: Bolded values are the spectrophotometer estimated detection limit, chlorophyll *a* not detected.

13.24

1.39

6.47

0.00

4.17

0.19

max

min

0.00

0.00

0.49

		July 2011			July 2012			July 2013			July 2014	
mg/m ²	chlor-a	chlor-b	chlor-c									
	3.10	0.00	0.26	1.05	0.04	0.12	1.07	0.00	0.14	0.74	0.00	0.10
	6.30	0.19	0.62	0.64	0.00	0.11	3.84	0.00	0.34	1.38	0.00	0.18
	4.59	0.00	0.38	0.73	0.00	0.07	0.96	0.00	0.15	2.83	0.00	0.15
	0.32	0.00	0.00	0.50	0.07	0.10	4.81	0.00	0.49	3.31	0.00	0.31
	13.88	0.00	0.54	0.34	-	-	5.77	0.00	0.78	0.75	0.00	0.06
	7.37	0.00	0.46	0.51	0.00	0.06	0.32	0.02	0.10	0.85	0.03	0.08
	1.50	0.00	0.09	0.96	0.00	0.16	4.70	0.00	0.44	0.85	0.00	0.01
	14.31	0.00	0.59	0.37	0.00	0.00	3.52	0.00	0.35	1.39	0.00	0.16
	0.85	0.00	0.01	1.28	0.00	0.09	0.53	0.00	0.02	0.43	0.01	0.04
	3.84	0.00	0.25	0.34	-	-	3.20	0.00	0.43	0.69	0.00	0.07
mean	5.61	0.02	0.32	0.67	0.01	0.09	2.87	0.00	0.32	1.32	0.00	0.12
max	14.31	0.19	0.62	1.28	0.07	0.16	5.77	0.02	0.78	3.31	0.03	0.31
min	0.32	0.00	0.00	0.34	0.00	0.00	0.32	0.00	0.02	0.43	0.00	0.01
		July 2015			July 2016							
mg/m²	chlor-a	chlor-b	chlor-c	chlor-a	chlor-b	chlor-c						
	0.69	0.00	0.00	1.50	0.00	0.17						
	0.96	0.00	0.00	2.03	0.00	0.30						
	0.85	0.00	0.11	0.43	0.00	0.13						
	1.28	0.00	0.16	2.98	0.00	0.38						
	2.14	0.00	0.24	0.96	0.00	0.09						
	3.63	0.65	0.43	1.28	0.04	0.26						
	0.96	0.07	0.03	1.71	0.00	0.22						
	2.14	0.78	1.30	1.92	0.35	0.16						
	1.07	0.00	0.14	0.41	0.00	0.08						
	2.46	0.00	0.24	0.96	0.00	0.06						

0.19

0.38

Appendix A.6.–Lower Sherman Creek SP2 chlorophylls *a*, *b*, and *c* density, 2011–2016.

0.06 Note: Bolded values are the spectrophotometer estimated detection limit, chlorophyll a not detected.

1.42

2.98

0.41

0.04

0.35

0.00

0.15

0.78

0.00

1.62

3.63

0.69

mean

max

min

0.27

1.30

APPENDIX B: BENTHIC MACROINVERTEBRATE DATA

11		2				
	5/4/11	5/2/12	4/30/13	4/30/14	4/27/15	4/26/16
Total BMI Taxa	29	32	27	32	26	24
Total EPT Taxa	13	17	16	17	13	11
Total BMI Counted	1,148	1,760	1,200	2,308	1,901	1,894
Ephemeroptera	85	387	400	73	196	225
Plecoptera	70	274	203	352	258	61
Trichoptera	2	8	6	17	6	3
Aquatic Diptera	862	975	503	1,711	1,268	1038
Other	129	116	88	155	173	567
% Ephemeroptera	7%	22%	33%	3%	10%	12%
% Plecoptera	6%	16%	17%	15%	14%	3%
% Trichoptera	0.2%	0.5%	0.5%	0.7%	0.3%	0.2%
% Aquatic Diptera	75%	55%	42%	74%	67%	55%
% Other	11%	7%	7%	7%	9%	30%
% EPT	14%	38%	51%	19%	24%	15%
% Chironomidae	72%	53%	35%	68%	64%	51%
Shannon Diversity Score (H)	0.51	0.69	0.85	0.64	0.70	0.65
Evenness Score (E)	0.48	0.58	0.70	0.52	0.58	0.57
Total Sample Area (m ²)	0.558	0.558	0.465	0.558	0.558	0.558
Mean BMI/m ²	2,057	3,154	2,581	4,136	3,407	3,394
±1 SD	1,046	1,849	551	3,592	2,458	1,667
Terrestrial Invertebrates	0	4	0	1	3	88
Juvenile Fish	1	0	0	1	0	0

Appendix B.1.–Lower Slate Creek BMI data summary, 2011–2016.

11									
	5/4/11	5/2/12	4/30/13	4/30/14	4/27/15	4/26/16			
Total BMI Taxa	21	31	28	29	28	25			
Total EPT Taxa	11	21	18	17	16	15			
Total BMI Counted	280	1,015	1,365	543	1,470	820			
Ephemeroptera	181	634	991	223	956	564			
Plecoptera	41	166	233	150	243	55			
Trichoptera	3	11	10	15	10	10			
Aquatic Diptera	35	175	118	136	215	151			
Other	20	29	13	19	46	40			
% Ephemeroptera	65%	63%	73%	41%	65%	69%			
% Plecoptera	15%	16%	17%	28%	17%	7%			
% Trichoptera	1%	1%	0.7%	3%	0.7%	1%			
% Aquatic Diptera	13%	17%	9%	25%	15%	18%			
% Other	7%	3%	1%	3%	3%	5%			
% EPT	80%	80%	90%	71%	82%	77%			
% Chironomidae	10%	15%	7%	22%	12%	18%			
Shannon Diversity Score (H)	0.63	0.84	0.73	0.91	0.82	0.72			
Evenness Score (E)	0.78	0.71	0.61	0.79	0.71	0.69			
Total Sample Area (m ²)	0.558	0.558	0.558	0.558	0.558	0.558			
Mean BMI/m ²	502	1,819	2,446	973	2,634	1,470			
±1 SD	410	1,009	777	482	1,400	703			
Terrestrial Invertebrates	2	0	0	0	1	7			
Juvenile Fish	0	0	0	0	0	0			

Appendix B.2.-West Fork Slate Creek BMI data summary, 2011–2016.

	5/12/11	4/27/12	4/29/13	4/30/14	4/29/15
Total BMI Taxa	27	33	33	24	28
Total EPT Taxa	15	17	17	9	16
Total BMI Counted	2,616	2,585	5,249	1,143	1,792
Ephemeroptera	387	490	19	9	274
Plecoptera	70	73	45	10	36
Trichoptera	28	23	66	3	14
Aquatic Diptera	507	547	598	454	633

4/25/16

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Appendix B.3.–East Fork Slate Creek BMI data summary, 2011–2016.

Total EPT Taxa	15	17	17	9	16	11
Total BMI Counted	2,616	2,585	5,249	1,143	1,792	1,117
Ephemeroptera	387	490	19	9	274	227
Plecoptera	70	73	45	10	36	42
Trichoptera	28	23	66	3	14	40
Aquatic Diptera	507	547	598	454	633	398
Other	1,624	1,451	4,521	667	835	410
% Ephemeroptera	15%	19%	0.4%	0.8%	15%	20%
% Plecoptera	3%	3%	0.9%	0.9%	2%	4%
% Trichoptera	1%	0.9%	1%	0.3%	0.8%	4%
% Aquatic Diptera	19%	21%	11%	40%	35%	36%
% Other	62%	56%	86%	58%	47%	37%
% EPT	19%	23%	2%	2%	18%	28%
% Chironomidae	17%	15%	10%	35%	28%	26%
Shannon Diversity Score (H)	0.64	0.78	0.57	0.70	0.92	0.92
Evenness Score (E)	0.54	0.61	0.47	0.63	0.72	0.78
Total Sample Area (m ²)	0.558	0.558	0.558	0.558	0.465	0.558
Mean BMI/m ²	4,688	4,633	9,407	2,048	3,854	2,002
±1 SD	1,081	1,325	3,830	952	837	469
Terrestrial Invertebrates	3	1	0	0	5	11
Juvenile Fish	0	0	0	0	0	0

11 11						
	5/12/11	4/27/12	4/29/13	4/28/14	4/29/15	4/25/16
Total BMI Taxa	33	39	34	36	31	28
Total EPT Taxa	18	21	20	20	19	15
Total BMI Counted	1,408	1,259	1,607	1,744	2,107	1,338
Ephemeroptera	368	454	492	622	622	554
Plecoptera	401	349	604	429	758	252
Trichoptera	116	48	55	44	44	104
Aquatic Diptera	248	273	338	518	517	169
Other	275	135	118	131	166	259
% Ephemeroptera	26%	36%	31%	36%	30%	41%
% Plecoptera	29%	28%	38%	25%	36%	19%
% Trichoptera	8.2%	4%	3%	3%	2%	8%
% Aquatic Diptera	18%	22%	21%	30%	25%	13%
% Other	20%	11%	7%	8%	8%	19%
% EPT	63%	68%	72%	63%	68%	68%
% Chironomidae	15%	20%	19%	28%	22%	11%
Shannon Diversity Score (H)	0.97	1.04	1.02	1.03	0.98	1.06
Evenness Score (E)	0.76	0.79	0.78	0.76	0.74	0.82
Total Sample Area (m ²)	0.558	0.558	0.558	0.558	0.558	0.558
Mean BMI/m ²	2,523	2,256	2,880	3,125	3,776	2,398
±1 SD	1,173	1,321	1,049	660	1,174	520
Terrestrial Invertebrates	1	0	0	1	3	6
Juvenile Fish	0	0	0	0	0	0

Appendix B.4.–Upper Slate Creek BMI data summary, 2011–2016.

			•			
	5/3/11	4/26/12	4/29/13	4/29/14	4/28/15	4/27/16
Total BMI Taxa	24	28	34	32	28	32
Total EPT Taxa	14	14	24	21	17	21
Total BMI Counted	2,084	2,214	2,938	1,483	1,556	2,054
Ephemeroptera	962	1,139	1,680	740	917	1160
Plecoptera	114	163	147	217	58	97
Trichoptera	59	118	95	68	137	198
Aquatic Diptera	619	586	799	407	366	476
Other	330	208	217	51	78	123
% Ephemeroptera	46%	51%	57%	50%	59%	56%
% Plecoptera	6%	7%	5%	15%	4%	5%
% Trichoptera	3%	5%	3%	5%	9%	10%
% Aquatic Diptera	30%	27%	27%	27%	24%	23%
% Other	16%	9%	7%	3%	5%	6%
% EPT	55%	64%	65%	69%	71%	71%
% Chironomidae	29%	26%	27%	26%	22%	22%
Shannon Diversity Score (H)	0.76	0.81	0.74	0.74	0.87	0.88
Evenness Score (E)	0.66	0.68	0.59	0.59	0.71	0.70
Total Sample Area (m ²)	0.558	0.558	0.558	0.558	0.558	0.558
Mean BMI/m ²	3,735	3,968	5,265	2,658	2,789	3,681
±1 SD	1,918	2,305	2,512	2,017	858	1,025
Terrestrial Invertebrates	1	1	1	4	1	2
Juvenile Fish	0	0	0	0	0	0

Appendix B.5.–Upper Johnson Creek BMI data summary, 2011–2016.

11			•			
	5/4/11	4/30/12	5/1/13	4/29/14	4/28/15	4/27/16
Total BMI Taxa	26	31	28	30	26	26
Total EPT Taxa	15	18	16	13	13	13
Total BMI Counted	624	1,525	1,002	1,687	921	3,816
Ephemeroptera	157	876	499	114	175	101
Plecoptera	36	103	135	97	67	41
Trichoptera	7.0	14	6	18	6	9
Aquatic Diptera	89	160	131	648	326	273
Other	335	372	231	810	347	3,392
% Ephemeroptera	25%	58%	50%	7%	19%	3%
% Plecoptera	6%	7%	13%	6%	7%	1%
% Trichoptera	1%	0.9%	0.6%	1%	1%	0.2%
% Aquatic Diptera	14%	11%	13%	38%	35%	7%
% Other	54%	24%	23%	48%	38%	89%
% EPT	32%	66%	64%	14%	27%	4%
% Chironomidae	6%	8%	12%	33%	33%	7%
Shannon Diversity Score (H)	0.76	0.74	0.85	0.71	0.84	0.32
Evenness Score (E)	0.71	0.62	0.71	0.57	0.70	0.27
Total Sample Area (m ²)	0.558	0.558	0.558	0.558	0.558	0.558
Mean BMI/m ²	1,118	2,733	1,796	3,023	1,651	6,839
±1 SD	1,000	1,410	247	936	718	1,398
Terrestrial Invertebrates	1	0	14	1	14	21
Juvenile Fish	10	12	0	8	0	77

Appendix B.6.–Lower Sherman Creek SP1 BMI data summary, 2011–2016.

11			•			
	5/3/11	4/30/12	4/30/13	4/29/14	4/28/15	4/27/16
Total BMI Taxa	30	36	39	28	23	23
Total EPT Taxa	17	26	25	16	13	13
Total BMI Counted	921	1,573	1,889	661	898	1,045
Ephemeroptera	548	1,143	1,049	31	163	84
Plecoptera	137	77	299	40	47	32
Trichoptera	14	26	18	7	13	10
Aquatic Diptera	143	254	289	354	315	224
Other	79	75	234	229	360	695
% Ephemeroptera	60%	73%	56%	5%	18%	8%
% Plecoptera	15%	5%	16%	6%	5%	3%
% Trichoptera	2%	2%	1%	1%	1%	1%
% Aquatic Diptera	16%	16%	15%	54%	35%	21%
% Other	8.6%	4.8%	12%	35%	40%	67%
% EPT	76%	79%	72%	12%	25%	12%
% Chironomidae	11%	15%	14%	48%	33%	20%
Shannon Diversity Score (H)	0.93	0.70	0.84	0.70	0.77	0.53
Evenness Score (E)	0.76	0.57	0.65	0.62	0.66	0.49
Total Sample Area (m ²)	0.558	0.558	0.558	0.558	0.558	0.558
Mean BMI/m ²	1,651	2,823	3,385	1,185	1,609	1,873
±1 SD	927	1,174	1,471	769	748	982
Terrestrial Invertebrates	1	2	18	1	10	4
Juvenile Fish	0	0	14	0	0	6

Appendix B.7.–Lower Sherman Creek SP2 BMI data summary, 2011–2016.

APPENDIX C: RESIDENT FISH DATA

Sample	_	Numb	er of Fisł	n Capture	ed	Population			
Date	FL (mm)	Set 1	Set 2	Set 3	Total	Estimate	95% CI	Precision	Power
9/1/2011	105-140	6	2	2	10	40			
8/1/2012	165-175	2	1	2	5	20			
8/27/2013		0	0	0	0	0			
8/20/2014		0	0	0	0	0			
8/17/2015		0	0	0	0	0			
8/8/2016		0	0	0	0	0			

Appendix C.1.–East Fork Slate Creek Dolly Varden char population, 2011–2016.

Appendix C.2.–Upper Slate Creek Dolly Varden char population, 2011–2016.

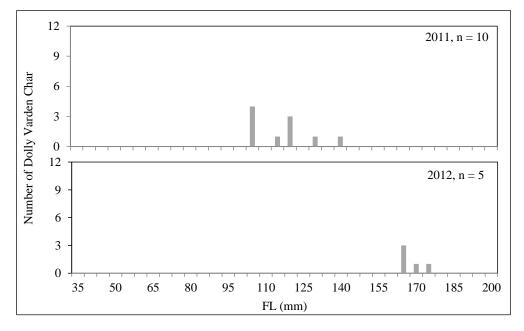
Sample		Numb	er of Fisł	n Capture	ed	Population			
Date	FL (mm)	Set 1	Set 2	Set 3	Total	Estimate	95% CI	Precision	Power
8/10/2011	35-145	14	12	2	28	120	104-136	13%	
8/2/2012	60-164	23	14	6	43	192	160-224	17%	44%
8/28/2013	35-190	21	7	2	30	120	120-120		
8/21/2014	55-160	13	4	6	23	108	76-140	30%	0.03%
8/20/2015	56-154	10	9	6	25	136	76-196	44%	0.10%
8/10/2016	33-135	18	7	9	34	168	120-216	29%	0.55%

	Habitat	Numb	er of Fis	h Captu	red	Population	
Year	Type	Set 1	Set 2	Set 3	Total	Estimate	95% CI
2011	Riffle	3	0	0	3	12	
2011	Pool	3	1	2	6	24	
2011	Glide	0	1	0	1	4	
2012	Riffle	0	0	1	1	4	
2012	Pool	2	1	1	4	16	
2012	Glide	0	0	0	0	0	
2013	Riffle	0	0	0	0	0	
2013	Pool	0	0	0	0	0	
2013	Glide	0	0	0	0	0	
2014	Riffle	0	0	0	0	0	
2014	Pool	0	0	0	0	0	
2014	Glide	0	0	0	0	0	
2015	Riffle	0	0	0	0	0	
2015	Pool	0	0	0	0	0	
2015	Glide	0	0	0	0	0	
2016	Riffle	0	0	0	0	0	
2016	Pool	0	0	0	0	0	
2016	Glide	0	0	0	0	0	

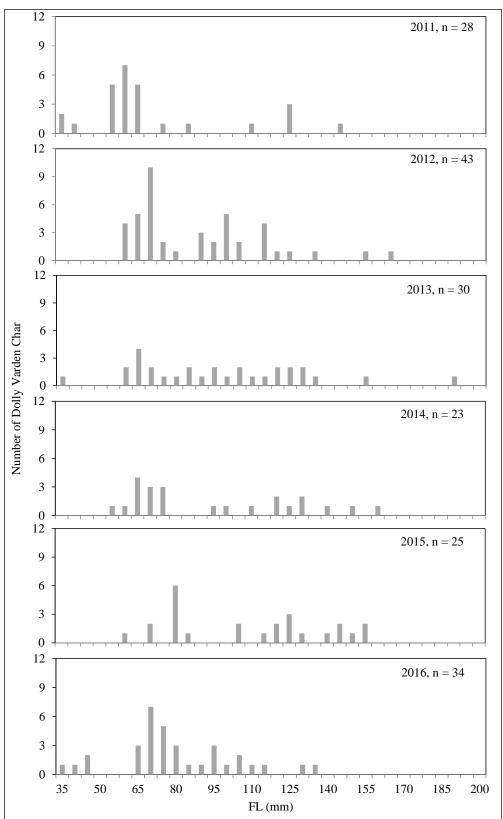
Appendix C.3.–East Fork Slate Creek Dolly Varden char capture data and population by habitat type, 2011–2016.

Appendix C.4.–Upper Slate Creek Dolly Varden char capture data and population by habitat type, 2011–2016.

	Habitat	Nı	umber of	Fish Ca	ptured	Population	
Year	Type	Set 1	Set 2	Set 3	Total	Estimate	95% CI
2011	Riffle	2	2	0	4	16	
2011	Pool	11	9	1	22	88	76-100
2011	Glide	1	1	1	3	12	
2012	Riffle	2	4	4	10	40	
2012	Pool	20	3	2	25	100	100-100
2012	Glide	1	7	0	8	32	
2013	Riffle	4	1	0	5	20	
2013	Pool	17	5	1	23	92	92-92
2013	Glide	0	1	1	2	8	
2014	Riffle	3	0	2	5	20	
2014	Pool	10	4	4	18	80	64-96
2014	Glide	0	0	0	0	0	
2015	Riffle	1	2	0	3	12	
2015	Pool	9	7	5	21	108	64-152
2015	Glide	0	0	1	1	4	
2016	Riffle	1	0	2	3	12	
2016	Pool	15	7	7	29	140	100-180
2016	Glide	2	0	0	2	8	



Appendix C.5.–Length frequency diagram of Dolly Varden char captured in East Fork Slate Creek, 2011–2012.



Appendix C.6.–Length frequency diagram of Dolly Varden char captured in Upper Slate Creek, 2011–2016.

Condition			
Factor	Weight (g)	FL (mm)	Pass No.
1.0	4.5	76	1
ND	1.5	33	1
1.2	13.9	104	1
1.1	14.5	110	1
1.0	10.6	101	1
1.0	15	114	1
1.4	3.5	63	1
1.2	3.9	69	1
1.3	6.7	80	1
1.2	5.8	79	1
1.3	3.8	66	1
1.1	7.8	90	1
1.2	3.9	69	1
1.1	3.9	71	1
1.1	3.5	69	1
0.9	4.8	82	1
1.1	3.2	66	1
1.1	4.8	75	1
1.9	1.6	44	2
1.0	8	94	2
1.0	9.1	97	2
0.8	6.4	93	2
1.1	26.8	135	2
1.2	2.8	62	2
1.4	3.6	64	2
1.3	4.7	71	3
1.0	20.4	126	3
1.2	3.8	68	3
1.1	4.5	75	3 3 3
1.6	1.4	44	3
ND	1.7	37	3
1.2	9.1	91	3
1.4	4.7	69	3
1.3	4.8	72	3

Appendix C.7.–Length, weight, and condition data for Dolly Varden char captured in Upper Slate Creek, 2016.

Appendix C.8.–Mean Dolly Varden char condition factor by sample reach, 2011–2016.

Site	2011	2012	2013	2014	2015	2016
East Fork Slate Creek	1.1	1.1	ND	ND	ND	ND
Upper Slate Creek	1.1	1.0	1.0	1.0	0.9	1.2

APPENDIX D: ADULT SALMON DATA

		7/19	9/2016			7/2	6/2016			8/2/2016			
Stream Reach	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass	
0-100 m	0	0	0	0	0	0	0	0	0	0	0	0	
100-200 m	0	0	0	0	0	0	0	0	0	0	0	0	
200-300 m	0	0	0	0	0	0	0	0	0	0	0	0	
300-400 m	0	0	0	0	0	0	0	0	0	0	0	0	
400-500 m	0	0	0	0	0	0	0	0	0	0	0	0	
500-600 m	0	0	0	0	0	0	0	0	0	0	0	0	
600-700 m	0	0	0	0	0	0	0	0	2	0	1	0	
700-800 m	0	0	0	0	0	0	0	0	0	0	0	0	
800-900 m	0	0	0	0	0	0	0	0	0	0	0	0	
900-Falls	ND	ND	ND	ND	0	0	0	0	0	0	0	0	
Total	0	0	0	0	0	0	0	0	2	0	1	0	

Appendix D.12016 Lower Slate Creek weekly adult pink salmon count by reach	ι.
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		8/9/2016				8/16/2016				8/23/2016			
Stream Reach	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass	
0-100 m	0	0	0	0	10	8	9	0	2	2	2	0	
100-200 m	0	0	0	0	40	40	40	0	10	10	10	0	
200-300 m	0	0	0	0	10	10	10	0	0	0	0	1	
300-400 m	0	0	0	0	0	0	0	0	0	0	0	0	
400-500 m	0	0	0	0	4	4	4	0	0	0	0	0	
500-600 m	0	0	0	0	1	1	1	0	0	0	0	0	
600-700 m	0	0	0	0	0	0	0	0	0	0	0	0	
700-800 m	0	0	0	0	0	0	0	0	0	0	0	0	
800-900 m	0	0	0	0	0	1	0	0	0	0	0	0	
900-Falls	0	0	0	0	0	0	0	0	0	0	0	0	
Total	0	0	0	0	65	64	64	0	12	12	12	1	

		8/29/2016									
Stream Reach	Obs.1	Obs.2	Mean	Carcass							
0-100 m	0	0	0	0							
100-200 m	2	2	2	0							
200-300 m	0	0	0	0							
300-400 m	0	0	0	0							
400-500 m	0	0	0	0							
500-600 m	ND	ND	ND	ND							
600-700 m	ND	ND	ND	ND							
700-800 m	ND	ND	ND	ND							
800-900 m	ND	ND	ND	ND							
900-Falls	ND	ND	ND	ND							
Total	2	2	2	0							

		7/19	9/2016			7/2	5/2016			8/2/2016			
Stream Reach	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass	
0-100 m	0	0	0	0	0	0	0	0	0	0	0	0	
100-200 m	0	0	0	0	0	0	0	0	0	0	0	0	
200-300 m	0	0	0	0	0	0	0	0	0	0	0	0	
300-400 m	0	0	0	0	0	0	0	0	0	0	0	0	
400-500 m	0	0	0	0	0	0	0	0	0	0	0	0	
500-600 m	0	0	0	0	0	0	0	0	0	0	0	0	
600-700 m	0	0	0	0	0	0	0	0	3	4	3	0	
700-800 m	0	0	0	0	0	0	0	0	2	0	1	0	
800-900 m	0	0	0	0	0	0	0	0	0	0	0	0	
900-Falls	ND	ND	ND	ND	0	0	0	0	0	0	0	0	
Total	0	0	0	0	0	0	0	0	5	4	4	0	

Appendix D.2.–2016 Lower Slate Creek weekly adult chum salmon count by reach.

		8/9	/2016			8/1	6/2016			8/23	8/2016	
Stream Reach	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass
0-100 m	5	5	5	0	5	6	5	0	0	0	0	0
100-200 m	2	2	2	0	5	6	5	0	9	9	9	0
200-300 m	0	0	0	0	0	0	0	0	6	6	6	0
300-400 m	0	0	0	0	0	0	0	0	5	5	5	0
400-500 m	2	5	3	0	0	0	0	0	0	0	0	0
500-600 m	0	0	0	0	0	0	0	0	0	0	0	0
600-700 m	1	0	0	0	0	0	0	0	0	0	0	0
700-800 m	0	0	0	0	0	0	0	0	0	0	0	0
800-900 m	0	0	0	0	0	0	0	0	0	0	0	0
900-Falls	0	0	0	0	0	0	0	0	0	0	0	0
Total	10	12	10	0	10	12	10	0	20	20	20	0

		8/29	9/2016	
Stream Reach	Obs.1	Obs.2	Mean	Carcass
0-100 m	0	0	0	0
100-200 m	1	1	1	0
200-300 m	0	0	0	0
300-400 m	0	0	0	0
400-500 m	0	0	0	0
500-600 m	ND	ND	ND	ND
600-700 m	ND	ND	ND	ND
700-800 m	ND	ND	ND	ND
800-900 m	ND	ND	ND	ND
900-Falls	ND	ND	ND	ND
Total	1	1	1	0

	9/2	8/2016	10/	5/2016	10/1	2/2016	10/2	20/2016	10/2	26/2016
Stream Reach	Obs.	Carcass								
0-100 m	0	0	0	0	0	0	0	0	0	0
100-200 m	0	0	0	0	0	0	0	0	0	0
200-300 m	0	0	0	0	0	0	0	0	0	0
300-400 m	0	0	0	0	0	0	0	0	0	0
400-500 m	0	0	0	0	0	0	2	0	0	0
500-600 m	0	0	0	0	0	0	0	0	0	0
600-700 m	0	0	0	0	0	0	0	0	0	0
700-800 m	0	0	0	0	0	0	0	0	0	0
800-900 m	0	0	0	0	0	0	0	0	0	0
900-Falls	0	0	0	0	ND	ND	0	0	0	0
Total	0	0	0	0	0	0	2	0	0	0

Appendix D.3.–2016 Lower Slate Creek weekly adult coho salmon count by reach.

		7/18/	2016			7/25/	/2016			8/1/2	2016	
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	0	0	0	0
JM-Trap Site	0	0	0	0	0	0	0	0	0	0	0	0
Trap-Site #4	0	0	0	0	2	0	1	0	100	50	75	0
Site #4-Site #7	0	0	0	0	3	2	2	0	60	80	70	0
Site #7-Site #10	0	0	0	0	0	0	0	0	11	3	7	0
Site #10-PH	0	0	0	0	0	6	3	0	0	4	2	0
PH-LF	0	0	0	0	0	0	0	0	0	0	0	0
LF-Site #15	0	0	0	0	0	0	0	0	0	0	0	0
Site #15-Falls	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	5	8	6	0	171	137	154	0
		8/8/2	2016		8/15/2016					8/22/	2016	
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	0	0	0	0
JM-Trap Site	0	10	5	0	1	0	0	0	0	0	0	0
Trap-Site #4	0	100	50	0	0	0	0	0	68	68	68	0
Site #4-Site #7	46	70	58	0	5	10	7	0	27	27	27	2
Site #7-Site #10	2	0	1	0	1	11	6	0	0	0	0	4
Site #10-PH	0	0	0	0	0	5	2	0	0	0	0	0
PH-LF	0	0	0	0	0	0	0	0	0	0	0	0
LF-Site #15	13	10	11	0	0	0	0	0	0	0	0	0
Site #15-Falls	0	0	0	0	0	0	0	0	0	0	0	0
Total	61	190	125	0	7	26	15	0	95	95	95	6

Appendix D.4.–2016 Lower Johnson Creek weekly adult pink salmon count by reach.

		8/29/	2016	
Stream Reach	Obs.1	Obs.2	Mean	Carcass
Con-Lace	0	0	0	0
Lace-JM	0	0	0	0
JM-Trap Site	0	0	0	0
Trap-Site #4	30	20	25	0
Site #4-Site #7	0	0	0	0
Site #7-Site #10	3	13	8	0
Site #10-PH	0	0	0	0
PH-LF	0	0	0	0
LF-Site #15	0	0	0	0
Site #15-Falls	0	0	0	0
Total	33	33	33	0

		7/18	8/2016			7/25/	2016			8/1/2	2016	
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	0	0	0	0
JM-Trap Site	0	0	0	0	0	0	0	0	0	0	0	0
Trap-Site #4	0	0	0	0	0	1	0	0	0	0	0	0
Site #4-Site #7	0	0	0	0	0	8	4	0	2	2	2	0
Site #7-Site #10	0	0	0	0	7	0	3	0	0	0	0	0
Site #10-PH	0	0	0	0	0	0	0	0	0	0	0	0
PH-LF	0	0	0	0	0	0	0	0	0	0	0	0
LF-Site #15	0	0	0	0	0	0	0	0	0	0	0	0
Site #15-Falls	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	7	9	7	0	2	2	2	0
		0/0	12016		1	0/15	2017			9/22	2016	
	01 1		/2016	a	01 1		2016	a	01 1		2016	G
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	0	0	0	0
JM-Trap Site	0	0	0	0	7	5	6	0	0	0	0	0
Trap-Site #4	4	2	3	0	1	0	0	0	0	0	0	0
Site #4-Site #7	2	0	1	2	10	3	6	0	0	0	0	0
Site #7-Site #10	0	0	0	0	6	10	8	0	0	0	0	0
Site #10-PH	0	0	0	0	0	0	0	0	0	0	0	0
PH-LF	0	0	0	0	0	0	0	0	0	0	0	0
	1				1							

Appendix D.5.–2016 Lower Johnson Creek weekly adult chum salmon count by reach.

		8/29	0/2016	
Stream Reach	Obs.1	Obs.2	Mean	Carcass
Con-Lace	0	0	0	0
Lace-JM	0	0	0	0
JM-Trap Site	0	0	0	0
Trap-Site #4	0	0	0	0
Site #4-Site #7	5	3	4	0
Site #7-Site #10	5	0	2	0
Site #10-PH	0	0	0	0
PH-LF	0	0	0	0
LF-Site #15	0	0	0	0
Site #15-Falls	0	0	0	0
Total	10	3	6	0

LF-Site #15

Total

Site #15-Falls

	9/2	8/2016	10/	5/2016	10/1	2/2016	10/2	20/2016	10/2	26/2016
Stream Reach	Obs.	Carcass								
Con-Lace	ND	ND	ND	ND	0	0	ND	ND	ND	ND
Lace-JM	ND	ND	ND	ND	0	0	ND	ND	ND	ND
JM-Trap Site	1	0	0	0	0	0	0	0	0	0
Trap-Site #4	0	0	0	0	0	0	1	0	1	0
Site #4-Site #7	0	0	0	0	0	0	3	0	1	0
Site #7-Site #10	0	0	0	0	0	0	1	0	1	0
Site #10-PH	1	0	0	0	0	0	5	0	7	0
PH-LF	0	0	0	0	0	0	0	0	0	0
LF-Site #15	0	0	0	0	0	0	2	0	0	1
Site #15-Falls	0	0	0	0	0	0	0	0	0	0
Total	2	0	0	0	0	0	12	0	10	1

Appendix D.6.–2016 Lower Johnson Creek weekly adult coho salmon count by reach.

		7/19	9/2016			7/25	5/2016		8/2/2016				
Stream Reach	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass	
0-50 m	0	0	0	0	0	0	0	0	0	0	0	0	
50-100 m	0	0	0	0	0	0	0	0	0	0	0	0	
100-150 m	0	0	0	0	0	0	0	0	0	0	0	0	
150-200 m	0	0	0	0	0	0	0	0	0	0	0	0	
200-250 m	0	0	0	0	0	0	0	0	0	0	0	0	
250-300 m	0	0	0	0	0	0	0	0	0	0	0	0	
300-350 m	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	0	0	0	0	0	0	0	0	0	0	0	0	

Appendix D.7.–2016 Lower Sherman Creek weekly adult pink salmon count by reach.

		8/9/2	2016			8/15/	2016			8/22	2/2016	
Stream Reach	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass
0-50 m	0	0	0	0	0	0	0	0	0	0	0	0
50-100 m	0	0	0	0	0	0	0	0	9	8	8	0
100-150 m	0	0	0	0	0	0	0	0	1	3	2	0
150-200 m	0	0	0	0	ND	ND	ND	ND	6	7	6	0
200-250 m	0	0	0	0	ND	ND	ND	ND	2	2	2	0
250-300 m	0	0	0	0	ND	ND	ND	ND	3	3	3	0
300-350 m	0	0	0	0	ND	ND	ND	ND	3	3	3	0
350-Falls	0	0	0	0	ND	ND	ND	ND	0	0	0	0
Total	0	0	0	0	0	0	0	0	24	26	24	0

		8/29/2016									
Stream Reach	Obs.1	Obs.2	Mean	Carcass							
0-50 m	0	0	0	0							
50-100 m	0	0	0	0							
100-150 m	0	4	2	0							
150-200 m	0	0	0	0							
200-250 m	0	0	0	0							
250-300 m	0	0	0	0							
300-350 m	0	0	0	0							
350-Falls	0	0	0	0							
Total	0	4	2	0							

		7/19	9/2016			7/25	5/2016		8/2/2016				
Stream Reach	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass	
0-50 m	0	0	0	0	0	0	0	0	0	0	0	0	
50-100 m	0	0	0	0	0	0	0	0	0	0	0	0	
100-150 m	0	0	0	0	0	0	0	0	0	0	0	0	
150-200 m	0	0	0	0	0	0	0	0	0	0	0	0	
200-250 m	0	0	0	0	0	0	0	0	0	0	0	0	
250-300 m	0	0	0	0	0	0	0	0	0	0	0	0	
300-350 m	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	0	0	0	0	0	0	0	0	0	0	0	0	

Appendix D.8.–2016 Lower Sherman Creek weekly adult chum salmon count by reach.

	8/9/2016			8/15/2016			8/22/2016					
Stream Reach	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass	Obs.1	Obs.2	Mean	Carcass
0-50 m	0	0	0	0	0	0	0	0	0	0	0	0
50-100 m	0	0	0	0	0	0	0	0	0	0	0	0
100-150 m	0	0	0	0	0	0	0	0	0	0	0	0
150-200 m	0	0	0	0	ND	ND	ND	ND	2	2	2	0
200-250 m	0	0	0	0	ND	ND	ND	ND	0	0	0	0
250-300 m	0	0	0	0	ND	ND	ND	ND	0	0	0	0
300-350 m	0	0	0	0	ND	ND	ND	ND	4	3	3	0
350-Falls	0	0	0	0	ND	ND	ND	ND	0	0	0	0
Total	0	0	0	0	0	0	0	0	6	5	5	0

	8/29/2016					
Stream Reach	Obs.1	Obs.2	Mean	Carcass		
0-50 m	0	0	0	0		
50-100 m	0	0	0	0		
100-150 m	0	0	0	0		
150-200 m	0	0	0	0		
200-250 m	0	0	0	0		
250-300 m	0	0	0	0		
300-350 m	0	0	0	0		
350-Falls	0	0	0	0		
Total	0	0	0	0		

Statistical						
Week No.	2011	2012	2013	2014	2015	2016
29	ND	0	0	0	ND	ND
30	ND	0	7	0	12	0
31	0	364	66	2	487	0
32	371	1,106	604	14	1,769	1
33	765	3,152	864	13	1,783	0
34	1,396	2,331	1,199	12	1,543	64
35	1,649	318	472	0	850	12
36	1,816	1	97	ND	527	2
37	232	0	27	ND	575	ND
38	46	ND	1	ND	32	ND
39	0	ND	ND	ND	2	ND

Appendix D.9.-Lower Slate Creek adult pink salmon count by statistical week, 2011-2016.

Appendix D.10.–Lower Johnson Creek adult pink salmon count by statistical week, 2011–2016.

Statistical						
Week No.	2011	2012	2013	2014	2015	2016
29	ND	0	59	ND	ND	ND
30	1	73	200	44	4,512	0
31	181	411	2,250	48	568	6
32	1,893	753	1,456	84	17,517	154
33	3,850	1,698	1,873	2	19,028	125
34	5,264	1,816	1,557	11	5,444	15
35	1,352	198	545	0	2,057	95
36	3,713	60	149	0	1,238	33
37	672	7	97	ND	702	ND
38	438	0	ND	ND	249	ND
39	145	ND	ND	ND	10	ND

Appendix D.11.–Lower Sherman Creek adult pink salmon count by statistical week, 2011–2016.

Statistical						_
Week No.	2011	2012	2013	2014	2015	2016
29	ND	0	2	ND	ND	ND
30	1	2	164	0	120	0
31	301	9	860	6	38	0
32	774	97	979	40	348	0
33	1,051	285	765	10	723	0
34	399	521	549	4	334	0
35	159	521	785	10	0	24
36	873	145	624	0	413	2
37	418	25	232	ND	648	ND
38	612	3	21	ND	159	ND
39	36	ND	ND	ND	15	ND

APPENDIX E: SPAWNING SUBSTRATE DATA

Sample	Sample		Volu	me (mL/I	L) Retain	ed Each	Sieve (m	n)			
Date	No.	101.6	50.8	25.4	12.7	6.35	1.68	0.42	0.15	Imhoff	GMPS
08/17/11	1	0	0	470	260	340	425	225	20	22.0	9.8
08/17/11	2	0	70	460	250	200	280	100	25	8.0	14.0
08/17/11	3	525	280	240	210	290	440	100	70	20.5	12.2
08/17/11	4	0	0	250	340	495	1425	525	55	68.0	5.2
07/09/12	1	1,050	140	140	280	190	395	95	15	24.0	10.6
07/09/12	2	0	0	200	225	140	325	140	15	24.0	8.2
07/09/12	3	0	515	310	225	250	580	240	27	65.0	12.8
07/09/12	4	0	570	510	260	290	750	435	53	54.0	11.8
07/02/13	1	0	400	460	430	320	365	145	25	66.0	15.4
07/02/13	2	0	150	400	250	245	515	225	36	53.0	9.8
07/02/13	3	0	800	325	320	255	445	205	25	60.0	18.0
07/02/13	4	0	275	565	385	245	495	250	19	28.0	13.5
07/01/14	1	600	420	375	225	235	320	165	22	57.0	15.5
07/01/14	2	0	50	350	300	175	225	25	7.5	41.0	14.0
07/01/14	3	0	100	510	465	275	420	250	38	52.0	11.0
07/01/14	4	400	275	260	220	225	375	225	19	51.0	11.2
07/06/15	1	0	75	300	350	325	350	325	70	42.0	8.2
07/06/15	2	0	225	350	400	325	525	300	24	20.5	10.8
07/06/15	3	0	150	475	150	150	200	50	6	6.5	19.6
07/06/15	4	0	275	400	225	275	375	150	16	17.0	14.6
07/05/16	1	0	175	600	300	375	625	100	25	34.0	12.8
07/05/16	2	0	500	375	375	300	700	100	50	26.0	14.6
07/05/16	3	0	275	300	475	725	500	100	25	15.0	12.9
07/05/16	4	0	100	725	250	300	500	125	25	15.0	13.9

Appendix E.1.–Lower Slate Creek SP1 pink salmon spawning substrate data, 2011–2016.

Note: GMPS = Geometric mean particle size.

Sample	Sample		Volu	me (mL/I	L) Retain	ed Each S	Sieve (mr	n)			
Date	No.	101.6	50.8	25.4	12.7	6.35	1.68	0.42	0.15	Imhoff	GMPS
08/17/11	1	1050	130	305	210	205	350	200	20	11.5	11.0
08/17/11	2	0	120	320	405	335	740	415	85	53.0	7.3
08/17/11	3	0	400	350	295	290	540	200	40	17.5	13.4
08/17/11	4	0	100	450	580	320	390	160	15	25.0	12.8
07/09/12	1	0	250	380	270	260	475	195	23	46.5	11.8
07/09/12	2	600	75	395	295	180	375	135	15	18.5	12.0
07/09/12	3	0	450	340	370	340	590	295	30	18.0	12.8
07/09/12	4	0	0	320	460	285	545	300	28	16.5	8.3
07/02/13	1	0	310	490	440	505	640	410	35	107.5	9.8
07/02/13	2	0	420	270	240	215	560	150	34	42.0	13.1
07/02/13	3	0	550	885	375	290	570	290	45	107.8	15.0
07/02/13	4	0	785	230	340	240	580	330	30	46.5	14.8
07/01/14	1	0	1225	450	495	305	760	300	12	110.0	17.7
07/01/14	2	0	450	250	250	200	300	100	11	65.0	16.5
07/01/14	3	0	850	480	200	175	490	175	30	106.0	18.4
07/01/14	4	0	150	350	200	225	300	120	15	20.0	13.3
07/06/15	1	0	75	175	325	425	475	50	6	5.5	10.7
07/06/15	2	500	825	225	225	175	250	50	11	8.0	28.9
07/06/15	3	300	225	500	200	175	300	50	15	21.5	18.1
07/06/15	4	275	100	200	200	150	225	100	22	9.0	12.2
07/05/16	1	0	300	275	400	350	525	100	25	26.0	13.1
07/05/16	2	0	0	200	600	575	550	150	25	30.0	9.0
07/05/16	3	0	0	100	1150	450	650	100	25	26.0	10.1
07/05/16	4	125	275	575	525	450	475	150	25	39.0	14.3

Appendix E.2.–Lower Slate Creek SP2 pink salmon spawning substrate data, 2011–2016.

Note: GMPS = Geometric mean particle size.

APPENDIX F: SEDIMENT DATA AND LAB REPORTS

		Particle Si	ize Data					
				% Coarse		% Total	Total	% Total
Sample				material	% Total	Volatile	Sulfide	Organic
Date	% Clay	% Silt	% Sand	(> 2 mm)	Solids	Solids	(mg/kg)	Carbon
Lower Slate Creek								
10/03/11	2.0	4.0	94.0	0.4	78.00	3.38	ND	2.04
07/03/12	2.0	0.0	98.0	0.1	79.22	3.37	ND	1.67
07/02/13	2.0	2.0	96.0	0.0	74.57	1.63	ND	1.67
07/28/14	2.3	3.8	91.8	0.9	75.3	3.28	<1.3	0.58
07/06/15	1.8	3.1	72.2	22.8	83.5	ND	<1.2	0.473
07/05/16	0.0	23.1	55.1	21.8	70.3	7.70	<2.5	0.585
East Fork Slate Cree	ek							
10/03/11	10.0	4.0	86.0	1.7	60.17	7.81	ND	11.00
07/10/12	40.0	34.0	26.0	0.0	23.72	28.54	ND	16.70
07/01/13	6.0	12.0	82.0	0.0	43.66	13.30	ND	18.30
07/30/14	3.8	21.1	75.0	0.1	65.5	6.21	<1.5	1.84
07/07/15	2.3	6.9	82.3	8.5	76.2	ND	<1.3	0.792
07/06/16	3.5	24.8	53.7	18.0	21.0	31.40	< 6.8	13.0
Upper Slate Creek								
10/06/11	4.0	2.0	94.0	0.0	72.10	4.12	ND	5.46
07/02/12	2.0	0.0	98.0	0.3	79.58	2.90	ND	3.74
07/01/13	4.0	0.0	96.0	0.2	74.21	2.73	ND	5.50
07/30/14	4.3	8.2	87.5	0.0	72.4	3.88	<1.4	0.87
07/07/15	1.5	0.2	31.9	66.3	76.5	ND	<1.3	1.04
07/06/16	0.0	2.9	73.1	24.0	62.9	5.00	<2.2	2.14
Lower Johnson Cree	ek							
10/03/11	2.0	2.0	96.0	0.0	74.28	2.01	ND	0.89
07/02/12	8.0	0.0	92.0	0.0	77.67	2.55	ND	1.19
07/01/13	2.0	2.0	96.0	0.3	73.21	0.90	ND	1.08
07/30/14	2.9	4.8	91.4	0.2	73.7	1.93	<1.4	0.26
07/06/15	0.4	1.1	41.9	56.6	80.0	ND	<1.3	0.376
08/08/16	5.1	28.1	66.8	0.0	71.9	2.40	<2.5	0.422
Lower Sherman Cre	ek							
10/04/11	2.0	2.0	96.0	0.1	73.15	2.75	ND	0.54
07/03/12	4.0	0.0	96.0	0.1	78.55	3.05	ND	0.82
07/01/13	2.0	2.0	96.0	0.6	75.66	0.75	ND	0.61
07/28/14	3.4	6.5	89.9	0.3	76.7	2.50	<1.3	0.35
07/07/15	1.8	3.0	86.1	9.0	76.2	ND	<1.3	0.399
07/06/16	0.1	0.9	71.19	27.8	80.5	3.10	<2.4	0.322

Appendix F.1.–Sediment sample compositions, 2011–2016.

Sample				Con	centration	n (mg/kg	dry weigh	t)			
Date	Ag	Al	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
Lower Slate Creek											
10/03/11	0.134	13,600	16.2	1.46	29.4	56.7	0.0502	47.4	7.79	0.720	220
07/03/12	0.145	13,600	9.31	1.22	32.0	50.7	0.0994	43.2	8.45	< 0.170	200
07/02/13	0.168	12,300	23.7	1.29	94.5	56.7	0.0402	73.4	9.14	1.94	205
07/28/14	0.08	12,000	20.1	1.21	20.0	51.1	0.06	40.8	8.78	1.3	189
07/06/15	0.07	12,000	14.9	0.53	18.9	39.1	0.04	30.0	6.86	0.7	131
07/05/16	0.079	12,800	17.0	0.735	20.4	39.8	0.057	35.2	7.16	1.3	173
East Fork Slate Cre	ek										
10/03/11	0.233	20,100	30.0	20.9	29.5	88.4	0.0692	143	8.50	1.41	1,360
07/10/12	0.513	15,300	24.0	23.2	38.9	159.0	0.3270	153	14.2	0.934	1,490
07/01/13	0.334	13,900	42.2	13.9	32.7	73.4	0.0774	79.8	12.5	4.79	844
07/30/14	0.14	13,300	39.1	12.1	14.6	55.7	0.04	85.3	6.94	2.4	812
07/07/15	0.12	12,300	22.3	5.87	15.1	46.7	0.05	46.8	4.48	1.7	333
07/06/16	0.190	16,500	51.5	8.20	16.5	59.5	0.109	86.1	5.54	3.1	634
Upper Slate Creek											
10/06/11	0.120	22,500	17.9	0.722	127	53.4	<0.0489	87.5	3.37	0.809	130
07/02/12	0.132	20,300	14.4	0.776	125	55.4	0.0625	78.4	4.05	0.606	134
07/01/13	0.131	14,600	13.5	0.750	101		< 0.0380	55.0	2.70	3.21	105
07/30/14	0.06	14,900	19.2	0.69	84.2	45.8	0.03	55.7	2.86	1.8	111
07/07/15	0.08	14,500	14.2	0.76	92.2	47.0	0.11	54.0	3.17	2.3	109
07/06/16	0.092	14,000	18.0	0.507	71.7	37.0	0.051	48.5	2.69	2.1	111
Lower Johnson Cre	ek										
10/03/11	0.164	13,100	16.2	0.238	31.5		< 0.0386	27.3	9.76	< 0.181	93.3
07/02/12	0.342	13,100	12.8	0.250	35.5	76.8	0.119	23.4	9.45	< 0.167	97.3
07/01/13	0.269	10,300	11.9	0.492	24.4		< 0.0354	15.7	8.00	< 0.163	121
07/30/14	0.32	10,300	16.5	0.16	22.2	68.2	0.02	16.9	10.9	< 0.5	83.4
07/06/15	0.16	10,900	12.5	0.15	18.1	71.1	< 0.02	17.7	8.04	< 0.8	79.7
08/08/16	0.574	9,470	13.0	0.150	18.9	76.3	0.020	15.1	8.41	< 0.57	65.7
Lower Sherman Cre	eek										
10/04/11	0.137	18,200	28.9	0.389	46.2		< 0.0455	45.9	6.70	< 0.178	110
07/03/12	0.289	17,900	24.3	0.578	51.4	79.1	0.0681	40.2	8.43	< 0.174	128
07/01/13	0.306	15,400	25.4	0.390	37.4		< 0.0384	30.9	7.39	1.77	111
07/28/14	0.14	14,900	27.9	0.360	33.6	68.4	0.03	31.1	6.97	1.2	119
07/07/15	0.25	17,500	37.0	0.32	30.9	70.8	0.02	38.0	11.0	2.0	134
07/06/16	0.097	13,800	19.9	0.388	27.5	72.5	< 0.020	32.9	6.6	1.1	123

Appendix F.2.–Sediment sample metals, As, and Se concentrations, 2011–2016.



ALS Environmental ALS Group USA, Corp 1317 South 13th Avenue Kelso, WA 98626 **T**:+1 360 577 7222 **F**:+1 360 636 1068 www.alsglobal.com

September 23, 2016

Analytical Report for Service Request No: K1607834

Kate Kanouse Alaska Department of Fish and Game Division of Habitat 802 3rd Street P.O. Box 110024 Douglas, AK 99811-0024

RE: Coeur AK Biomonitoring

Dear Kate,

Enclosed are the results of the sample(s) submitted to our laboratory July 13, 2016 For your reference, these analyses have been assigned our service request number **K1607834**.

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

Please contact me if you have any questions. My extension is 3293. You may also contact me via email at Shar.Samy@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Shar Samy, Ph.D. Project Manager



ALS Environmental ALS Group USA, Corp 1317 South 13th Avenue Kelso, WA 98626 **T**: +1 360 577 7222 **F**: +1 360 636 1068 www.alsglobal.com

Table of Contents

Acronyms Qualifiers State Certifications, Accreditations, And Licenses Case Narrative Chain of Custody Total Solids General Chemistry

Metals

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Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M MCL	Modified 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

- ${f F}$ 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.

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

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

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.



Case Narrative

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ALS ENVIRONMENTAL

Client:Alaska Department of Fish and GameProject:Coeur AK BiomonitoringSample Matrix:Sediment

Service Request No.: Date Received: K1607834 07/13/16

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 Matrix/Duplicate Matrix Spike (MS/DMS).

Sample Receipt

Four sediment samples were received for analysis at ALS Environmental on 07/13/16. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

General Chemistry Parameters

Total Volatile Solids by EPA Method 160.4 Modified and Total Sulfide by PSEP:

All samples were received past holding time or with insufficient time remaining. The analysis was performed as soon as possible after receipt by the laboratory. The data was flagged to indicate the holding time violation.

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

Total Metals

Matrix Spike Recovery Exceptions:

The control criteria for matrix spike recovery of Aluminum for sample Lower Slate Creek were not applicable. The analyte 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.

5/ Approved by



Chain of Custody

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3. Maper Slate Creek	7		1500		З	X	X	X	X	X	X	X										
4 Kobel Johnson Conex 1	err	1419/06/	JODER	-11	150	X	X	A	A	7L	A	K	v	-	-2-	2		27				
5 Lower Sherman Creek	7	1/4/10	1000		3	X	X	×	X	X	X	X										
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AL	5							PC Sh	av
				Cooler	Receipt and I	Preservation For	m	ī.	
Client	Luv f	Harst	a _			Service Request 1	M7.871		****
Received:	July	3,14	Opened:_	7/13	By:		aded: 7/13	_By:	
1. Sample	es were rece	ived via?	USPS	Fed Ex	UPS L	OHL PDX Co	urier Hand Delivere	ed	
2. Sample	es were rece	eived in: (ci	rcle) (Cooler	Box Env	elope Other		NA	
3. Were c	ustody seal	s on cooler	s?	NA (Y) N I	If yes, how many and	where? ZFRE	nt	
-	ent, were cu			<u> </u>) N		ey signed and dated?	0	N
Raw Cooler Temp	Corrected. Gooler Temp	Raw Témp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID	Tracking	Number N	A Filed
1.4	1.4	<u>.</u>	(.)	$\mathcal{O}\mathcal{K}$	360		7635 5510	7033	
4. Packin	g material:	Inserts	Baggies	Bubble Wi	ap Gel Packs	Wet Ice Dry Ice	Sleeves		
5. Were d	ustody pap	ers properly	y filled out	(ink, signed	I, etc.)?			na (Y	N
6. Did all	bottles arri	ive in good	condition	(unbroken)?	Indicate in the	table below.		NA (Y)	N
7. Were a	ll sample la	bels compl	ete (i.e ana	lysis, preser	vation, etc.)?			NA Y	N
8. Did all	sample lab	els and tags	agree with	n custody pa	pers? Indicate n	najor discrepancies i	the table on page 2.	NA (Y)	Ν
9. Were a	appropriate	bottles/con	tainers and	volumes re	ceived for the tes	sts indicated?		NA (Y	Ν
10. Were	the pH-pres	served bott	es (see SM) GEN SOP)	received at the a	ppropriate pH? India	cate in the table below	(NA) Y	N
11. Were VOA vials received without headspace? Indicate in the table below.									

12. Was C12/Res negative?

Sample ID on Bottle	Sample ID on COC	Identified by:

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

Notes, Discrepancies, & Resolutions:

(NA)

Y

Ν



Total Solids

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Analytical Report

Client:	Alaska Department of Fish and Game	Service	Request:	K1607834
Project:	Coeur AK Biomonitoring	Date	Collected:	07/05/16 - 07/06/16
Sample Matrix:	Sediment	Date	Received:	07/13/16
Analysis Method:	160.3 Modified		Units:	Percent
Prep Method:	None		Basis:	As Received
		Solids, Total		

Date Sample Name Lab Code Result MRL Dil. Analyzed Q Lower Slate Creek 70.7 1 07/27/16 16:00 K1607834-001 _ East Fork Slate Creek K1607834-002 21.0 1 07/27/16 16:00 -Upper Slate Creek K1607834-003 62.9 1 07/27/16 16:00 _ Lower Sherman Creek 80.5 1 07/27/16 16:00 K1607834-004 _

QA/QC Report

Client:	Alaska Department of Fish and Game	Service Request:K1607834
Project	Coeur AK Biomonitoring	Date Collected:07/05/16
Sample Matrix:	Sediment	Date Received: 07/13/16
Analysis Method:	160.3 Modified	Units:Percent
Prep Method:	None	Basis: As Received
	Renlicate Sample Summe	

Replicate Sample Summary Inorganic Parameters

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Lower Slate Creek	K1607834-001DUP	-	70.7	69.9	70.3	1	20	07/27/16
Batch QC	K1608007-001DUP	-	76.2	77.5	76.9	2	20	07/27/16

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

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

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



General Chemistry

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Analytical Report

Client:	Alaska Department of Fish and Game	Servi
Project:	Coeur AK Biomonitoring	Date
Sample Matrix:	Sediment	Dat
Analysis Method: Prep Method:	160.4 Modified None	

Service Request: K1607834 Date Collected: 07/05/16 - 07/06/16 Date Received: 07/13/16

> Units: Percent Basis: Dry, per Method

Solids, Total Volatile

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Lower Slate Creek	K1607834-001	7.70	0.010	1	07/14/16 08:43	*
East Fork Slate Creek	K1607834-002	32.5	0.010	1	07/14/16 08:43	*
Upper Slate Creek	K1607834-003	5.00	0.010	1	07/14/16 08:43	*
Lower Sherman Creek	K1607834-004	3.10	0.010	1	07/14/16 08:43	*
Method Blank	K1607834-MB	ND U	0.010	1	07/14/16 08:43	

QA/QC Report

Client:	Alaska Department of Fish	and Game			Service Reque		
Project	Coeur AK Biomonitoring				Date Collecte	d: 07/06	6/16
Sample Matrix:	Sediment				Date Receive	d: 07/13	3/16
					Date Analyze	d: 07/14	4/16
		Replic	cate Sample Sur	nmary			
		General	l Chemistry Pa	rameters			
Sample Name:	East Fork Slate Creek				Uni	ts: Perc	cent
Lab Code:	K1607834-002				Bas	is: Dry,	, per Method
			Sample	Duplicate Sample K1607834- 002DUP			
Analyte Name	Analysis Method	MRL	Result	Result	Average	RPD	RPD Limit
Solids, Total Volatile	160.4 Modified	0.010	32.5	30.2	31.4	7	20

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

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

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

Client:Alaska Department of Fish and GameProject:Coeur AK BiomonitoringSample Matrix:Sediment

 Service Request:
 K1607834

 Date Collected:
 7/5/2016

 Date Received:
 7/13/2016

 Date Analyzed:
 7/19/2016

Particle Size Determination ASTM D422

Sample Name: Lower Slate Creek Lab Code: K1607834-001

Gravel and Sand (Sieve Analysis)

Description	Sieve Size		Percent
		Weight (g)	Passing
Gravel (19.0 mm)	No.3/4''(19.0 mm)	0.0957	99.28
Gravel (9.50 mm)	No.3/8''(9.50 mm)	6.0386	81.77
Gravel, Medium	No.4 (4.75 mm)	1.1718	78.37
Gravel, Fine	No.10 (2.00 mm)	0.0584	78.20
Sand, Very Coarse	No.20 (0.850 mm)	2.7406	70.20
Sand, Coarse	No.40 (0.425 mm)	1.8150	64.90
Sand, Medium	No.60 (0.250 mm)	3.7860	53.85
Sand, Fine	No.140 (0.106 mm)	10.0533	24.49
Sand, Very Fine	No.200 (0.0750 mm)	2.6145	16.86

Silt and Clay

Particle Diameter	Percent Passing
0.074 mm	23.11
0.005 mm	0.00
0.001 mm	0.00

Client:Alaska Department of Fish and GameProject:Coeur AK BiomonitoringSample Matrix:Sediment

 Service Request:
 K1607834

 Date Collected:
 7/6/2016

 Date Received:
 7/13/2016

 Date Analyzed:
 7/19/2016

Particle Size Determination ASTM D422

Sample Name: East Fork Slate Creek Lab Code: K1607834-002

Gravel and Sand (Sieve Analysis)

Description	Sieve Size		Percent
		Weight (g)	Passing
Gravel (19.0 mm)	No.3/4''(19.0 mm)	0.0000	94.07
Gravel (9.50 mm)	No.3/8''(9.50 mm)	0.1721	92.91
Gravel, Medium	No.4 (4.75 mm)	1.1775	84.96
Gravel, Fine	No.10 (2.00 mm)	0.4382	81.99
Sand, Very Coarse	No.20 (0.850 mm)	2.5596	64.93
Sand, Coarse	No.40 (0.425 mm)	2.0926	50.98
Sand, Medium	No.60 (0.250 mm)	0.8673	45.19
Sand, Fine	No.140 (0.106 mm)	2.1104	31.12
Sand, Very Fine	No.200 (0.0750 mm)	0.6597	26.72

Silt and Clay

(Hydrometer Analysis)

Particle Diameter	Percent Passing
0.074 mm	28.32
0.005 mm	3.48
0.001 mm	0.00

Page No.:

Client:Alaska Department of Fish and GameProject:Coeur AK BiomonitoringSample Matrix:Sediment

 Service Request:
 K1607834

 Date Collected:
 7/6/2016

 Date Received:
 7/13/2016

 Date Analyzed:
 7/19/2016

Particle Size Determination ASTM D422

Sample Name: Upper Slate Creek Lab Code: K1607834-003

Gravel and Sand (Sieve Analysis)

Description	Sieve Size		Percent
		Weight (g)	Passing
Gravel (19.0 mm)	No.3/4''(19.0 mm)	0.0000	100.05
Gravel (9.50 mm)	No.3/8''(9.50 mm)	3.1101	91.08
Gravel, Medium	No.4 (4.75 mm)	5.0954	76.39
Gravel, Fine	No.10 (2.00 mm)	0.1177	76.05
Sand, Very Coarse	No.20 (0.850 mm)	17.1372	26.12
Sand, Coarse	No.40 (0.425 mm)	4.9260	11.77
Sand, Medium	No.60 (0.250 mm)	1.9467	6.10
Sand, Fine	No.140 (0.106 mm)	1.0710	2.98
Sand, Very Fine	No.200 (0.0750 mm)	0.1374	2.58

Silt and Clay

Particle Diameter	Percent Passing
0.074 mm	2.93
0.005 mm	0.00
0.001 mm	0.00

Client:Alaska Department of Fish and GameProject:Coeur AK BiomonitoringSample Matrix:Sediment

 Service Request:
 K1607834

 Date Collected:
 7/6/2016

 Date Received:
 7/13/2016

 Date Analyzed:
 7/19/2016

Particle Size Determination ASTM D422

Sample Name: Lower Sherman Creek Lab Code: K1607834-004

Gravel and Sand (Sieve Analysis)

Description	Sieve Size		Percent
		Weight (g)	Passing
Gravel (19.0 mm)	No.3/4''(19.0 mm)	0.0000	100.01
Gravel (9.50 mm)	No.3/8''(9.50 mm)	4.0688	90.68
Gravel, Medium	No.4 (4.75 mm)	7.9300	72.49
Gravel, Fine	No.10 (2.00 mm)	0.1319	72.19
Sand, Very Coarse	No.20 (0.850 mm)	26.4918	11.29
Sand, Coarse	No.40 (0.425 mm)	3.1914	3.96
Sand, Medium	No.60 (0.250 mm)	0.9920	1.68
Sand, Fine	No.140 (0.106 mm)	0.3901	0.78
Sand, Very Fine	No.200 (0.0750 mm)	0.0365	0.69

Silt and Clay

Particle Diameter	Percent Passing
0.074 mm	1.00
0.005 mm	0.07
0.001 mm	0.00

Client:Alaska Department of Fish and GameProject:Coeur AK BiomonitoringSample Matrix:Sediment

 Service Request:
 K1607834

 Date Collected:
 7/6/2016

 Date Received:
 7/13/2016

 Date Analyzed:
 7/19/2016

Particle Size Determination ASTM D422

Sample Name: Lower Sherman Creek Lab Code: K1607834-004DUP

Gravel and Sand (Sieve Analysis)

Description	Sieve Size		Percent
		Weight (g)	Passing
Gravel (19.0 mm)	No.3/4''(19.0 mm)	0.0000	100.01
Gravel (9.50 mm)	No.3/8''(9.50 mm)	0.0000	100.01
Gravel, Medium	No.4 (4.75 mm)	8.0611	81.30
Gravel, Fine	No.10 (2.00 mm)	0.1051	81.06
Sand, Very Coarse	No.20 (0.850 mm)	27.3535	17.40
Sand, Coarse	No.40 (0.425 mm)	4.8084	6.21
Sand, Medium	No.60 (0.250 mm)	1.6003	2.48
Sand, Fine	No.140 (0.106 mm)	0.6265	1.03
Sand, Very Fine	No.200 (0.0750 mm)	0.0598	0.89

Silt and Clay

Particle Diameter	Percent Passing
0.074 mm	1.28
0.005 mm	0.04
0.001 mm	0.00

Analytical Report

Client:	Alaska Department of Fish and Game	Service Request:	K1607834
Project:	Coeur AK Biomonitoring	Date Collected:	07/05/16 - 07/06/16
Sample Matrix:	Sediment	Date Received:	07/13/16
Analysis Method:	PSEP Sulfide	Units:	mg/Kg
Prep Method:	Method	Basis:	Dry
		Sulfide, Total	

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Lower Slate Creek	K1607834-001	ND U	2.5	1	07/29/16 21:57	7/29/16	*
East Fork Slate Creek	K1607834-002	ND U	6.8	1	07/29/16 21:57	7/29/16	*
Upper Slate Creek	K1607834-003	ND U	2.2	1	07/29/16 21:57	7/29/16	*
Lower Sherman Creek	K1607834-004	ND U	2.4	1	07/29/16 21:57	7/29/16	*
Method Blank	K1607834-MB	ND U	1.0	1	07/29/16 21:57	7/29/16	

Client:	Alaska Departm	ent of Fish and Gan	ne		Service Re	equest:	K1607834
Project	Coeur AK Biom	onitoring			Date Col	lected:	07/05/16
Sample Matrix:	Sediment				Date Re	ceived:	07/13/16
			Date Ana	alyzed:	07/29/16		
		Tr	iplicate Sample	Summary			
		Gen	eral Chemistry	Parameters			
Sample Name:	Lower Slate Cre	ek				Units:	mg/Kg
Lab Code:	K1607834-001					Basis:	Dry
Analysis Method:	PSEP Sulfide						
Prep Method:	Method						
Analyte Name	MRL	Sample Result	Duplicate K1607834- 001DUP	Triplicate K1607834- 001TRP	Average	RSI	D RSD Limit
		Sample Result	Result	Result	11, et uge		
Sulfide, Total	2.6	ND	ND	ND	NC	NC	20

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

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

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

QA/QC Report

Client:	Alaska Depar		Ser	vice Reque	st: K1	607834				
Project:	Coeur AK Bi	Coeur AK Biomonitoring					Date Collected: 07/05/16			
Sample Matrix:	Sediment		Dat							
						Dat	/29/16			
					Dat	Date Extracted: 07/29/16				
			Duplicat	e Matrix S	pike Sumr	nary				
			_	Sulfide, 7	Fotal	-				
Sample Name:	Lower Slate C	Creek					Unit	s: mg	g/Kg	
Lab Code:	K1607834-00)1		Basis:					у	
Analysis Method:	PSEP Sulfide	;								
Prep Method:	Method									
				x Spike 84-001MS		Duplicate M K1607834	-	e		
	Sample		Spike			Spike		% Rec		RPD
Analyte Name	Result	Result	Amount	% Rec	Result	Amount	% Rec	Limits	RPD	Limit
Sulfide, Total	ND U	770	930	83	740	910	81	28-175	4	20

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

QA/QC Report

Client: Project: Sample Matrix:	Alaska Department of Fish and Gam Coeur AK Biomonitoring Sediment	ne	Service Requ Date Analyz Date Extrac	ed:	K1607834 07/29/16 07/29/16	
	Lab	Control Sample Summary Sulfide, Total				
Analysis Method: Prep Method:	PSEP Sulfide Method		Units: Basis: Analysis Lot	:	mg/Kg Dry 507779	
Sample Name Lab Control Sample	Lab Code K1607834-LCS	Result 391	Spike Amount 410	% Rec 94		% Rec Limits 39-166

Analytical Report

Client:	Alaska Department of Fish and Game	Service Request:	K1607834
Project:	Coeur AK Biomonitoring	Date Collected:	07/05/16 - 07/06/16
Sample Matrix:	Sediment	Date Received:	07/13/16
Analysis Method: Prep Method:	PSEP TOC ALS SOP		Percent Dry, per Method
r			, , , , , , , , , ,

Carbon, Total Organic (TOC)

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Lower Slate Creek	K1607834-001	0.585	0.050	1	07/19/16 12:00	7/19/16	
East Fork Slate Creek	K1607834-002	13.0	0.050	1	07/19/16 12:00	7/19/16	
Upper Slate Creek	K1607834-003	2.14	0.050	1	07/19/16 12:00	7/19/16	
Lower Sherman Creek	K1607834-004	0.322	0.050	1	07/19/16 12:00	7/19/16	
Method Blank	K1607834-MB	ND U	0.050	1	07/19/16 12:00	7/19/16	

QA/QC Report

				Qu'i Qu'incipoir				
Client:	Alaska Departm	ent of Fish	and Game			Service Reque	est: K160	7834
Project	Coeur AK Biom	nonitoring				Date Collect	ed: NA	
Sample Matrix:	Sediment					Date Receive	ed: NA	
						Date Analyz	ed: 07/19	0/16
			Triplica	ate Sample Sumr	nary			
			General	Chemistry Parai	neters			
Sample Name:	Batch QC					Uni	its: Perce	ent
Lab Code:	K1607938-013					Bas	sis: Dry,	per Method
Analysis Method:	PSEP TOC							
Prep Method:	ALS SOP							
		MDI	Sample	Duplicate K1607938-	Triplicate K1607938-		DCD	
Analyte Name		MRL	Result	013DUP Result	013TRP Result	Average	RSD	RSD Limit
Carbon, Total Organ	ic (TOC)	0.050	0.873	0.873	0.874	0.874	<1	27

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

QA/QC Report

Client:	Alaska Department of	Fish and Ga	me			Service	Request:	K160	7834	
Project:	Coeur AK Biomonitori	ing				Date Co	ollected:	N/A		
Sample Matrix:	Sediment	Sediment					Date Received:			
						Date Ar	nalyzed:	07/19	/16	
						Date Ex	tracted:	07/19	/16	
		Dup	licate Matr	ix Spike S	ummary					
		-	arbon, Tota	-	-					
Sample Name:	Batch QC						Units:	Perce	nt	
Lab Code:	K1607938-013						Basis:	Dry, j	per Meth	od
Analysis Method:	PSEP TOC									
Prep Method:	ALS SOP									
			latrix Spike 07938-013N		-	l icate Matri 607938-013	-			
	Sample		Spike			Spike		% Rec		RPD
Analyte Name	Result	Result	Amount	% Rec	Result	Amount	% Rec	Limits	RPD	Limit
Carbon, Total Organi	c (TOC) 0.873	3.91	3.02	101	3.80	3.00	98	69-123	3	27

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

QA/QC Report

Client: Project: Sample Matrix:	Alaska Department of Fish and Game Coeur AK Biomonitoring Sediment		Service Req Date Analyz Date Extrac	ed:	K1607834 07/19/16 07/19/16
Lab Control Sample Summary Carbon, Total Organic (TOC)					
Analysis Method: Prep Method:	PSEP TOC ALS SOP		Units: Basis: Analysis Lot:		Percent Dry, per Method 507692
Sample Name Lab Control Sample	Lab Code K1607834-LCS	Result 0.579	Spike Amount 0.582	% Rec 99	% Rec Limits 74-118



Metals

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

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Analytical Report

Client:	Alaska Department of Fish and Game	Service Request: K1607834
Project:	Coeur AK Biomonitoring	Date Collected: 07/05/16 09:00
Sample Matrix:	Sediment	Date Received: 07/13/16 09:40
Sample Name: Lab Code:	Lower Slate Creek K1607834-001	Basis: Dry

	Analysis							
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.7	13100	mg/Kg	2.1	2	08/15/16 05:35	08/15/16	
Arsenic	200.8	17.5	mg/Kg	0.52	5	08/25/16 10:07	08/15/16	
Cadmium	200.8	0.673	mg/Kg	0.021	5	08/25/16 10:07	08/15/16	
Chromium	200.8	21.1	mg/Kg	0.21	5	08/25/16 10:07	08/15/16	
Copper	200.8	37.5	mg/Kg	0.10	5	08/25/16 10:07	08/15/16	
Lead	200.8	7.00	mg/Kg	0.052	5	08/25/16 10:07	08/15/16	
Mercury	7471B	0.057	mg/Kg	0.019	1	08/02/16 12:35	08/02/16	
Nickel	200.8	33.8	mg/Kg	0.21	5	08/25/16 10:07	08/15/16	
Selenium	200.8	1.4	mg/Kg	1.0	5	08/25/16 10:07	08/15/16	
Silver	200.8	0.076	mg/Kg	0.021	5	08/25/16 10:07	08/15/16	
Zinc	200.8	177	mg/Kg	0.52	5	08/25/16 10:07	08/15/16	

Analytical Report

Client:	Alaska Department of Fish and Game	Service Request: K1607834
Project:	Coeur AK Biomonitoring	Date Collected: 07/06/16 13:00
Sample Matrix:	Sediment	Date Received: 07/13/16 09:40
Sample Name: Lab Code:	East Fork Slate Creek K1607834-002	Basis: Dry

	Analysis							
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.7	16500	mg/Kg	5.7	2	08/15/16 05:52	08/15/16	
Arsenic	200.8	51.5	mg/Kg	1.4	5	08/25/16 10:35	08/15/16	
Cadmium	200.8	8.20	mg/Kg	0.057	5	08/25/16 10:35	08/15/16	
Chromium	200.8	16.5	mg/Kg	0.57	5	08/25/16 10:35	08/15/16	
Copper	200.8	59.5	mg/Kg	0.28	5	08/25/16 10:35	08/15/16	
Lead	200.8	5.54	mg/Kg	0.14	5	08/25/16 10:35	08/15/16	
Mercury	7471B	0.109	mg/Kg	0.020	1	08/02/16 12:37	08/02/16	
Nickel	200.8	86.1	mg/Kg	0.57	5	08/25/16 10:35	08/15/16	
Selenium	200.8	3.1	mg/Kg	2.8	5	08/25/16 10:35	08/15/16	
Silver	200.8	0.190	mg/Kg	0.057	5	08/25/16 10:35	08/15/16	
Zinc	200.8	634	mg/Kg	1.4	5	08/25/16 10:35	08/15/16	

Analytical Report

Client:	Alaska Department of Fish and Game	Service Request: K1607834
Project:	Coeur AK Biomonitoring	Date Collected: 07/06/16 15:00
Sample Matrix:	Sediment	Date Received: 07/13/16 09:40
Sample Name: Lab Code:	Upper Slate Creek K1607834-003	Basis: Dry

	Analysis							
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.7	14000	mg/Kg	2.0	2	08/15/16 05:55	08/15/16	
Arsenic	200.8	18.0	mg/Kg	0.51	5	08/25/16 10:39	08/15/16	
Cadmium	200.8	0.507	mg/Kg	0.020	5	08/25/16 10:39	08/15/16	
Chromium	200.8	71.7	mg/Kg	0.20	5	08/25/16 10:39	08/15/16	
Copper	200.8	37.0	mg/Kg	0.10	5	08/25/16 10:39	08/15/16	
Lead	200.8	2.69	mg/Kg	0.051	5	08/25/16 10:39	08/15/16	
Mercury	7471B	0.051	mg/Kg	0.019	1	08/02/16 12:39	08/02/16	
Nickel	200.8	48.5	mg/Kg	0.20	5	08/25/16 10:39	08/15/16	
Selenium	200.8	2.1	mg/Kg	1.0	5	08/25/16 10:39	08/15/16	
Silver	200.8	0.092	mg/Kg	0.020	5	08/25/16 10:39	08/15/16	
Zinc	200.8	111	mg/Kg	0.51	5	08/25/16 10:39	08/15/16	

Analytical Report

Client:	Alaska Department of Fish and Game	Service Request: K1607834
Project:	Coeur AK Biomonitoring	Date Collected: 07/06/16 10:00
Sample Matrix:	Sediment	Date Received: 07/13/16 09:40
Sample Name: Lab Code:	Lower Sherman Creek K1607834-004	Basis: Dry

	Analysis							
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.7	13800	mg/Kg	2.1	2	08/15/16 05:58	08/15/16	
Arsenic	200.8	19.9	mg/Kg	0.52	5	08/25/16 10:42	08/15/16	
Cadmium	200.8	0.388	mg/Kg	0.021	5	08/25/16 10:42	08/15/16	
Chromium	200.8	27.5	mg/Kg	0.21	5	08/25/16 10:42	08/15/16	
Copper	200.8	72.5	mg/Kg	0.10	5	08/25/16 10:42	08/15/16	
Lead	200.8	6.60	mg/Kg	0.052	5	08/25/16 10:42	08/15/16	
Mercury	7471B	ND U	mg/Kg	0.020	1	08/02/16 12:44	08/02/16	
Nickel	200.8	32.9	mg/Kg	0.21	5	08/25/16 10:42	08/15/16	
Selenium	200.8	1.1	mg/Kg	1.0	5	08/25/16 10:42	08/15/16	
Silver	200.8	0.097	mg/Kg	0.021	5	08/25/16 10:42	08/15/16	
Zinc	200.8	123	mg/Kg	0.52	5	08/25/16 10:42	08/15/16	

Analytical Report

Client:	Alaska Department of Fish and Game	Service Request:	K1607834
Project:	Coeur AK Biomonitoring	Date Collected:	NA
Sample Matrix:	Sediment	Date Received:	NA
Sample Name: Lab Code:	Method Blank KQ1609655-01	Basis:	Dry

	Analysis							
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.7	ND U	mg/Kg	2.0	2	08/15/16 05:28	08/15/16	
Arsenic	200.8	ND U	mg/Kg	0.50	5	08/25/16 09:56	08/15/16	
Cadmium	200.8	ND U	mg/Kg	0.020	5	08/25/16 09:56	08/15/16	
Chromium	200.8	ND U	mg/Kg	0.20	5	08/25/16 09:56	08/15/16	
Copper	200.8	ND U	mg/Kg	0.10	5	08/25/16 09:56	08/15/16	
Lead	200.8	ND U	mg/Kg	0.050	5	08/25/16 09:56	08/15/16	
Nickel	200.8	ND U	mg/Kg	0.20	5	08/25/16 09:56	08/15/16	
Selenium	200.8	ND U	mg/Kg	1.0	5	08/25/16 09:56	08/15/16	
Silver	200.8	ND U	mg/Kg	0.020	5	08/25/16 09:56	08/15/16	
Zinc	200.8	ND U	mg/Kg	0.50	5	08/25/16 09:56	08/15/16	

Analytical Report

Client:	Alaska Department of Fish and Game	Service Request:	K1607834
Project:	Coeur AK Biomonitoring	Date Collected:	NA
Sample Matrix:	Sediment	Date Received:	NA
Sample Name: Lab Code:	Method Blank KQ1609070-04	Basis:	Dry

	Analysis		T T 1 /	MDI	5.1			0
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Mercury	7471B	ND U	mg/Kg	0.020	1	08/02/16 12:05	08/02/16	

QA/QC Report

Client:	Alaska Department of Fish and Game	Service Request: K1607834	
Project	Coeur AK Biomonitoring	Date Collected: 07/05/16	
Sample Matrix:	Sediment	Date Received: 07/13/16	
		Date Analyzed: 08/15/16 - 08/25/16	

Replicate Sample Summary Total Metals

Sample Name: Lab Code:	Lower Slate Creek K1607834-001					Units: mg/ Basis: Dry	•
Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1609655-04 Result	Average	RPD	RPD Limit
Aluminum	200.7	2.0	13100	12500	12800	5	20
Arsenic	200.8	0.51	17.5	16.5	17.0	6	20
Cadmium	200.8	0.020	0.673	0.797	0.735	17	20
Chromium	200.8	0.20	21.1	19.6	20.4	8	20
Copper	200.8	0.10	37.5	42.1	39.8	11	20
Lead	200.8	0.051	7.00	7.31	7.16	4	20
Nickel	200.8	0.20	33.8	36.5	35.2	8	20
Selenium	200.8	1.0	1.4	1.1	1.3	28	20
Silver	200.8	0.020	0.076	0.082	0.079	7	20
Zinc	200.8	0.51	177	168	173	5	20

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

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

QA/QC Report

Client:	Alaska Department of Fish and Game	Service Request: K1607834
Project	Coeur AK Biomonitoring	Date Collected: NA
Sample Matrix:	Biosolids Solids	Date Received: NA
		Date Analyzed: 08/15/16 - 08/25/16

Replicate Sample Summary Total Metals

Sample Name:	Batch QC					Units: mg/	Kg
Lab Code:	K1607934-001					Basis: Dry	
Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1609655-06 Result	Average	RPD	RPD Limit
Aluminum	200.7	11	4730	4680	4710	1	20
Arsenic	200.8	2.8	ND U	ND U	ND	-	20
Cadmium	200.8	0.11	1.37	1.44	1.41	5	20
Chromium	200.8	1.1	29.2	34.3	31.8	16	20
Copper	200.8	0.56	267	275	271	3	20
Lead	200.8	0.28	11.5	11.3	11.4	2	20
Nickel	200.8	1.1	24.3	27.7	26.0	13	20
Selenium	200.8	5.6	ND U	ND U	ND	-	20
Silver	200.8	0.11	1.90	2.25	2.08	17	20
Zinc	200.8	2.8	681	685	683	<1	20

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

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

QA/QC Report

Client: Project Sample Matrix:	Alaska Department Coeur AK Biomoni Soil		ame		Date Col Date Rec	equest: K160 lected: NA ceived: NA llyzed: 08/02			
	Replicate Sample Summary Total Metals								
Sample Name:	Batch QC					Units: mg/l	Kg		
Lab Code:	K1607727-003					Basis: Dry			
Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1609070-09 Result	Average	RPD	RPD Limit		
Mercury	7471B	0.020	0.093	0.066	0.080	33	20		

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

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

QA/QC Report

Client:	Alaska Department of Fish and Game
Project:	Coeur AK Biomonitoring
Sample Matrix:	Sediment

Service Request:K1607834 Date Collected:07/05/16 Date Received:07/13/16 Date Analyzed:08/15/16 - 08/25/16

Matrix Spike Summary Total Metals

Sample Name:	Lower Sl
Lab Code:	K160783

Lower Slate Creek K1607834-001 Units:mg/Kg Basis:Dry

Matrix Spike KQ1609655-05

Analyte Name	Method	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	200.7	13100	13600	407	117 #	70-130
Arsenic	200.8	17.5	114	102	95	70-130
Cadmium	200.8	0.673	10.5	10.2	97	70-130
Chromium	200.8	21.1	59.8	40.7	95	70-130
Copper	200.8	37.5	88.2	50.9	100	70-130
Lead	200.8	7.00	103	102	94	70-130
Nickel	200.8	33.8	135	102	100	70-130
Selenium	200.8	1.4	105	102	102	70-130
Silver	200.8	0.076	9.59	10.2	94	70-130
Zinc	200.8	177	260	102	82	70-130

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

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

QA/QC Report

Client:	Alaska Department of Fish and Game
Project:	Coeur AK Biomonitoring
Sample Matrix:	Biosolids Solids

Service Request:K1607834 Date Collected:N/A Date Received:N/A Date Analyzed:08/15/16 - 08/25/16

Matrix Spike Summary Total Metals

Sample Name: Lab Code:

Batch QC K1607934-001 Units:mg/Kg Basis:Dry

Matrix Spike KQ1609655-07

Analyte Name	Method	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	200.7	4730	7220	2250	111	70-130
Arsenic	200.8	ND U	579	563	103	70-130
Cadmium	200.8	1.37	56.5	56.3	98	70-130
Chromium	200.8	29.2	264	225	104	70-130
Copper	200.8	267	572	282	108	70-130
Lead	200.8	11.5	569	563	99	70-130
Nickel	200.8	24.3	604	563	103	70-130
Selenium	200.8	ND U	594	563	105	70-130
Silver	200.8	1.90	56.5	56.3	97	70-130
Zinc	200.8	681	1270	563	105	70-130

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

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

QA/QC Report

Client: Project: Sample Matrix:	Alaska Depar Coeur AK Bi Soil		a and Game			Dat Dat Dat	vice Reque e Collected e Received e Analyzed e Extracte	l: N/ : N/ l: 08		
			Duplicat	e Matrix S	pike Sumr	nary				
			-	Total Me	-	·				
Sample Name:	Batch QC						Unit	s: mg	g/Kg	
Lab Code:	K1607727-00)3					Basi	s: Di	у	
Analysis Method:	7471B									
Prep Method:	Method									
				x Spike 9070-01		Duplicate M KQ1609	-	e		
	Sample		Spike			Spike		% Rec		RPD
Analyte Name	Result	Result	Amount	% Rec	Result	Amount	% Rec	Limits	RPD	Limit
Mercury	0.093	0.545	0.490	92	0.550	0.490	93	80-120	<1	20

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

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

Client: Project: Sample Matrix:	Alaska Department of Fish Coeur AK Biomonitoring Sediment	and Game	Service Request: Date Analyzed: Date Extracted:	K1607834 08/15/16 08/15/16					
Lab Control Sample Summary									
		Total Metals							
Analysis Method:	200.7		Units:	mg/Kg					
Prep Method:	EPA 3050B		Basis:	Dry					
			Analysis Lot:	509941					
		Lab Control Sample KQ1609655-02							
Analyte Name	Resu		% Rec	% Rec Limits					
Aluminum	403	5 374	108	85-115					

Client: Project: Sample Matrix:	Alaska Department of Fish and Game Coeur AK Biomonitoring Sediment		Service Request: Date Analyzed: Date Extracted:	K1607834 08/25/16 08/15/16
	Lab Co	ontrol Sample Summary		
		Total Metals		
Analysis Method:	200.8		Units:	mg/Kg
Prep Method:	EPA 3050B		Basis:	Dry
•			Analysis Lot:	511439
		Lab Control Sample KQ1609655-02		
Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
Arsenic	97.6	93.5	104	85-115
Cadmium	9.16	9.35	98	85-115
Chromium	37.9	37.4	101	85-115
Copper	48.2	46.7	103	85-115
Lead	90.2	93.5	96	85-115
Nickel	96.6	93.5	103	85-115
Selenium	103	93.5	110	85-115
Silver	9.01	9.35	96	85-115
Zinc	102	93.5	109	85-115

Client: Project: Sample Matrix:	Alaska Department of Fis Coeur AK Biomonitoring Sediment		Service Request: Date Analyzed: Date Extracted:	K1607834 08/15/16 08/15/16	
			Sample Summary		
		10ta	al Metals		
Analysis Method:	200.7			Units:	mg/Kg
Prep Method:	EPA 3050B			Basis:	Dry
				Analysis Lot:	509941
			b Control Sample KQ1609655-03		
Analyte Name	Re	esult	Spike Amount	% Rec	% Rec Limits
Aluminum	59	970	7930	75	39-161

Client: Project: Sample Matrix:	Alaska Department of Fish and Game Coeur AK Biomonitoring Sediment	2	Service Request: Date Analyzed: Date Extracted:	K1607834 08/25/16 08/15/16
	Lab C	Control Sample Summary		
		Total Metals		
Analysis Method: Prep Method:	200.8 EPA 3050B		Units: Basis: Analysis Lot:	mg/Kg Dry 511439
		Lab Control Sample KQ1609655-03	0/ D	
Analyte Name Arsenic	Result 102	Spike Amount 98.5	<u>% Rec</u> 104	<u>% Rec Limits</u> 69-145
Cadmium	102	98.5 146	104 98	73-127
Chromium	183	182	100	71-130
Copper	108	102	100	75-125
Lead	127	130	98	72-127
Nickel	153	149	103	73-127
Selenium	169	154	110	68-132
Silver	39.7	40.9	97	66-134
Zinc	201	191	105	70-130

Client: Project: Sample Matrix:	Alaska Department of Fi Coeur AK Biomonitorin Sediment		Service Request: Date Analyzed: Date Extracted:	K1607834 08/02/16 08/02/16	
			ol Sample Summary otal Metals		
		1			
Analysis Method:	7471B			Units:	mg/Kg
Prep Method:	Method			Basis:	Dry
				Analysis Lot:	508132
		I	Lab Control Sample KQ1609070-06		
Analyte Name	R	esult	Spike Amount	% Rec	% Rec Limits
Mercury	0	.490	0.500	98	80-120

Client: Project: Sample Matrix:	Alaska Department of Fish Coeur AK Biomonitoring Sediment	and Game	Service Request: Date Analyzed: Date Extracted:	K1607834 08/02/16 08/02/16
		Lab Control Sample Summary		
		Total Metals		
Analysis Method:	7471B		Units:	mg/Kg
Prep Method:	Method		Basis:	Dry
			Analysis Lot:	508132
		Lab Control Sample KQ1609070-08		
Analyte Name	Rest	ılt Spike Amount	% Rec	% Rec Limits
Mercury	6.9	1 7.10	97	51-149



ALS Environmental ALS Group USA, Corp 1317 South 13th Avenue Kelso, WA 98626 **T** : +1 360 577 7222 **F** : +1 360 636 1068 www.alsglobal.com

September 27, 2016

Analytical Report for Service Request No: K1609286

Kate Kanouse Alaska Department of Fish and Game Division of Habitat 802 3rd Street P.O. Box 110024 Douglas, AK 99811-0024

RE: Coeur AK Biomonitoring

Dear Kate,

Enclosed are the results of the sample(s) submitted to our laboratory August 11, 2016 For your reference, these analyses have been assigned our service request number **K1609286**.

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

Please contact me if you have any questions. My extension is 3293. You may also contact me via email at Shar.Samy@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Shar Samy, Ph.D. Project Manager



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Acronyms Qualifiers State Certifications, Accreditations, And Licenses Case Narrative Chain of Custody Total Solids General Chemistry

Metals

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Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M MCL	Modified 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 tr	Total Petroleum Hydrocarbons 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

- ${f F}$ 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.

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

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

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.



Case Narrative

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ALS ENVIRONMENTAL

Client:Alaska Department of Fish and GameProject:Coeur AK BiomonitoringSample Matrix:Sediment

Service Request No.: Date Received: K1609286 08/11/16

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 Matrix/Duplicate Matrix Spike (MS/DMS).

Sample Receipt

One sediment sample was received for analysis at ALS Environmental on 08/11/16. The sample was received in good condition and consistent with the accompanying chain of custody form. The sample was stored in a refrigerator at 4°C upon receipt at the laboratory.

General Chemistry Parameters

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

Total Metals

Relative Percent Difference Exceptions:

The Relative Percent Difference (RPD) for the replicate analysis of Aluminum in the Batch QC sample was outside the normal ALS control limits. The variability in the results was attributed to the heterogeneous character of the sample. Standard mixing techniques were used, but were not sufficient for complete homogenization of this sample.

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

Approved by



Chain of Custody

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Chain of Custody





ADDRESS 1317 South 13th Ave., Kelso, WA 98626

PHONE 1 360 577 7222 FAX 1 360 636 1068 Columbia Analytical Services, Inc. Part of the ALS Group __ A Campbell Brothers Limited Company

Work Order No.:

Project Manager: Kat	te Kanouse							Bill	to:		<u> </u>	Jew .	Alas	Ka			
Client Name: Coeu	r Alaska / AK.	Dept. of Fish a	nd G	ian	<u>e</u>		1	Con	npan	γ;			Spiper				
Address: 802	3ra Street	1						Ado	iress	•	30	231	Lino	on Dr	. Ste	202	
City, State ZIP: Doug	Mas, AK 998	24								te ZIP:		rear					
Email: Kate.	Kanouse@alaska.g	Bo√ Phone:	(901	<u>)469</u>	<u>5-4</u>	290		Ema			Kepp	vers@	coen	r. con	1		
Project Name: COEL	r AK Biomonitor	ring?			<u>.</u>				REC	UEST	ED ANA	LYSIS				0.3.6	TAT
Project Number:	· · · · · · · · · · · · · · · · · · ·																Routine
P.O. Number:							6		.								Same Day ***
Sampler's Name: Kat	e Kanouse						Size										Next Day ***
S/	AMPLE RECEIPT																5 Day
Temperature ('C):	Temp Bla	nk Present	1			+	to t										7 Day
Received Intact:	Yes No N/A	Wet Ice / Blue Ice				N		5	- VS								
Cooler Custody Seals:	Yes No N/A	Total Containers:		S S		12	14	1	F	Í			1		1 1	Î	*** Please call
Sample Custody Seals:	Yes No N/A				E	Metal	D422	Z	q /								for availability
			40. of Containers	PSB 101				pan	pan								Due Date:
Consulta Identification	Mately Date	Time Lab ID	5		18	3	3	6	-								
Sample Identification	Matrix Sampled	Sampled	E OF	518	1 L	S	F		4.								}
			₹ K	18	74718	202	ASTM	8	160								Comments
Lower Johnson Creek	8/8/16	1500	3 x	1 7		×	X	X	X					1-1			
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Total		a, Be, Ca, Cd Co (Cr)	Cu,⊁e,	K, Li,	Mg, M	in, Mo	o, Na _l		<u>יניט</u> י	ာ၊ (၁၉)	<u>isi, sn, sr</u>	<u>, II, V,(</u>	(n)Zr ~	<u>+ H3</u>	Sector Sector Sector	alidDH	e Upon Request
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Cooler Receipt and Preservation Form	IC OUR	<u>/1</u>
Client CORUF Alaska Service Request K16 092	86	
Received: <u>81116</u> Opened: <u>81116</u> By: <u>Dw</u> Unloaded: <u>81116</u>	By: Der	
1. Samples were received via? USPS Fed Ex UPS DHL PDX Courier Hand Delivered 2. Samples were received in: (circle) Cooler Box Envelope Other	NA	·
3. Were <u>custody seals</u> on coolers? NA (Y N If yes, how many and where? ////	<u>NT</u>	
If present, were custody seals intact? (Y) N If present, were they signed and dated?	\sim	N
Raw Corrected. Raw Corrected Corrected Corrected Tracking N Cooler Temp Cooler Temp Temp Blank Factor ID NA Tracking N	umber NA	Filed
18-2 17.8 18.4 18.0 -04 365	1987	
	<u></u>	
4. Packing material: Inserts Baggies Bubble Wrap Gel Packs Wet Ice Dry Ice Sleeves ThAWE	Ξ /	L
 4. Packing material. <i>Insens Buggles Bubble Whap Ger Lacks Werkee Dry ice Steeves</i>	NA (Y)	N
6. Were samples received in good condition (temperature, unbroken)? <i>Indicate in the table below.</i>	NA Y	N
If applicable, tissue samples were received: <i>Frozen Partially Thawed Thawed</i>		1
7. Were all sample labels complete (i.e analysis, preservation, etc.)?	NA Y	Ν
8. Did all sample labels and tags agree with custody papers? Indicate major discrepancies in the table on page 2.	NA Y	Ν
9. Were appropriate bottles/containers and volumes received for the tests indicated?	NAY	Ν
10. Were the pH-preserved bottles (see SMO GEN SOP) received at the appropriate pH? Indicate in the table below	NA Y	Ν
11. Were VOA vials received without headspace? Indicate in the table below.	NA Y	Ν
12. Was C12/Res negative?	NA Y	Ν
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:_____



Total Solids

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Analytical Report

Client:	Alaska Department of Fish and Game		Service Request:	K1609286
Project:	Coeur AK Biomonitoring		Date Collected:	08/8/16
Sample Matrix:	Sediment		Date Received:	08/11/16
Analysis Method:	160.3 Modified		Units:	Percent
Prep Method:	None		Basis:	As Received
		Solids, Total		

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Lower Johnson Creek	K1609286-001	71.9	-	1	08/17/16 14:22	

QA/QC Report

Client:	Alaska Department of Fish and Game	Service Request:K1609286			
Project	Coeur AK Biomonitoring	Date Collected:NA			
Sample Matrix:	Soil	Date Received:NA			
Analysis Method:	160.3 Modified	Units:Percent			
Prep Method:	None	Basis:As Received			
	Replicate Sample Summ Inorganic Parameters				
	Sample Duplic	ate RPD Date			

Sample Name:	Lab Code:	MRL	Result	Result	Average	RPD	Limit	Analyzed	
Batch QC	K1609223-001DUP	-	56.1	55.6	55.9	<1	20	08/17/16	-

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

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

QA/QC Report

Client:	Alaska Department of Fish and Game	Service Request:K1609286
Project	Coeur AK Biomonitoring	Date Collected:NA
Sample Matrix:	Sediment	Date Received:NA
Analysis Method:	160.3 Modified	Units:Percent
Prep Method:	None	Basis:NA
	Replicate Sample Summary Inorganic Parameters Sample Duplicate	RPD Date

			Sample	Duplicate			KPD	Date	
Sample Name:	Lab Code:	MRL	Result	Result	Average	RPD	Limit	Analyzed	_
Batch QC	K1609256-001DUP	-	41.2	41.1	41.2	<1	20	08/17/16	•

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

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



General Chemistry

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Analytical Report

Client:	Alaska Department of Fish and Game	Service Request: K1609286
Project:	Coeur AK Biomonitoring	Date Collected: 08/8/16
Sample Matrix:	Sediment	Date Received: 08/11/16
Analysis Method: Prep Method:	160.4 Modified None	Units: Percent Basis: Dry, per Method

Solids, Total Volatile

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Lower Johnson Creek	K1609286-001	2.30	0.010	1	08/12/16 13:45	
Method Blank	K1609286-MB	ND U	0.010	1	08/12/16 13:45	

QA/QC Report

Client: Project	Alaska Department of Fish Coeur AK Biomonitoring	and Game			Service Reques		
Sample Matrix:	Sediment				Date Receive	d: 08/11	1/16
					Date Analyze	d: 08/12	2/16
		Replic	ate Sample Su	nmary			
		General	l Chemistry Pa	rameters			
Sample Name:	Lower Johnson Creek				Uni	ts: Perc	ent
Lab Code:	K1609286-001				Bas	is: Dry,	per Method
			Sample	Duplicate Sample K1609286- 001DUP			
Analyte Name	Analysis Method	MRL	Result	Result	Average	RPD	RPD Limit
Solids, Total Volatile	160.4 Modified	0.010	2.30	2.50	2.40	8	20

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

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

ALS Group USA, Corp. dba ALS Environmental Analytical Report

Client:Alaska Department of Fish and GameProject:Coeur AK BiomonitoringSample Matrix:Sediment

 Service Request:
 K1609286

 Date Collected:
 8/8/2016

 Date Received:
 8/11/2016

 Date Analyzed:
 8/30/2016

Particle Size Determination ASTM D422

Sample Name: Lower Johnson Creek Lab Code: K1609286-001

Gravel and Sand (Sieve Analysis)

Description	Sieve Size	Sieve Size	
		Weight (g)	Passing
Gravel (19.0 mm)	No.3/4''(19.0 mm)	0.0000	100.00
Gravel (9.50 mm)	No.3/8''(9.50 mm)	0.0000	100.00
Gravel, Medium	No.4 (4.75 mm)	0.0000	100.00
Gravel, Fine	No.10 (2.00 mm)	0.0000	100.00
Sand, Very Coarse	No.20 (0.850 mm)	0.3049	98.53
Sand, Coarse	No.40 (0.425 mm)	0.4190	96.52
Sand, Medium	No.60 (0.250 mm)	1.7426	88.13
Sand, Fine	No.140 (0.106 mm)	8.2435	48.47
Sand, Very Fine	No.200 (0.0750 mm)	3.1642	33.25

Silt and Clay

(Hydrometer Analysis)

Particle Diameter	Percent Passing
0.074 mm	30.57
0.005 mm	5.14
0.001 mm	0.00

ALS Group USA, Corp. dba ALS Environmental Analytical Report

Client:Alaska Department of Fish and GameProject:Coeur AK BiomonitoringSample Matrix:Sediment

 Service Request:
 K1609286

 Date Collected:
 8/8/2016

 Date Received:
 8/11/2016

 Date Analyzed:
 8/30/2016

Particle Size Determination ASTM D422

Sample Name: Lower Johnson Creek Lab Code: K1609286-001DUP

Gravel and Sand (Sieve Analysis)

Description	Sieve Size		Percent	
		Weight (g)	Passing	
Gravel (19.0 mm)	No.3/4''(19.0 mm)	0.0000	100.00	
Gravel (9.50 mm)	No.3/8''(9.50 mm)	0.0000	100.00	
Gravel, Medium	No.4 (4.75 mm)	0.0000	100.00	
Gravel, Fine	No.10 (2.00 mm)	0.0000	100.00	
Sand, Very Coarse	No.20 (0.850 mm)	0.1436	99.29	
Sand, Coarse	No.40 (0.425 mm)	0.3416	97.60	
Sand, Medium	No.60 (0.250 mm)	1.3571	90.87	
Sand, Fine	No.140 (0.106 mm)	7.7890	52.27	
Sand, Very Fine	No.200 (0.0750 mm)	3.0595	37.11	

Silt and Clay

(Hydrometer Analysis)

Particle Diameter	Percent Passing
0.074 mm	33.00
0.005 mm	5.24
0.001 mm	0.00

Analytical Report

Client:	Alaska Department of Fish and Game	Service Reque	st: K1609286
Project:	Coeur AK Biomonitoring	Date Collecto	d: 08/8/16
Sample Matrix:	Sediment	Date Receive	d: 08/11/16
Analysis Method:	PSEP Sulfide	Uni	t s: mg/Kg
Prep Method:	Method	Bas	is: Dry
		Sulfide, Total	

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Lower Johnson Creek	K1609286-001	ND U	2.5	1	08/15/16 20:07	8/15/16	
Method Blank	K1609286-MB	ND U	1.0	1	08/15/16 20:07	8/15/16	

Client: Project Sample Matrix:	Alaska Department of Fis Coeur AK Biomonitoring Sediment		Service Request Date Collected Date Received Date Analyzed						
Replicate Sample Summary General Chemistry Parameters									
Sample Name: Lab Code:	Lower Johnson Creek K1609286-001			Duplicate	Units: mg/Kg Basis: Dry				
Analyte Name	Analysis Method	MRL	Sample Result	Sample K1609286- 001DUP Result	8		RPD Limit		
Sulfide, Total	PSEP Sulfide	2.2	ND U	ND U	NC	NC	20		

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

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

QA/QC	Report
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					с • р		V1 (0000)		
Client:	r	ent of Fish and Gan	ne		Service Re	equest:	K1609286		
Project	Coeur AK Biom	nonitoring			Date Col	lected:	08/08/16		
Sample Matrix:	Sediment				Date Rec	08/11/16			
					Date Ana	alyzed:	08/15/16		
		Tr	riplicate Sample	Summary					
General Chemistry Parameters									
Sample Name:	Lower Johnson	Creek				Units:	mg/Kg		
Lab Code:	K1609286-001				Basis: Dry				
Analysis Method:	PSEP Sulfide								
Prep Method:	Method								
			Duplicate K1609286-	Triplicate K1609286-					
Analyte Name	MRL	Sample Result	001DUP Result	001TRP Result	Average	RSI	D RSD Limit		
Sulfide, Total	2.4	ND	ND	ND	NC	NC	20		

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

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

QA/QC Report

Client: Project: Sample Matrix:	Alaska Depar Coeur AK Bi Sediment		a and Game			Dat Dat Dat	vice Reque e Collecteo e Received e Analyzeo	l: 03 : 03 l: 03	1609286 8/08/16 8/11/16 8/15/16	
			D H (e Extracte	d: 08	8/15/16	
Duplicate Matrix Spike Summary Sulfide, Total										
Sample Name:	Lower Johnso	on Creek		Sumue, I			Unit	s: m	g/Kg	
Lab Code:	K1609286-00)1					Basi		ry	
Analysis Method:	PSEP Sulfide	•								
Prep Method:	Method									
				x Spike 6-001MS		Duplicate M K1609286	-	e		
	Sample		Spike			Spike		% Rec		RPD
Analyte Name	Result	Result	Amount	% Rec	Result	Amount	% Rec	Limits	RPD	Limit
Sulfide, Total	ND U	850	970	88	830	970	86	28-175	3	20

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

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

Client: Project: Sample Matrix:	Alaska Department of Fish and Gar Coeur AK Biomonitoring Sediment	ne	Service Req Date Analyz Date Extrac	ed:	K160928 08/15/16 08/15/16	-				
Lab Control Sample Summary										
Sulfide, Total										
Analysis Method:	PSEP Sulfide		Units:		mg/Kg					
Prep Method:	Method		Basis:		Dry					
			Analysis Lot		510030					
			Spike			% Rec				
Sample Name	Lab Code	Result	Amount	% Rec		Limits				
Lab Control Sample	K1609286-LCS	359	400	90		39-166				

Analytical Report

Client:	Alaska Department of Fish and Game	Service Request:	K1609286
Project:	Coeur AK Biomonitoring	Date Collected:	08/8/16
Sample Matrix:	Sediment	Date Received:	08/11/16
Analysis Method:	PSEP TOC	Units:	Percent
Prep Method:	ALS SOP	Basis:	Dry, per Method
	Carbon, Total Organic (TOC)		

Date Date Sample Name Lab Code Result MRL Dil. Analyzed Extracted Q Lower Johnson Creek K1609286-001 0.422 0.050 1 08/19/16 11:00 8/18/16 Method Blank K1609286-MB ND U 0.050 1 08/19/16 11:00 8/18/16

QA/QC Report

Client:	Alaska Departi	ment of Fish ar	nd Game			Service Request:	K16092	286
Project	Coeur AK Bio	monitoring				Date Collected:	NA	
Sample Matrix:	Sediment					Date Received:	NA	
						Date Analyzed:	08/19/1	6
			Replicate	Sample Sumn	nary			
			General Ch	emistry Paran	neters			
Sample Name:	Batch QC					Units	Percer	ıt
Lab Code:	K1609115-012	2				Basis	Dry, p	er Method
		Analysis		Sample	Duplicate Sample K1609115- 012DUP			
Analyte Name		Method	MRL	Result	Result	Average	RPD	RPD Limit
Carbon, Total Organic (T	OC)	PSEP TOC	0.050	1.26	1.26	1.26	<1	27

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

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

QA/QC Report

				C - C				
Client:	Alaska Departm	ent of Fish	and Game			Service Requ	est: K160	9286
Project	Coeur AK Biom	onitoring				Date Collect	ted: NA	
Sample Matrix:	Sediment					Date Receiv	ed: NA	
						Date Analyz	ed: 08/19	/16
			Triplica	ate Sample Sumr	nary			
			General	Chemistry Parar	neters			
Sample Name:	Batch QC					Un	its: Perce	nt
Lab Code:	K1609115-012					Ba	sis: Dry,	per Method
Analysis Method:	PSEP TOC							
Prep Method:	ALS SOP							
Analyte Name		MRL	Sample Result	Duplicate K1609115- 012DUP	Triplicate K1609115- 012TRP	Average	RSD	RSD Limit
Analyte Name			Kesuit	Result	Result	Average	KSD	KSD Lillit
Carbon, Total Organ	ic (TOC)	0.050	1.26	1.26	1.25	1.26	<1	27

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

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

QA/QC Report

Client:	Alaska Department of	Fish and Ga	me			Service	Request:	K160	9286	
Project:	Coeur AK Biomonitori	ng				Date Co	llected:	N/A		
Sample Matrix:	Sediment					Date Re	ceived:	N/A		
						Date An	alyzed:	08/19	/16	
						Date Ex	tracted:	08/18	/16	
	Duplicate Matrix Spike Summary									
		Ca	arbon, Total	Organic	(TOC)					
Sample Name:	Batch QC						Units:	Perce	nt	
Lab Code:	K1609115-012						Basis:	Dry, j	per Meth	od
Analysis Method:	PSEP TOC									
Prep Method:	ALS SOP									
			latrix Spike 09115-012N		-	licate Matri 1609115-012	-			
	Sample		Spike			Spike		% Rec		RPD
Analyte Name	Result	Result	Amount	% Rec	Result	Amount	% Rec	Limits	RPD	Limit
Carbon, Total Organi	c (TOC) 1.26	4.98	3.73	100	4.86	3.64	99	69-123	1	27

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

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

Client: Project: Sample Matrix:	Alaska Department of Fish and Gan Coeur AK Biomonitoring Sediment	ne	Service Requ Date Analyze Date Extract	ed:	K1609286 08/19/16 08/18/16
		Control Sample Summary bon, Total Organic (TOC)			
Analysis Method: Prep Method:	PSEP TOC ALS SOP		Units: Basis: Analysis Lota	:	Percent Dry, per Method 510765
Sample Name Lab Control Sample	Lab Code K1609286-LCS	Result 0.563	Spike <u>Amount</u> 0.582	% Rec 97	% Rec Limits 74-118



Metals

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Analytical Report

Client:	Alaska Department of Fish and Game	Service Request:	K1609286
Project:	Coeur AK Biomonitoring	Date Collected:	08/08/16 15:00
Sample Matrix:	Sediment	Date Received:	08/11/16 09:45
Sample Name: Lab Code:	Lower Johnson Creek K1609286-001	Basis:	Dry

Total Metals

	Analysis							
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	9470	mg/Kg	110	500	09/13/16 11:57	09/02/16	
Arsenic	200.8	13.0	mg/Kg	0.28	5	09/13/16 11:53	09/02/16	
Cadmium	200.8	0.150	mg/Kg	0.011	5	09/13/16 11:53	09/02/16	
Chromium	200.8	18.9	mg/Kg	0.11	5	09/13/16 11:53	09/02/16	
Copper	200.8	76.3	mg/Kg	0.057	5	09/13/16 11:53	09/02/16	
Lead	200.8	8.41	mg/Kg	0.028	5	09/13/16 11:53	09/02/16	
Mercury	7471B	0.020	mg/Kg	0.020	1	09/02/16 12:00	09/02/16	
Nickel	200.8	15.1	mg/Kg	0.11	5	09/13/16 11:53	09/02/16	
Selenium	200.8	ND U	mg/Kg	0.57	5	09/13/16 11:53	09/02/16	
Silver	200.8	0.574	mg/Kg	0.011	5	09/13/16 11:53	09/02/16	
Zinc	200.8	65.7	mg/Kg	0.28	5	09/13/16 11:53	09/02/16	

Analytical Report

Client:	Alaska Department of Fish and Game	Service Request:	K1609286
Project:	Coeur AK Biomonitoring	Date Collected:	NA
Sample Matrix:	Sediment	Date Received:	NA
Sample Name: Lab Code:	Method Blank KQ1610690-01	Basis:	Dry

Total Metals

	Analysis							
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	ND U	mg/Kg	2.0	5	09/13/16 11:45	09/02/16	
Arsenic	200.8	ND U	mg/Kg	0.50	5	09/13/16 11:45	09/02/16	
Cadmium	200.8	ND U	mg/Kg	0.020	5	09/13/16 11:45	09/02/16	
Chromium	200.8	ND U	mg/Kg	0.20	5	09/13/16 11:45	09/02/16	
Copper	200.8	ND U	mg/Kg	0.10	5	09/13/16 11:45	09/02/16	
Lead	200.8	ND U	mg/Kg	0.050	5	09/13/16 11:45	09/02/16	
Nickel	200.8	ND U	mg/Kg	0.20	5	09/13/16 11:45	09/02/16	
Selenium	200.8	ND U	mg/Kg	1.0	5	09/13/16 11:45	09/02/16	
Silver	200.8	ND U	mg/Kg	0.020	5	09/13/16 11:45	09/02/16	
Zinc	200.8	ND U	mg/Kg	0.50	5	09/13/16 11:45	09/02/16	

Analytical Report

Client:	Alaska Department of Fish and Game	Service Request: K16	09286
Project:	Coeur AK Biomonitoring	Date Collected: NA	
Sample Matrix:	Sediment	Date Received: NA	
Sample Name: Lab Code:	Method Blank KQ1610699-01	Basis: Dry	

Total Metals

	Analysis		T T 1 /		5.1			0
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Mercury	7471B	ND U	mg/Kg	0.020	1	09/02/16 11:56	09/02/16	

QA/QC Report

Client:	Alaska Department of Fish and Game	Service Request: K1609286
Project	Coeur AK Biomonitoring	Date Collected: NA
Sample Matrix:	Soil	Date Received: NA
		Date Analyzed: 09/13/16

Replicate Sample Summary Total Metals

Sample Name:	Batch QC					Units: mg/	Kg
Lab Code:	K1609967-001					Basis: Dry	
Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1610690-03 Result	Average	RPD	RPD Limit
Aluminum	200.8	20	275	364	320	28 *	20
Arsenic	200.8	5.0	ND U	ND U	ND	-	20
Cadmium	200.8	0.20	ND U	ND U	ND	-	20
Chromium	200.8	2.0	8.4	10.0	9.2	17	20
Copper	200.8	1.00	114	124	119	9	20
Lead	200.8	0.50	1.57	1.95	1.76	22	20
Nickel	200.8	2.0	59.6	66.6	63.1	11	20
Selenium	200.8	10.0	ND U	ND U	ND	-	20
Silver	200.8	0.20	0.23	ND U	NC	NC	20
Zinc	200.8	5.0	562	607	585	8	20

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

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

QA/QC Report

Client: Project	Alaska Department Coeur AK Biomoni		ame			Request: H	
Sample Matrix:	Soil	6			Date Re	eceived: N	NA
					Date Ar	nalyzed: (09/02/16
		R	eplicate Samp	ole Summary			
			Total M	letals			
Sample Name:	Batch QC					Units:	mg/Kg
Lab Code:	K1609479-001					Basis:	Dry
Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1610699-04 Result	Average	RPD	RPD Limit
Mercury	7471B	0.020	0.043	0.042	0.043	4	20

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

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

QA/QC Report

Client:	Alaska Department of Fish and Game	Service Request:	K1609286
Project:	Coeur AK Biomonitoring	Date Collected:	N/A
Sample Matrix:	Soil	Date Received:	N/A
		Date Analyzed:	09/13/16
		Date Extracted:	09/2/16
	Matrix Spike Summary		
	Total Metals		
Sample Name:	Batch QC	Units:	mg/Kg
Lab Code:	K1609967-001	Basis:	Dry
Analysis Method:	200.8		
Prep Method:	EPA 3050B		

Matrix Spike

KQ1610690-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	275	3860	3920	92	70-130
Arsenic	ND U	905	980	92	70-130
Cadmium	ND U	94.3	98.0	96	70-130
Chromium	8.4	379	392	95	70-130
Copper	114	584	489	96	70-130
Lead	1.57	950	980	97	70-130
Nickel	59.6	982	980	94	70-130
Selenium	ND U	912	980	93	70-130
Silver	0.23	92.1	98.0	94	70-130
Zinc	562	1470	980	93	70-130

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

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

QA/QC Report

Client: Project: Sample Matrix:	Alaska Depar Coeur AK Big Soil		n and Game			Dat Dat Dat	vice Reque e Collected e Received e Analyzed e Extracted	l: N/. : N/. l: 09.		
			Duplicat	e Matrix S	pike Sumr				2,10	
				Total Me	etals					
Sample Name:	Batch QC						Unit	s: mg	g/Kg	
Lab Code:	K1609479-00)1					Basi	s: Dr	у	
Analysis Method:	7471B									
Prep Method:	Method									
				x Spike 0699-05		Duplicate M KQ1610	-	e		
	Sample		Spike			Spike		% Rec		RPD
Analyte Name	Result	Result	Amount	% Rec	Result	Amount	% Rec	Limits	RPD	Limit
Mercury	0.043	0.506	0.496	93	0.485	0.496	89	80-120	4	20

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

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

Client: Project: Sample Matrix:	Alaska Department of Fish an Coeur AK Biomonitoring Sediment	l Game	Service Request: Date Analyzed: Date Extracted:	K1609286 09/13/16 09/02/16
		Lab Control Sample Summary		
		Total Metals		
Analysis Method:	200.8		Units:	mg/Kg
Prep Method:	EPA 3050B		Basis:	Dry
-			Analysis Lot:	513863
		Lab Control Sample KQ1610690-02		
Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	5350	7930	67	39-161
Arsenic	91.8	98.5	93	69-145
Cadmium	130	146	89	73-127
Chromium	159	182	87	71-130
Copper	95.6	106	90	75-125
Lead	120	130	92	72-127
Nickel	133	149	90	73-127
Selenium	150	154	97	68-132
Silver	36.0	40.9	88	66-134
Zinc	178	191	93	70-130

Client: Project: Sample Matrix:	Alaska Department of Fi Coeur AK Biomonitorin Sediment			Service Request: Date Analyzed: Date Extracted:	K1609286 09/02/16 09/02/16
			ol Sample Summary		
		1	otal Metals		
Analysis Method:	7471B			Units:	mg/Kg
Prep Method:	Method			Basis:	Dry
				Analysis Lot:	512823
		1	Lab Control Sample KQ1610699-02		
Analyte Name	R	esult	Spike Amount	% Rec	% Rec Limits
Mercury	0	.512	0.500	102	80-120

Client: Project: Sample Matrix:	Alaska Department of Fish an Coeur AK Biomonitoring Sediment	d Game	Service Request: Date Analyzed: Date Extracted:	K1609286 09/02/16 09/02/16
		Lab Control Sample Summary Total Metals		
Analysis Method:	7471B		Units:	mg/Kg
Prep Method:	Method		Basis:	Dry
			Analysis Lot:	512823
		Lab Control Sample KQ1610699-03		
Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
Mercury	7.15	7.10	101	51-149

BIOASSAY REPORT

CHRONIC DEFINITIVE SEDIMENT BIOASSAYS CONDUCTED August 22 through September 1, 2016

Prepared for

COEUR ALASKA / ALASKA DEPARTMENT OF FISH AND GAME KENSINGTON MINE DOUGLAS, ALASKA

Prepared by



Applied Sciences Laboratory (ASL)

1100 NE Circle Boulevard, Suite 300 Corvallis, Oregon 97330 541-768-3160

NELAC #OR100022

Report Date: September 21, 2016 Lab I.D. No. B3584

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APPENDIX C. CHAIN OF CUSTODY

1

INTRODUCTION

CH2M HILL conducted 10 day chronic definitive sediment bioassays from August 22 through September 31, 2016, on samples provided by Coeur Alaska / Alaska Department of Fish and Game, Douglas, Alaska on behalf of the Kensington Gold Mine. The tests were conducted using the freshwater amphipod (*Hyalella azteca*) and the freshwater chironomid (*Chironomus tentans*).

OVERVIEW OF REGULATORY GUIDANCE

The following provides an overview and excerpts of applicable permit specifics, regulatory guidance, and other relevant information. This is intended only as a helpful guide, from a laboratory perspective, for understanding test outcomes. The final responsibility for interpretation of results remains with the client and/or regulatory agency.

The following guidance is taken from CH2M's reading of the APDES permit for Kensington Mine (permit #AK0050571).

1.5.2.3 Biological Testing of Sediments:

- 1.5.2.3.1 Sediment samples will undergo acute toxicity testing to assess the relative toxicity ... The following bioassays are required:
 - o Test method 100.1 : Hyalella azteca 10-day survival test for sediments
 - Test method 100.2 : Chironomus dilutus 10-day survival test for sediments
- 1.5.2.3.2 Test methods ... shall be in accordance with Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates, EPA/600/R-94/024.

SUMMARY OF TEST RESULTS

Exhibit 1 provides a summary of the final test results.

EXHIBIT 1 Summary of Chronic Test Results

Sample ID	Species	NOEC (%)	LOEC (%)
Lower Sherman Creek	H. azteca	100%	> 100%
Lower Sherman Creek	C. tentans	< 100%	100%
East Fork Slate Creek	H. azteca	100%	> 100%
East Fork Slate Creek	C. tentans	100%	> 100%
Lower Johnson Creek	H. azteca	100%	> 100%
Lower Johnson Creek	C. tentans	100%	> 100%
Lower Slate Creek	H. azteca	100%	> 100%
Lower Slate Creek	C. tentans	100%	> 100%
Upper Slate Creek	H. azteca	100%	> 100%
Upper Slate Creek	C. tentans	100%	> 100%

Note: acronyms are as defined below Exhibit 2.

More detailed information is provided in the Acute Results and Data Interpretation sections.

ACRONYM DEFINITIONS (from EPA guidance):

NOEC = No Observed Effect Concentration: The highest test concentration that causes no observable adverse effects on the test organisms (i.e. no statistically significant reduction from the control).

LOEC = Low Observed Effect Concentration: The lowest test concentration that does cause an observable adverse effect on the test organisms (i.e. is statistically significant reduction from the control).

METHODS AND MATERIALS

TEST METHODS

The tests were performed according to: *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates*, Second Edition, EPA 600/R-99/064 (EPA 2000). (Most recent update to the EPA 600/R-94/024 method sited in the permit)

Note: The test species *Chironomus dilutus* was replaced with *Chironomus tentans* in the newer version of the protocol and was used for this testing.

DEVIATIONS FROM PROTOCOLS

Deviations from <u>required</u> procedures in the test methods:

• None noted.

Deviations from <u>recommended</u> procedures in the test methods:

 Not all of the samples were within the EPA <u>recommended</u> holding temperature range of 0 to 6 °C upon arrival at the laboratory. See notation in Sample Collection and Storage below.

TEST DESIGN

The following summarizes the conditions used for both overall testing and the specifics for each test (observations and notations can be found on the datasheets in Appendix A):

Overall Test Design:

• Acute tests: 100 percent sample + dilution sediment for the control.

H. azteca 10-day sediment test:

- Source: Chesapeake Cultures, Nayes, Virginia
- Age: 7 to 14 days old (required), within a 1-2 age range (recommended)
- Design: Eight test vessels per concentration (a minimum of 4 required), ten organisms per vessel
 - o 100 ml of sediment per vessel
 - o 175 ml of overlying water (Reconstituted Moderately Hard water)
- Overlying Water Renewal: Twice Daily
- Monitoring:
 - Initiation and Termination: Hardness, Alkalinity, Ammonia, DO, pH, Conductivity, and Temperature in the overlying water.

- Daily: DO and Temperature in pre-renewal solutions in the overlying water, all concentrations.
- o Termination: Survival and Dry Weight.
- Feeding: 1.0 ml YCT per vessel daily.
- Termination: 10 days after test initiation.
- Endpoints: Survival and Growth (average dry weight per surviving organism)

C. tentans 10-day sediment test:

- Source: Aquatic Biosystems, Fort Collins, Colorado
- Age: 2nd to 3rd instar (~10 days old)
- Design: Eight test vessels per concentration (a minimum of 4), ten organisms per vessel
 - o 100 ml of sediment per vessel.
 - o 175 ml of overlying water (Reconstituted Moderately Hard water)
- Overlying Water Renewal: Twice Daily
- Monitoring:
 - Initiation and Termination: Hardness, Alkalinity, Ammonia, DO, pH, Conductivity, and Temperature in the overlying water.
 - Daily: DO and Temperature in pre-renewal solutions in the overlying water, all concentrations.
 - o Termination: Survival and Ash-Free Dry Weight (AFDW).
- Feeding: 1.5 ml of a 4 g/L TetraMin slurry per vessel daily.
- Termination: 10 days after test initiation.
- Endpoints: Survival and AFDW (average AFDW per surviving organism)

CONTROL SEDIMENT AND OVERLYING WATER

The dilution water used was the standard culture water used by CH2M-ASL:

• Reconstituted, moderately hard water (as per EPA protocol) with a total hardness of 80 to 100 mg/L as CaCO₃ and an alkalinity of 60 to 70 mg/L as CaCO₃.

The dilution sediment used was field collected sediment from Beaver Creek, upstream of Yaquina bay, near the town of Newport, Oregon.

• The Beaver Creek sediment was press sieved to remove indigenous organisms.

SAMPLE COLLECTION AND STORAGE

Samples were collected by Coeur Alaska / Alaska Department of Fish and Game personnel. The samples were accepted as scheduled by CH2M's Applied Sciences Laboratory. Chain of Custody and Sample Receipt Records are provided in Appendix C.

- <u>Not</u> all samples were received within the EPA recommended 0 to 6 °C range.
 - The sample collected on Aug. 8, 2016 was received at 15.2 °C which is outside of the EPA recommended 0 to 6 °C range.
 - The Jul. 6, 2016 and Jul. 5, 2016 samples were received in the 0 to 6 °C range.

- Following receipt, the samples were stored in the dark at 0 to 6 °C until test solutions were prepared and tested.
- All testing was initiated within the EPA recommended 8 week holding time from sample collection.

SAMPLE PREPARATION

Samples used during these tests were:

• Homogenized prior to use with all large material (~ 1 inch +) removed.

DATA ANALYSIS

The statistical analyses performed for the acute tests were those outlined in *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates*, Second Edition, EPA 600/R-99/064

- The specific statistical analysis and CETIS version used for each endpoint evaluation is listed with the statistical outputs included with each test in Appendix A.
- If any additional analysis methods were also used, an explanation of the rationale and reference to the source method is included with the presentation of those results below.

RESULTS AND DISCUSSION

The raw data sheets for all tests are presented in Appendix A.

ACUTE BIOASSAYS

Table 1 summarizes the survival data for the amphipod test.

Table 1 Amphipod (<i>H. azteca</i>) Bioassay Data						
Sample Concentration (%)	10 day % Survival	10 day Dry Weight (mg)				
Control	96.3	0.0914				
Lower Sherman Creek	95.0	0.0929				
East Fork Slate Creek	91.3	0.0990				
Lower Johnson Creek	91.3	0.0917				
Lower Slate Creek	90.0	0.0976				
Upper Slate Creek	85.0	0.0929				

Statistical analysis in accordance with the EPA protocol results no statistically significant reduction in survival or growth for the following samples:

- Lower Sherman Creek
- East Fork Slate Creek
- Lower Johnson Creek
- Lower Slate Creek
- Upper Slate Creek

Daily mean test temperatures remained at $23\pm1^{\circ}$ C, and instantaneous temperatures remained at $23\pm3^{\circ}$ C, for the tests. The dissolved oxygen levels in the tests remained above the EPA recommended minimum 2.5 mg/L throughout the test period.

The *H. azteca* test meets Test Acceptability Criteria (TAC) of a minimum 80 percent control survival and measureable growth (initial dry weights were 0.0645 mg). Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

Table 2Chironomid (C. tentans) Bioassay Data						
Sample Concentration (%)	10 day % Survival	10 day Ash- Free Dry Weight (mg)				
Control	100	1.473				
Lower Sherman Creek	83.8 ^a	1.420				
East Fork Slate Creek	93.8	1.409				
Lower Johnson Creek	97.5	1.499				
Lower Slate Creek	96.3	1.470				
Upper Slate Creek	95.0	1.403				
^a Indicates a statistically sign Equal Variance t Two-Sam		ntrol at p equal to 0.05 using				

Table 2 summarizes the survival data for the chironomid test.

Statistical analysis in accordance with the EPA protocol results in <u>no</u> statistically significant reduction in survival or growth for the following samples:

- East Fork Slate Creek
- Lower Johnson Creek
- Lower Slate Creek
- Upper Slate Creek

Statistical analysis in accordance with the EPA protocol <u>did</u> result in a statistically significant reduction in survival or growth for the following samples:

• Lower Sherman Creek

Daily mean test temperatures remained at $23\pm1^{\circ}$ C, and instantaneous temperatures remained at $23\pm3^{\circ}$ C, for the tests. The dissolved oxygen levels in the tests remained above the EPA recommended minimum 2.5 mg/L throughout the test period.

The *C. tentans* test meets Test Acceptability Criteria (TAC) of a minimum 70 percent control survival and minimum Ash-free dry weight (AFDW) of 0.48 mg. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

REFERENCE TOXICANT TESTS

Reference toxicant (reftox) testing is performed to document both initial and ongoing laboratory performance of the test method(s). While the health of the test organisms is primarily evaluated by the performance of the laboratory control, reftox test results also may be used to assess the health and sensitivity of the test organisms. Reftox test results within their respective cumulative summary (Cusum) chart limits are indicative of consistent laboratory performance and normal test organism sensitivity.

The results of the reftox tests indicate that the test organisms were within their respective cusum chart limits based on EPA guidelines. This demonstrates ongoing laboratory proficiency of the test methods and suggests normal test organism sensitivity in the associated client testing.

The *H. azteca* and *C. tentans* reftox tests were conducted using potassium chloride. The data sheets for the reference toxicant tests are provided in Appendix B.

Referen	Table 3 nce Toxicant Tests (g/L)	
Species	LC50	Control Chart
H. azteca	0.309	0.280 to 0.439
C. tentans	6.12	1.71 to 7.24

Table 3 summarizes the reference toxicant test results and Cusum chart limits.

APPENDIX A

RAW DATA SHEETS

Test Species/ID Hyalle		Kensington				Test Initiation: Date	8-22-16	Test Ten	Test Termination: Date	9-1-1-6
ID Field er ID De Fast Fork Slate Creek J	Hyallela azteca			AMP B(9					
ID Field er ID De Fast Fork Slate Creek J									/	
ID Field er ID Di Fast Fork Slate Creek J	Sample Information	mation				Test		ID#	ID#	ID#
er	Collected	Total Residual Ammonia Chlorine (mg/l) NH ₃ -N	Ammonia NH ₃ -N	70	1	Species Information	AMP 86			
	3 Time	As As Received / Dechlor.	mg/l	CaCO ₃	caco ₃	Organism Age at	7 to 14 days			
	1,1300	- / -	See Titrs	See Titration and Ammonia	monia	Initiation	(1 day range)			
B3584-02 Upper Slate Creek 7-6-1(7-6-16 1500			sheet		Test Container Size	300 ml			
B3584-03 Lower Sherman Creek 7-6-16 1000	1000	- / -	B	1	e e	Test Volume	100 ml sample, 175 ml overlving			
B3584-04 Lower Slate Creek	7-5-16590	- / -	I	I	1		water			
B3584-05 Lower Johnson Creek & A-1 L	1530	- / -	I	1	1	Feeding: Type	1 ml YCT			- -
		/				Amount	daily			
		\ \								
		/				Aeration: Began	Such			
		/		-		Amount	١			
		/				Dilution Water ID#	1340, 4397			
		/				Acclimation Period	3 days			
		/				Test Location	G(#			
		/				Initial Size (mg/org)	Sh90'Q			
			Hardness	Alkalinity	Initial	Comments: \square Indicates the following action was taken, (\square Indicates action not taken):	ates the following a	ction was taken,	(Indicates action	n not taken
Dilution Water		ID#	mg/l as	mg/l as	Ηd					-
			caco ₃	CaCO ₃		8-21-16-	Selimit	added to T	Jars > diluter	Min
Dilution Sediment Rewer Creek		4380	1	1	1	worter a	added MITS/	Tw /	400	
Recon MH (FHM)		4397	50	66	25		2			
		しっしつ	ণত	66	52					
		2020	26	66	9.2					
		4403	20	64	1,1		Water Qui	Water Quality Meters Used/ID#	d/ID#	
at -		407	74	66	4,6	Dissolved Oxygen)xygen <u># 1</u>	HqHd	Conductivity	#2

Doc. Control ID: ASL1119-0614

	Hyallela	RANDOMIZA	TION SHEET		
Client:	Kensington		Test Start Date:		
Laboratory ID:	Field ID:	Alternate ID / Dilutions:	Replicate ID:	Random Number	Test Chamber Number:
Sediment Control	Beaver Creek	Control	D	0.96386	3
Sediment Control	Beaver Creek	Control	A	0.87687	7
Sediment Control	Beaver Creek	Control	B	0.84599	10
Sediment Control	Beaver Creek	Control	E	0.78946	14
Sediment Control	Beaver Creek	Control	F	0.64025	19
Sediment Control	Beaver Creek	Control	C	0.57624	22
Sediment Control	Beaver Creek	Control	Н	0.11533	41
Sediment Control	Beaver Creek	Control	G	0.03380	45
B3584-05	Lower Johnson Creek		Н	0.98837	2
B3584-05	Lower Johnson Creek		E	0.60252	21
B3584-05	Lower Johnson Creek		A	0.47825	28
B3584-05	Lower Johnson Creek		С	0.33275	33
B3584-05	Lower Johnson Creek		G	0.29038	34
B3584-05	Lower Johnson Creek		D	0.08595	42
B3584-05	Lower Johnson Creek		F	0.04697	44
B3584-05	Lower Johnson Creek		В	0.00317	48
B3584-04	Lower Slate Creek		F	0.99934	1
33584-04	Lower Slate Creek		D	0.84256	11
33584-04	Lower Slate Creek		H	0.77387	15
33584-04	Lower Slate Creek		B	0.54258	24
B3584-04	Lower Slate Creek		E	0.50834	26
B3584-04	Lower Slate Creek		A	0.47836	27
B3584-04	Lower Slate Creek		G	0.45783	31
B3584-04	Lower Slate Creek		C C	0.06878	43
B3584-03	Lower Sherman Creek		<u>D</u>	0.89121	5
B3584-03	Lower Sherman Creek		C	0.89107	6
B3584-03	Lower Sherman Creek		0	0.85573	9
B3584-03	Lower Sherman Creek		A	0.80200	13
B3584-03	Lower Sherman Creek		G	0.46815	29
B3584-03	Lower Sherman Creek		В	0.28869	35
33584-03 33584-03					
	Lower Sherman Creek Lower Sherman Creek		B F	0.23766	37
33584-03				0.19028	39
33584-02	Upper Slate Creek		H	0.94389	4
33584-02	Upper Slate Creek		E	0.70720	16
33584-02	Upper Slate Creek		<u>A</u>	0.66646	17
33584-02	Upper Slate Creek		B	0.60460	20
33584-02	Upper Slate Creek		D	0.53838	25
33584-02	Upper Slate Creek		F	0.46329	30
33584-02	Upper Slate Creek		G	0.27055	36
33584-02	Upper Slate Creek		C	0.16596	40
33584-01	East Fork Slate Creek		E	0.87374	8
33584-01	East Fork Slate Creek		A	0.81221	12
33584-01	East Fork Slate Creek		В	0.66528	18
33584-01	East Fork Slate Creek		С	0.54494	23
33584-01	East Fork Slate Creek		D	0.35681	32
33584-01	East Fork Slate Creek		F	0.20421	38
33584-01	East Fork Slate Creek		G	0.01514	46
33584-01	East Fork Slate Creek		H	0.00640	47
			Z		
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Client Sample Description:		_ Species ID# _	amp 8(, 2/zz/11			
Laboratory ID		dness s CaCO3) Final		Alkalinity (mg/L as CaCO ₃) Initial Final		monia 18 NH3-N) Final
Sediment Control	BD	91	59	67	0,13	0,30
B3584-01	111	105	24	96	<i>D.</i> 4D	0.27
B3584-02	101	97	80	81	0,16	0.65
B3584-03	95	22	70	74	<0,10	0.20
B3584-04	93	47	69	68	20,10	<i>20,10</i>
B3584-05	9,93	25	63	66	0.16	6.30

Client	Kens	Species ID# AMP 86		
Lab ID: see randomizat	ion sheet batch nur	nber: B3584	Start Date	8/22/2016
Sample Description:	Weights of Amphipods a	t test initiation (= numb	er of replicates as the test, I	10 Hyallela each)
Technician: Date: Balance Serial #:	MC 8/24/2016 50309851	KJ 8/18/2016 50309851		
Tin ID Number	Total Weight (mg) (after 60°C for 24 hr)	Tare Weight (mg) (after 60°C for 24 hr)	No. of Amphipods Surviving	No. of Amphipods in Tin
@ Initiation A	64.41	64.04	na	5
@ Initiation B	63.73	63.45	na	5
@ Initiation C	64.08	63.81	na	5
@ Initiation D	63.17	62.80	na	5
@ Initiation E			na	
@ Initiation F			na	
@ Initiation G			na	
@ Initiation H			na	

Averge weight: 0.0645 m/ mbindent

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Client Client Sample Description Test Species: Hvaltela azteca Amp $\delta(o$		
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CHA	CHAM HILL FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA										
Sample D		See Ra	ndomizati azteca	Kensington on Sheet(s). Batch number: B 35 多じ ID#: AMP名(
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Beaker Number	Start Count 0	# alive found 10	# dead found 10	Comments:	Beaker	Start Count 0	# alive found 10	# dead found 10	Comments:		
1	10	10	ð		16	10	9	0			
2	10	Ø	Ð		17	10	হি	0			
3	10	1D	0		18	10	9	D			
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5	10	10	0		20	10	8	0			
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7	10	10	0		22	10	9	Ø			
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9	10	IJD	D		24	10	9	0			
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11	10	10	0		26	10	8	د			
12	10	9	0		27	10	в	0		··· ···	
13	10	9	0		28	10	9	D			
14	10	9	0	·	29	10	10	0			
15	10	jo	D	· · · · · · · · · · · · · · · · · · ·	30	10	10	0			

	<u>MHIL</u>	<u>L</u>	FR	ESHWATER	TOXICITY	Y TEST :	SURVIV	AL AN	D WAT	ER QUA	LITY DATA	
Client			H	Censington				Beginnin	g, Date	3-72-16	Time	
Sample D	escription	See Ra	ndomizati	on Sheet(s). Batc	h number: B	3584	-	Ending, I	Date	9-1-16	Time Time	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Test Spec	eies:			I								
Test Initi	ation:	Tech:	Tech:		Time:		Test Teri	nination:	Tech:	Tech:	<u> </u>	Time: <u>3</u> ی
Beaker	Start Count	# alive found	# dead found				Beaker	Start Count	# alive found	# dead found		
Number	0	10	10	Comments:			Number	0	10	10	Comments:	
31	10	9	0				46	10	ê	D		
32	10 .	10	0				47	10	8	0		
33	10	9	0				48	10	9	\Diamond		
34	10	10	0									
35	10	9	0	<u></u>								
36	10	9	0									
37	10	ઇ	ð	····								
38	10	10	6									
39	10	טו	0									
40	10	10	0									
41	10	9	Ο									
42	10	7	0									
43	10	8	0	······································							····	
44	10	10	0	-								
45	10	16	0									
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Hyallela GROWTH DATA

Client	Kensi	ngton	Species ID# AMP 86			
Lab ID: see randomization	on sheet batch nun	ber: B3584	Start Date	8/22/2016		
Sample Description:						
Technician: Date: Balance Serial #:	MC 9/7/2016 50309851	MC 8/30/2016 50309851				
Tin ID Number	Total Weight (mg) (after 60°C	Tare Weight (mg) (after 60°C	No. of Amphipods Surviving	No. of Amphipods in Tin		
	for 24 hr)	for 24 hr)				
1	69.48	68.63	10	10		
2	69.64	68.58	10	10		
3	69.67	68.82	10	10		
4	69.03	68.71	3	3		
5	69.51	68.54	10	10		
6	69.74	68.72	10	10		
7	69.69	68.76	10	10		
8	69.61	68.82	10	10		
9	69.44	68.69	10	10		
10	69.67	68.73	10	10		
11	69.87	68.90	10	10		
12	69.65	68.74	9	9		
13	69.65	68.75	9	9		
14	69.53	68.67	9	9		
15	69.64	68.64	10	10		
16	69.52	68.65	9	9		
17	69.54	68.78	9	9		
18	69.80	68.76	9	9		
19	69.23	68.38	10	10		
20	69.09	68.48	8	8		
21	69.51	68.64	9	9		
22	69.55	68.76	9	9		
23	69.39	68.61	9	9		
24	69.31	68.50	9	9		
25	69.51	68.57	10	10		
26	69.47	68.68	8	8		
27	69.09	68.33	8	8		
28	69.57	68.86	9	9		
29	69.18	68.36	10	10		
30	69.31	68.49	10	10		

Client	Kens	ington	Species ID# AMP 86				
Lab ID: see randomizati	on sheet batch nur	nber: B3584	Start Date	8/22/2016			
Sample Description:							
Technician: Date: Balance Serial #:	MC 9/7/2016 50309851	MC 8/30/2016 50309851					
Tin ID Number	Total Weight (mg) (after 60°C for 24 hr)	Tare Weight (mg) (after 60°C for 24 hr)	No. of Amphipods Surviving	No. of Amphipods in Tin			
<u>31</u> 32	<u>69.49</u> 69.49	68.49 68.58	9 10	9 10			
33	69.69	68.78	9	9			
34	69.62	68.88	10	10			
35	69.57	68.83	9	9			
36	69.54	68.57	9	9			
37	69.75	68.91	8	8			
38	69.70	68.69	10	10			
39	69.45	68.45	10	10			
40	69.53	68.58	10	10			
41	69.31	68.53	9	9			
42	69.47	68.82	7	7			
43	69.72	68.89	8	8			
44	70.05	69.13	10	10			
45	70.07	69.03	10	10			
46	69.86	69.00	8	8			
47	69.55	68.67	8	8			
48	69.53	68.70	9	9			
				· · · · · · · · · · · · · · · · · · ·			

Client	Kensi	ngton	Species ID# AMP 26			
Lab ID: see randomizati	on sheet batch nun	nber: B 3824	Start Date 2	-22-14		
Sample Description:	<u>-</u>		• ••••••••••••••••••••••••••••••••••••			
	50309851	MC 8/30/2016 50309851				
Tin ID Number	Total Weight (mg) (after 60°C for 24 hr)	Tare Weight (mg) (after 60°C for 24 hr)	No. of Amphipods Surviving	No. of Amphipods in Tin		
1		68.63 68.58	Sime as -B	(0		
2				(0		
3		68.82 68.71		(0)		
4 5		68.54		<u>ع</u> م		
6	······································	68.72				
7		68.76		10		
8		68.82		10		
9		68.69		10		
10		68.73		در		
11		68.90				
12		68.74		9		
13		68.75		9		
13		68.67		9		
15		68.64		10		
16		68.65		9		
17		68.78		9		
18		68.76		9		
19		68.38		10		
20		68.48	*****	3		
21		68.64		q		
22		68.76		9		
23		68.61		9		
24		68.50		9		
25		68.57		10		
26	an an de litter het skinger hit de skinger het de s	68.68		3		
27		68.33		03		
28		68.86		9		
29		68.36		10		
30		68.49		o _l o		

Hyallela GROWTH DATA

Client	Kensi	ngton	Species ID# AMP 56				
Lab ID: see randomizati	on sheet batch nun	nber: B うらこ4	Start Date 9-2	۲.(
Sample Description:							
Technician: Date: Balance Serial #:	50309851	MC 8/30/2016 50309851					
Tin ID Number	Total Weight (mg) (after 60°C for 24 hr)	Tare Weight (mg) (after 60°C for 24 hr)	No. of Amphipods Surviving	No. of Amphipods in Tin			
31		68.49	Shure — P	9			
32	· ·	68.58		10			
33		68.78		9			
34		68.88		(0			
35		68.83		9 			
36		68.57					
37		68.91		3			
38		68.69		10			
39		68.45		[0			
40		68.58		51			
41		68.53		<u> </u>			
42	<u> </u>	68.82		7			
43		68.89		B			
44		69.13		(0			
45		69.03		61			
46		69.00		3			
47		68.67		÷,			
48		68.70		9			
		· · · · · · · · · · · · · · · · · · ·					

CETIS Sun	nmary Repo	rt					•	ort Date: Code:		•	17 (p 1 of 1 5-9305-211	
Hyallela 10-d	Survival and Gro	wth Sec	liment Test								HILL - ASL	
Batch ID: Start Date: Ending Date: Duration:	tart Date:22 Aug-16Protocol:EPA/600/R-99/064 (2000)Diluentnding Date:01 Sep-16Species:Hyalella aztecaBrine:					ent: Mod e:	t Muckey -Hard Synth	etic Water				
Sample ID:	05-1582-8506	05-1582-8506 Code: B358 06 Jul-16 Material: Sedir					Clie					
=					-	050574)	Proj	ect:				
Receive Date:		-		ensington Gol wer Shermar	•••	(1100071)						
Sample Age:			tation: Lo	wer onermar	Гогеек							
Comparison S	Summary			-								
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	TU	Method				
03-9700-6627		nt-mg	100	>100	NA	8.93%	1	•	ance t Two-	-		
14-1674-6543	Survival Rate		100	>100	NA	5.76%	1	Wilcoxon I	Rank Sum Two-Sample Test			
Test Acceptat	oility											
Analysis ID	Endpoint		Attribute)	Test Stat	TAC Lin	nits	Overlap	Decision			
14-1674-6543	Survival Rate		Control F	Resp	0.9625	0.8 - NL		Yes	Passes Ac	ceptability	Criteria 🖌	
Mean Dry Wei	ight-mg Summar	у										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect	
0	Dilution Water	8	0.09138	0.08588	0.09687	0.085	0.104	0.002325	0.006577	7.2%	0.0%	
100		8	0.0929	0.08342	0.1024	0.075	0.105	0.004009	0.01134	12.21%	-1.67%	
Survival Rate	Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect	
0	Dilution Water	8	0.9625	0.9192	1	0.9	1	0.0183	0.05175	5.38%	0.0%	
100		8	0.95	0.8868	1	0.8	1	0.02673	0.07559	7.96%	1.3%	
Mean Dry Wei	ight-mg Detail											
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104			
100		0.097	0.102	0.075	0.1	0.082	0.08222	0.105	0.1			
Survival Rate	Detail											
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
0	Dilution Water	1	1	1	0.9	1	0.9	0.9	1			
100		1	1	1	0.9	1	0.9	0.8	1			
Survival Rate	Binomials					·						
	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
C-%	00111101 1390											
		10/10	10/10	10/10	9/10	10/10	9/10	9/10	10/10			

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Analyst:______ QA:_____

CETIS Analytical Report

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Analyzaci: 15 Sep-16 16:17 Analysis: Parametric-Two Sample Official Results: Yes Batch ID: 15 6393-5015 Test Type: Survival-Growth Analysis: Rest Workshowshowshowshowshowshowshowshowshowshow	Hyallela 10-d Survival and Growth Sediment Test									CH2M	HILL - ASL		
Start Date: 22 Aug-16 Diruration: Protocol: EPA/600/R-99/064 (2000) Diluent: Mod-Hard Synthetic Water Ending Date: 01 Sep-16 Species: Hyalella azteca Brite: Hyalella azteca Brite: Brite: Brite: Hyalella azteca Brite: Hyalella azteca Brite: Hyalella azteca Brite: Hyalella azteca Brite: Hyalella azteca Brite: Hyalella azteca Age: Sample Date: 06 Jul-16 Material: Sediment Project: Freiters Freiters Sample Date: 06 Jul-16 Material: Sediment Project: Freiters Freiters Sample Age: 7d 0h Station: Lower Sherman Creek PMSD Test Result Freiters Equal Variance t Two-Sample Test Control vs. 6% Test Stat Critical MSD DF P-Yale Pertype Decision(α:5%) Univaliant Effect Control Trend Man-Kendall Trend - 0.3387 Non-significant Effect Sample Age:	Analysis ID: Analyzed:			•	•						.8.8		
Ending Date: 01 Sep-16 10d 0h Species: Hyalella azteca Surce: Brine: Age: Sample Date: 05 -1582-8506 Code: B3584-03 Client: Project: Project: Sample Date: 05 -1582-8506 Code: B3584-03 Project: Project: Sample Date: 05 -1682-8506 Source: Kensington Gold Mine (AK0050571) Project: Project: Sample Age: 47d 0h Station: Lower Sherman Creek PMSD Test Result Project: Data Transform Zeta Alt Hyp Trials Seed PMSD Test Result Project: Control VS C-Y NA NA 8.93% Pesses mean dry weight-mg Project: Control vs C-Y Test Stat Critical MSD DF P-Value Persyse Decision(a:5%) Project: Pro	Batch ID:	15-6395-3015		Test Type:	Survival-Grow	۲th		Ana	lyst: Bre	tt Muckey			
Duration: 10d On Source: Chesapeak Cultures, Nayes, Virginia Age: Sample ID: 05-1582-8506 Code: B3584-03 Client: Project: Sample Date: 05-JU-16 Material: Sediment Project: Project: Receive Date: 13-Jul-16 Source: Kensington Gold Mine (AK005057)1 Project: Viet (Control Control C	Start Date:	22 Aug-16		Protocol:	EPA/600/R-99	9/064 (2000)		Diluent: Mod-Hard Synthetic Water					
Sample ID: 05-1582-8506 Code: B3584-03 Client: Sample Date: 06 Jul-16 Material: Sediment Project: Sample Date: 06 Jul-16 Source: Kensington Gold Mine (AK0050571) Sample Age: 47d 0h Station: Lower Sherman Creek Data Transform Zeta Alt Hyp Trials Seed PMSD Test Result Untransformed NA C > T NA 8.93% Passes mean dry weight-mg Equal Variance t Two-Sample Test Control vs C-% Test Stat Critical MSD DF P-Value P-Type Decision(α:5%) Dilution Water 100 -0.3296 1.761 0.008 14 0.6267 CDF Non-Significant Effect Auxiliary Tests Attribute Test Test Stat Critical P-Value Decision(α:5%) Control (α:5%) Control Trend Mann-Kendall Trend 0.335101E-06 1 0.1087 0.7466 Non-Significant Effect Source Sum Squares <t< td=""><td>Ending Date:</td><td>01 Sep-16</td><td></td><td>Species:</td><td>Hyalella aztec</td><td>a</td><td></td><td>Brin</td><td>ie:</td><td></td><td></td><td></td></t<>	Ending Date:	01 Sep-16		Species:	Hyalella aztec	a		Brin	ie:				
Sample Date: 06 Jul-16 tower Material: Sediment Source: Kensington Gold Mine (AK005071) Sample Age: 470 0h Station: Lower Sherman Creek Data Transform Zeta Alt Hyp Trials Seed PMSD Test Result V Data Transformed NA C > T NA NA 8.93% Passes mean dy weight-mg V Equal Variance Two-Sample Test Control vs C-% Test Stat Critical MSD P P-Yalue P-Type Decision(c:5%) V V Control vs C-% Test Stat Critical MSD P P-Value Decision(c:5%) V	Duration:	10d Oh		Source:	Chesapeak Co	ultures, Naye	es, Virginia	Age	:				
Receive Date: 13 Jul-16 Sample Age: Source: Kensington Gold Mine (AK0050571) Station: Lower Sherman Creek Data Transform Zeta Alt Hyp Trials Seed PMSD Test Result	Sample ID:	05-1582-8506		Code:	B3584-03			Clie	nt:				
Sample Age: 47 d Na Station: Lower Sherman Creek Data Transform Zeta Alt Hyp Trials Seed PMSD Test Result Untransformed NA C > T NA NA NA 8.93% Passes mean dry weight-mg Equal Variance t Two-Sample Test Test Stat Critical MSD DF P-Value P-Type Decision(a:5%) Dilution Water 100 -0.3296 1.761 0.08 14 0.6267 CDF Non-Significant Effect Auxiliary Tests Test Stat Critical P-Value Decision(a:5%) Control Non-Significant Effect ANOVA Table Source Sum Squares Mean Square DF F Stat P-Value Decision(a:5%) Ostributional Test Test Stat Critical P-Value Decision(a:1%) Control Significant Effect Ostribution Source Sum Squares Mean Square DF F Stat P-Value Decision(a:1%) Variances Justribution Test Stat <thc< td=""><td>Sample Date:</td><td>06 Jul-16</td><td></td><td>Material:</td><td>Sediment</td><td></td><td></td><td>Proj</td><td>ect:</td><td></td><td></td><td></td></thc<>	Sample Date:	06 Jul-16		Material:	Sediment			Proj	ect:				
Data Transform Zeta Alt Hyp Trials Seed PMSD Test Result Untransformed NA C > T NA NA 8.93% Passes mean dry weight-mg Equal Variance t Two-Sample Test Test Stat Critical MSD DF P-Value P-Type Decision(α:5%) Ontrol vs C-% Test Stat Critical MSD DF P-Value P-Type Decision(α:5%) Dilution Water 100 -0.3286 1.761 0.008 14 0.6267 CDF Non-Significant Effect Auxiliary Tests Test Test Stat Critical P-Value Decision(α:5%) Control Trend Mann-Kendall Trend 0.3987 Non-significant Trend in Controls ANOVA Table Source Sum Squares Mean Square DF F Stat P-Value Decision(α:5%) Etror 0.00120286 8.591659E-05 14 0.7466 Non-Significant Effect Distributional Tests Test Tes	Receive Date:	: 13 Jul-16		Source:	Kensington G	old Mine (AK	0050571)						
Untransformed NA C > T NA NA 8.93% Passes mean dry weight-mg Equal Variance t Two-Sample Test Control vs C-% Test Stat Critical MSD DF P-Value P-Type Decision(α:5%) Dilution Water 100 -0.3296 1.761 0.008 14 0.6267 CDF Non-Significant Effect Auxiliary Tests Test Test Stat Critical P-Value Decision(α:5%) Control Trend Mann-Kendall Trend 0.3987 Non-significant Trend in Controls Source Sum Squares Mean Square DF F Stat P-Value Decision(α:5%) Between 9.335101E-06 1 0.1087 0.7466 Non-Significant Effect Error 0.00120286 8.591859E-05 14 Nor-Significant Effect Distributional Tests Test Test Stat Critical P-Value Decision(α:1%) Variances Variance Ratio F Test 2.973 8.885 0.1739 Equal Variances	Sample Age:	47d Oh		Station:	Lower Sherma	an Creek							
Equal Variance t Two-Sample Test Control vs C-% Test Stat Critical MSD DF P-Value P-Type Decision(α:5%) Dilution Water 100 -0.3296 1.761 0.008 I4 On-Significant Effect Auxiliary Tests Attribute Test Test Stat Critical P-Value Decision(α:5%) Control Trend Mann-Kendall Trend 0.3987 Non-Significant Effect Source Sum Squares Mean Square DF F Stat P-Value Decision(α:5%) Between 9.335101E-06 0.1087 0.7466 Non-Significant Effect Error 0.00120286 8.591859E-05 14 Test Test Stat Critical P-Value Decision(a:1%) <th colspan<="" td=""><td>Data Transfor</td><td>m</td><td>Zeta</td><td>Alt H</td><td>yp Trials</td><td>Seed</td><td></td><td>PMSD</td><td>Test Res</td><td>ult</td><td></td><td></td></th>	<td>Data Transfor</td> <td>m</td> <td>Zeta</td> <td>Alt H</td> <td>yp Trials</td> <td>Seed</td> <td></td> <td>PMSD</td> <td>Test Res</td> <td>ult</td> <td></td> <td></td>	Data Transfor	m	Zeta	Alt H	yp Trials	Seed		PMSD	Test Res	ult		
Control vs C-% Test Stat Critical MSD DF P-Value P-Type Decision(α:5%) Dilution Water 100 -0.3296 1.761 0.008 14 0.6267 CDF Non-Significant Effect Auxillary Tests Test Test Stat Critical P-Value Decision(α:5%) Auxillary Tests Test Test Stat Critical P-Value Decision(α:5%) Auxillary Tests Mann-Kendall Trend Test Stat Critical P-Value Decision(α:5%) Control Trend Mann-Kendall Trend 0.3987 Non-significant Trend in Controls ANOVA Table Sum Squares Mean Square DF F Stat P-Value Decision(α:5%) Source Sum Squares Mean Square DF F Stat P-Value Decision(α:5%) Stattribute Test Test Stat Critical P-Value Decision(α:1%) <	Untransformed	1	NA	C > T	NA	NA		8.93%	Passes m	iean dry weig	gh t-mg		
Dilution Water 100 -0.3296 1.761 0.008 14 0.6267 CDF Non-Significant Effect Auxiliary Tests Test Test Stat Critical P-Value Decision(α:5%) Control Trend Mann-Kendall Trend 0.3987 Non-significant Trend in Controls ANOVA Table Source Sum Squares Mean Square DF F Stat P-Value Decision(α:5%) Source Sum Squares Mean Square DF F Stat P-Value Decision(α:5%) Between 9.335101E-06 9.335101E-06 1 0.1087 0.7466 Non-Significant Effect Error 0.00120286 8.591859E-05 14 0.0012021195 15 Distributional Tests Test Stat Critical P-Value Decision(α:1%) Variances Variance Ratio F Test 2.973 8.885 0.1739 Equal Variances Distribution Shapiro-Wilk W Normality 0.9565 0.8408 0.5992 Normal Distribution Mean Dry Weight-mg Summary C-%	Equal Variance	ce t Two-Sample	e Test										
Auxiliary Tests Test Test Stat Critical P-Value Decision(α:5%) Control Trend Mann-Kendall Trend 0.3987 Non-significant Trend in Controls ANOVA Table Source Sum Squares Mean Square DF F Stat P-Value Decision(α:5%) Source Sum Squares Mean Square DF F Stat P-Value Decision(α:5%) Between 9.335101E-06 1 0.1087 0.7466 Non-Significant Effect Error 0.001212195 15 15 15 15 Distributional Tests Xariance Ratio F Test 2.973 8.885 0.1739 Equal Variances Variances Variance Ratio F Test 2.973 8.885 0.1739 Equal Variances Distribution Shapiro-Wilk W Normality 0.9565 0.8408 0.5992 Normal Distribution	Control	vs C-%		Test \$	Stat Critical	MSD DI	F P-Value	P-Type	Decision	(α:5%)			
Attribute Test Test Stat Critical P-Value Decision(α:5%) Control Trend Mann-Kendall Trend 0.3987 Non-significant Trend in Controls ANOVA Table Source Sum Squares Mean Square DF F Stat P-Value Decision(α:5%) Between 9.335101E-06 9.335101E-06 1 0.1087 0.7466 Non-significant Effect Error 0.00120286 8.591859E-05 14 Non-significant Effect Total 0.001212195 15 15 Variances Variance Ratio F Test 2.973 8.885 0.1739 Equal Variances Normal Distribution Variances Variance Ratio F Test 2.973 8.885 0.5992 Normal Distribution Mean Dry Weight-mg Summary 0.9565 0.8408 0.5992 Normal Distribution 0 Dilution Water 8 0.09138 0.08588 0.09039 0.	Dilution Water	100		-0.329	96 1.761	0.008 14	0.6267	CDF	Non-Sign	ificant Effect			
Control Trend Mann-Kendall Trend 0.3987 Non-significant Trend in Controls ANOVA Table Source Sum Squares Mean Square DF F Stat P-Value Decision(a:5%) Between 9.335101E-06 9.335101E-06 1 0.1087 0.7466 Non-Significant Effect Error 0.00120286 8.591859E-05 14 0.1087 0.7466 Non-Significant Effect Total 0.001212195 15 Distributional Tests Test Test Stat Critical P-Value Decision(a:1%) Variances Variance Ratio F Test 2.973 8.885 0.1739 Equal Variances Distribution Shapiro-Wilk W Normality 0.9665 0.8408 0.5992 Normal Distribution Mean Dry Weight-mg Summary C-% Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effect 0 Dilution Water 8 0.09138 0.08588 0.09039 0.085 0.104 0.002325	Auxiliary Test	S											
ANOVA Table Source Sum Squares Mean Square DF F Stat P-Value Decision(α:5%) Between 9.335101E-06 9.335101E-06 1 0.1087 0.7466 Non-Significant Effect Error 0.00120286 8.591859E-05 14 0.1087 0.7466 Non-Significant Effect Total 0.001212195 15 15 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 16 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.00120206 0.0012000 0.00100 0.00200 0.00100 0.00200 0.00100 0.00200 0.0067 0.00200 0.0085 0.00100 0.000	Attribute	Test			Test Sta	t Critical	P-Value	Decision	(α:5%)				
Source Sum Squares Mean Square DF F Stat P-Value Decision(α:5%) Between 9.335101E-06 9.335101E-06 1 0.1087 0.7466 Non-Significant Effect Error 0.00120286 8.591859E-05 14 Non-Significant Effect Total 0.001212195 15 Non-Significant Effect Distributional Tests Test Test Stat Critical P-Value Decision(α:1%) Variances Variance Ratio F Test 2.973 8.885 0.1739 Equal Variances Distribution Shapiro-Wilk W Normality 0.9565 0.8408 0.5992 Normal Distribution Mean Dry Weight-mg Summary Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effect 0 Dilution Water 8 0.09138 0.08588 0.09039 0.085 0.104 0.002325 7.2% 0.0% 100 8 0.0929 0.08342 0.1024	Control Trend Mann-Kendall Trend					0.3987	Non-signi	ficant Trend	in Controls				
Between 9.335101E-06 9.335101E-06 1 0.1087 0.7466 Non-Significant Effect Error 0.00120286 8.591859E-05 14	ANOVA Table												
Error 0.00120286 8.591859E-05 14 Total 0.001212195 15 Distributional Tests Attribute Test Test Stat Critical P-Value Decision(α:1%) Variances Variance Ratio F Test 2.973 8.885 0.1739 Equal Variances Distribution Shapiro-Wilk W Normality 0.9565 0.8408 0.5992 Normal Distribution Mean Dry Weight-mg Summary C-% Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effect 0 Dilution Water 8 0.09138 0.08588 0.09039 0.085 0.104 0.002325 7.2% 0.0% 100 8 0.0929 0.08342 0.1024 0.0985 0.075 0.105 0.004009 12.21% -1.67% Mean Dry Weight-mg Detail Control Type Rep 1 Rep 2 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 C.0104 Contol Type	Source	Sum Squ	ares	Mean	Square	DF	F Stat	P-Value	Decision	(α:5%)			
Total 0.001212195 15 Distributional Tests Attribute Test Test Stat Critical P-Value Decision(α:1%) Variances Variance Ratio F Test 2.973 8.885 0.1739 Equal Variances Distribution Shapiro-Wilk W Normality 0.9565 0.8408 0.5992 Normal Distribution Mean Dry Weight-mg Summary C-% Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effect 0 Dilution Water 8 0.09138 0.08588 0.09039 0.085 0.104 0.002325 7.2% 0.0% 100 8 0.0929 0.08342 0.1024 0.0985 0.075 0.104 0.002325 7.2% 0.0% Mean Dry Weight-mg Detail Equal Variance Rep 7 Rep 8 Control Type Rep 1 Rep 2 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 0 Dilution Water 0.085 0.093	Between	9.335101	E-06	9.335	101E-06	1	0.1087	0.7466	Non-Sign	ificant Effect			
Distributional Tests Attribute Test Test Stat Critical P-Value Decision(α:1%) Variances Variance Ratio F Test 2.973 8.885 0.1739 Equal Variances Distribution Shapiro-Wilk W Normality 0.9565 0.8408 0.5992 Normal Distribution Mean Dry Weight-mg Summary C-% Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effect 0 Dilution Water 8 0.09138 0.08588 0.09039 0.085 0.104 0.002325 7.2% 0.0% 100 8 0.0929 0.08342 0.1024 0.0985 0.075 0.104 0.002325 7.2% 0.0% Mean Dry Weight-mg Detail E E E E E E C-% Control Type Rep 1 Rep 2 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 0 Dilution Water 0.085 <	Error	0.001202	86	8.591	859E-05								
Attribute Test Test Stat Critical P-Value Decision(α:1%) Variances Variance Ratio F Test 2.973 8.885 0.1739 Equal Variances Distribution Shapiro-Wilk W Normality 0.9565 0.8408 0.5992 Normal Distribution Mean Dry Weight-mg Summary Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% % Effect 0 Dilution Water 8 0.09138 0.08588 0.09039 0.085 0.104 0.002325 7.2% 0.0% 100 8 0.0929 0.08342 0.1024 0.0985 0.105 0.004009 12.21% -1.67% Mean Dry Weight-mg Detail E </td <td>Total</td> <td>0.001212</td> <td>195</td> <td></td> <td></td> <td>15</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Total	0.001212	195			15							
Variances Variance Ratio F Test 2.973 8.885 0.1739 Equal Variances Distribution Shapiro-Wilk W Normality 0.9565 0.8408 0.5992 Normal Distribution Mean Dry Weight-mg Summary C-% Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effect 0 Dilution Water 8 0.09138 0.08588 0.09039 0.085 0.104 0.002325 7.2% 0.0% 100 8 0.0929 0.08342 0.1024 0.0985 0.075 0.105 0.004009 12.21% -1.67% Mean Dry Weight-mg Detail Equal Variances Rep 5 Rep 6 Rep 7 Rep 8 0 Dilution Water 0.085 0.093 0.0856 0.0867 0.08667 0.104	Distributional	Tests											
Distribution Shapiro-Wilk W Normality 0.9565 0.8408 0.5992 Normal Distribution Mean Dry Weight-mg Summary Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effect 0 Dilution Water 8 0.09138 0.08588 0.09039 0.085 0.104 0.002325 7.2% 0.0% 100 8 0.0929 0.08342 0.1024 0.0985 0.075 0.105 0.004009 12.21% -1.67% Mean Dry Weight-mg Detail Control Type Rep 1 Rep 2 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 Image: Control Type Std Err Control Type Rep 1 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 Image: Control Type Std Err Control Type Rep 1 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 Image: Control Type Rep 1 Rep 3 Rep 5 Rep 6 Rep 7 Rep 8 Imag	Attribute	Test			Test Stat	t Critical	P-Value	Decision	(α:1%)				
Mean Dry Weight-mg Summary Countol Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effect 0 Dilution Water 8 0.09138 0.08588 0.09039 0.085 0.104 0.002325 7.2% 0.0% 100 8 0.0929 0.08342 0.1024 0.0985 0.075 0.105 0.004009 12.21% -1.67% Mean Dry Weight-mg Detail Control Type Rep 1 Rep 2 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 0 Dilution Water 0.085 0.093 0.085 0.085778 0.08667 0.104	Variances	Variance	Ratio F	Test	2.973	8.885	0.1739	Equal Va	riances				
C-% Control Type Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effect 0 Dilution Water 8 0.09138 0.08588 0.09039 0.085 0.104 0.002325 7.2% 0.0% 100 8 0.0929 0.08342 0.1024 0.0985 0.075 0.105 0.004009 12.21% -1.67% Mean Dry Weight-mg Detail Exercise Exercise Rep 1 Rep 2 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 Exercise Ex	Distribution	Shapiro-	Wilk W I	Normality	0.9565	0.8408	0.5992	Normal D	istribution				
0 Dilution Water 8 0.09138 0.08588 0.09687 0.09039 0.085 0.104 0.002325 7.2% 0.0% 100 8 0.0929 0.08342 0.1024 0.0985 0.075 0.105 0.004009 12.21% -1.67% Mean Dry Weight-mg Detail Control Type Rep 1 Rep 2 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 0 Dilution Water 0.085 0.093 0.09556 0.085 0.08778 0.08667 0.104	Mean Dry Wei	ight-mg Summa	ıry										
100 8 0.0929 0.08342 0.1024 0.0985 0.075 0.105 0.004009 12.21% -1.67% Mean Dry Weight-mg Detail Control Type Rep 1 Rep 2 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 0 Dilution Water 0.085 0.093 0.094 0.09556 0.085 0.08778 0.08667 0.104	C-%	Control Type	Coun	t Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect	
Mean Dry Weight-mg Detail C-% Control Type Rep 1 Rep 2 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 0 Dilution Water 0.085 0.093 0.094 0.09556 0.085 0.08778 0.08667 0.104	0	Dilution Water	8	0.0913	38 0.08588	0.09687	0.09039	0.085	0.104	0.002325	7.2%	0.0%	
C-% Control Type Rep 1 Rep 2 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 0 Dilution Water 0.085 0.093 0.094 0.09556 0.085 0.08778 0.08667 0.104	100		8	0.092	9 0.08342	0.1024	0.0985	0.075	0.105	0.004009	12.21%	-1.67%	
0 Dilution Water 0.085 0.093 0.094 0.09556 0.085 0.08778 0.08667 0.104	Mean Dry Wei	ight-mg Detail											
· · · · · · · · · · · · · · · · · · ·	C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
100 0.097 0.102 0.075 0.1 0.082 0.08222 0.105 0.1	0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104			
	100		0.097	0.102	0.075	0.1	0.082	0.08222	0.105	0.1			

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CETIS Analytical Report	Report Date:	15 Sep-16 16:17 (p 2 of 4)
	Test Code:	B358403hac 06-9305-2114

Hyallela 10-d Survival and Growth Sediment Test CH2M HILL - ASL Analysis ID: 03-9700-6627 Endpoint: Mean Dry Weight-mg **CETIS Version:** CETISv1.8.8 Parametric-Two Sample Analyzed: 15 Sep-16 16:17 Analysis: Official Results: Yes Graphics 0.12 0.015 0.010 0.10 Mean Dry Weight-mg Centered Untransformed 0.005 Reject Null 0.08 0.000 0.06 -0.005 0.04 -0.010 0.02 -0.015 0.00 -0.020 0 D 100 -1.5 -1.0 -0.5 0.0 -2.0 0.5 1.0 1.5 2.0 C-%

QA:___

Rankits

CETIS Analytical Report

Report Date: Test Code:

Hyailela 10-d	Survival and G	rowth Sec	liment Te	st							CH2M	HILL - ASL
Analysis ID: Analyzed:	14-1674-6543 15 Sep-16 16:		ndpoint: nalysis:	Survival F		Two Sampl	0	-	IS Version		.8.8	
	•											
Batch ID:	15-6395-3015			Survival-(Anal	•	ett Muckey		
Start Date:	22 Aug-16		rotocol:			064 (2000)		Dilu		od-Hard Syntl	netic Wate	r
Ending Date:			pecies:	Hyalella a				Brin				
Duration:	10d 0h		ource:			tures, Naye	s, virginia	Age				
Sample ID:	05-1582-8506		ode:	B3584-03				Clie				
Sample Date:			aterial:	Sediment				Proj	ect:			
Receive Date	• • • • • • • •		ource:			d Mine (AK	0050571)					
Sample Age:	4/a Un	51	tation:	Lower Sh	ermar	Стеек						
Data Transfor		Zeta	Alt H		s	Seed		PMSD	Test Res			
Angular (Corre	ected)	NA	С>Т	NA		NA		5.76%	Passes s	survival rate		
Wilcoxon Rai	nk Sum Two-Sa	mple Test	:									
Control	vs C-%		Test \$	Stat Criti	cal	Ties DI	P-Value	P-Type	Decision	n(α:5%)		
Dilution Water	· 100		66.5	NA		2 14	0.5000	Exact	Non-Sigi	nificant Effect	t	
Auxiliary Test	ts											·,
Attribute	Test			Test	Stat	Critical	P-Value	Decision	(α:5%)			
Control Trend	Mann-Ke	ndall Tren	ıd				0.1964	Non-signi	ficant Tren	d in Controls		
ANOVA Table	•											
Source	Sum Squ	ares	Mean	Square		DF	F Stat	P-Value	Decision	n(α:5%)		
Between	0.001258	423	0.001:	258423		1	0.1206	0.7336	Non-Sigr	nificant Effect	ł	
Error	0.146121		0.010	43726		14	_					
Total	0.147380	1				15						
Distributional	l Tests											
Attribute	Test			Test	Stat	Critical	P-Value	Decision	(α:1%)			
Variances		Ratio F T		1.93		8.885	0.4037	Equal Var				
Distribution	Shapiro-	Wilk W No	ormality	0.75	6	0.8408	0.0008	Non-norm	al Distribut	tion		
Survival Rate	Summary											
C-%	Control Type	Count	Mean	95%	LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.962			1	1	0.9	1	0.0183	5.38%	0.0%
100		8	0.95	0.88	68	1	1	0.8	1	0.02673	7.96%	1.3%
Angular (Corr	rected) Transfor	med Sum	mary				•					
C-%	Control Type	Count	Mean	95%	LCL	95% UCL	Median	Min	Мах	Std Err	CV%	%Effect
0	Dilution Water	8	1.351	1.28		1.421	1.412	1.249	1.412	0.02982	6.24%	0.0%
100		8	1.333	1.23	5	1.431	1 .412	1.107	1.412	0.04147	8.8%	1.31%
Survival Rate	Detail											
C-%	Control Type	Rep 1	Rep 2	Rep	3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	1	1	1		0.9	1	0.9	0.9	1		
100		1	1	1		0.9	1	0.9	0.8	1	······································	
÷ .	rected) Transfor	med Deta	il									
C-%	Control Type	Rep 1	Rep 2	•		Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	1.412	1.412	1.41		1.249	1.412	1.249	1.249	1.412		
100		1.412	1.412	1.41	2	1.249	1.412	1.249	1.107	1.412		
Survival Rate												
<u>C-%</u>	Control Type	Rep 1	Rep 2			Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	10/10	10/10	10/10		9/10	10/10	9/10	9/10	10/10		
100		10/10	10/10	10/10	U	9/10	10/10	9/10	8/10	10/10		

Analyst: 3- QA:____

CETIS Ana	alytical Report				Report Date: Test Code:	15 Sep-16 16:17 (p 4 of 4) B358403hac 06-9305-2114
Hyallela 10-d	Survival and Growth	n Sediment Test				CH2M HILL - ASL
Analysis ID: Analyzed:	14-1674-6543 15 Sep-16 16:17	•	ival Rate parametric-Two Sample		CETIS Version: Official Results:	CETISv1.8.8 Yes
Graphics						
1.0 0.9 0.7 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7			Centered Corr. Angle	0.15 0.10 0.05 -0.05 -0.10 -0.15 -0.20	•••	•••••
0.0	0 D	100		-0.25 -2.0	-1.5 -1.0 -0.5 0.0	0.5 1.0 1.5 2.0
		C-%			Rankits	

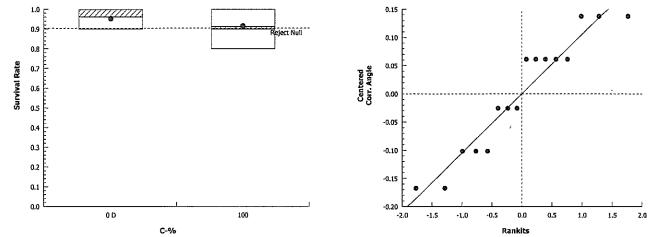
CETIS Summary Report							•			15 Sep-16 16:15 (p 1 of 1) 3358401hac 12-1807-9938		
Hyallela 10-d	Survival and Gr	owth Sedin	nent Test							CH2M I	HILL - ASL	
Batch ID: Start Date: Ending Date: Duration:	15-6395-3015 22 Aug-16 01 Sep-16 10d Oh	Prot Spe	tocol: EP cies: Hya	rvival-Growth A/600/R-99/ alella azteca esapeak Cul	064 (2000)	s, Virginia	Anal Dilu Brin Age	ent: Mod e:	t Muckey -Hard Synth	etic Water		
Sample ID: Sample Date: Receive Date: Sample Age:	: 13 Jul-16	Sou	erial: Sec rce: Kei	584-01 diment nsington-Gol st Fork Slate		0050571)	Clie Proj					
Comparison S	Summary			مسير بد ويو بي و ويورون و و و و و و و و و و و								
Analysis ID	Endpoint	~	NOEL	EOEL	TOEL	PMSD	TU	Method				
00-6723-3050 12-0143-9665	Mean Dry Weig Survival Rate	Iht-mg 📐	100 100	>100 >100	NA NA	9.62% 6.1%	1 1	-	ance t Two ance t Two	-		
Test Acceptat	oility											
Analysis ID	Endpoint		Attribute		Test Stat	TAC Lim	its	Overlap	Decision			
12-0143-9665	Survival Rate		Control Re	esp	0.9625	0.8 - NL		Yes	Passes A	ceptability	Criteria 🗸	
Mean Dry Wei	ight-mg Summa	ry										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect	
0	Dilution Water	8	0.09138	0.08588	0.09687	0.085	0.104	0.002325	0.006577	7.2%	0.0%	
100		8	0.09898	0.08854	0.1094	0.079	0.1156	0.004416	0.01249	12.62%	-8.32%	
Survival Rate	Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect	
0	Dilution Water	8	0.9625	0.9192	1	0.9	1	0.0183	0.05175	5.38%	0.0%	
100		8	0.9125	0.8427	0.9823	0.8	1	0.0295	0.08345	9.15%	5.2%	
Mean Dry Wei	ight-mg Detail											
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104		<u></u>	
100		0.079	0.1011	0.1156	0.08667	0.091	0.101	0.1075	0.11			
Survival Rate	Detail											
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
0	Dilution Water	1	1	1	0.9	1	0.9	0.9	1			
100		1	0.9	0.9	0.9	1	1	0.8	0.8			
Survival Rate	Binomials											
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
0	Dilution Water	10/10	10/10	10/10	9/10	10/10	9/10	9/10	10/10			
100		10/10	9/10	9/10	9/10	10/10		8/10	8/10			

Analyst: <u>%</u> QA:_____

CETIS Analytical Report							Report Date: 15 Sep-16 16:15 (p 3 Test Code: B358401hac 12-1807				
Hyallela 10-c	d Survival and G	rowth Se	diment Tes	it							HILL - AS
Analysis ID:	12-0143-9665	E	indpoint:	Survival Rate			CET	IS Version	: CETISv1	.8.8	
Analyzed:	15 Sep-16 16:	12 4	nalysis:	Parametric-Two	Sample		Offic	cial Result	s: Yes		
Batch ID:	15-6395-3015	T		Survival-Growth			Anal	-	ett Muckey		
Start Date:	22 Aug-16	F		EPA/600/R-99/	, ,		Diluent: Mod-Hard Synthetic Water				
Ending Date	: 01 Sep-16	5	-	Hyalella azteca			Brin	e:			
Duration:	10d Oh	9	iource:	Chesapeak Cul	tures, Naye	s, Virginia	Age:	:			
Sample ID:	18-2203-5030	c	ode:	B3584-01			Clie	nt:			
Sample Date	e: 06 Jul-16	٨	laterial:	Sediment			Proj	ect:			
Receive Date	e: 13 Jul-16	S	iource:	Kensington Gol	d Mine (AK	050571)					
Sample Age	: 47d Oh	s	itation:	East Fork Slate	Creek						
Data Transfo	orm	Zeta	Ait Hy	p Trials	Seed		PMSD	Test Res	sult		
Angular (Cori	rected)	NA	C > T	NA	NA		6.1%	Passes s	survival rate		
Equal Variar	nce t Two-Sampl	e Test									
Control	vs C-%		Test S	tat Critical	MSD DF	P-Value	Р-Туре	Decision	n(α:5%)		
Dilution Wate			1.406	1.761		0.0907	CDF		nificant Effect	t	
Auxiliary Tes											
Attribute	Test			Test Stat	Critical	P-Value	Decision	(a·5%)			
Control Trend		ndall Tre	nd	Test otat	Ontical	0.1964			d in Controls		
						0.1001					
ANOVA Tabl -	-			-							
Source	Sum Squ			Square	DF	F Stat	P-Value	Decision			
Between	0.023236		0.0232		1	1.978	0.1814	Non-Significant Effect			
Error	0.164487		0.0117	4908	14	_					
Total	0.187723	<u>د</u>			15						
Distribution	al Tests										
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:1%)			
Variances	Variance	Ratio F	ſest	2.303	8.885	0.2934	Equal Var	riances			
Distribution	Shapiro-	Wilk W N	ormality	0.9035	0.8408	0.0916	Normal D	istribution			
Survival Rat	e Summary										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.9625	0.9192	1	1	0.9	1	0.0183	5.38%	0.0%
100		8	0.9125	0.8427	0.9823	0.9	0.8	1	0.0295	9.15%	5.2%
Angular (Co	rrected) Transfor	med Sur	omary								
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Modian	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.351	1.28	1.421	1.412	1.249	1.412	0.02982	6.24%	0.0%
100	Dilution water	8	1.351	1.168	1.382	1.249	1.249	1.412	0.02982	0.24% 10.04%	0.0% 5.64%
	- Deteil	-									
Survival Rat		m 4	Da i A	m A	De:= 4		Dec C	D	D A		
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0 100	Dilution Water	1 1	י 0.9	1 0.9	0.9 0.9	1 1	0.9 1	0.9 0.8	1 0.8		
				v.a		I 	•	0.0	0.0		
	rrected) Transfor										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	1.412	1.412	1.412	1.249	1.412	1.249	1.249	1.412		
100		1.412	1.249	1.249	1.249	1.412	1.412	1.107	1.107		
Survival Rate	e Binomials										
							D 6	D 7			
	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
C-%	Control Type Dilution Water	Rep 1 10/10	Rep 2 10/10	Rep 3 10/10	Rep 4 9/10	кер 5 10/10	9/10	9/10	Rep 8 10/10		

Analyst: 3~ QA:_

ac 12-1807-9938	B358401hac	Report Date: Test Code:	CETIS Analytical Report Hyallela 10-d Survival and Growth Sediment Test					
H2M HILL - ASL	CH2							
	CETISv1.8.8	CETIS Version:	Survival Rate	Endpoint:	12-0143-9665	Analysis ID:		
	Yes	Official Results:	Parametric-Two Sample	Analysis:	15 Sep-16 16:12	Analyzed:		
-				•		•		

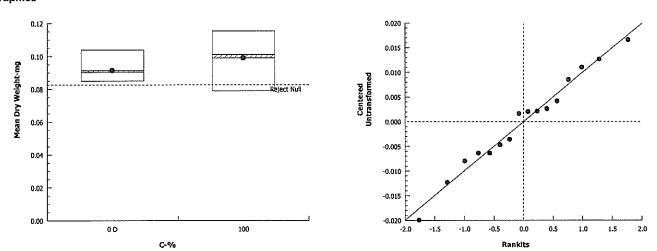


QA:____

CETIS Ana	lytical Rep	ort					•	Report Date: 15 Sep-16 16:15 (Test Code: B358401hac 12-18			
Hyallela 10-d S	Survival and G	rowth S	Gediment Te	st						CH2M	HILL - ASL
Analysis ID: Analyzed:	00-6723-3050 15 Sep-16 16:	15	Endpoint: Analysis:	Mean Dry Wei Parametric-Tw				IS Version: cial Results		.8.8	
Batch ID:	15-6395-3015		Test Type:	Survival-Grow	th		Ana	vst: Bre	tt Muckey		
Start Date:	22 Aug-16		Protocol:	EPA/600/R-99			Dilu		d-Hard Synth	etic Water	
Ending Date:	01 Sep-16		Species:	Hyalella aztec	• •		Brin		•		
Duration:	10d 0h		Source:	Chesapeak Cu	ultures, Naye	es, Virginia	Age	:			
Sample ID:	18-2203-5030		Code:	B3584-01			Clie	nt:			
Sample Date:	06 Jul-16		Material:	Sediment			Proj	ect:			
Receive Date:			Source:	Kensington Go	old Mine (AK	0050571)					
Sample Age:	47d Oh		Station:	East Fork Slat	•	,					
Data Transfor	m	Zeta	Alt H	yp Trials	Seed	• •	PMSD	Test Res	ult		
Untransformed	1	NA	C > T	NA	NA		9.62%	Passes m	nean dry weig	ght-mg	
Equal Varianc	e t Two-Sample	e Test									
Control	vs C-%		Test	Stat Critical	MSD DI	P-Value	P-Type	Decision	(α:5%)		
Dilution Water	100		-1.52	4 1.761	0.009 14	0.9251	CDF	Non-Sign	ificant Effect		
Auxiliary Test	s										
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:5%)			
Control Trend	Mann-Ke	ndall T	rend			0.3987	Non-signi	ficant Trend	I in Controls		
ANOVA Table											
Source	Sum Squ	ares	Mean	Square	DF	F Stat	P-Value	Decision	(α:5%)		
Between	0.000231	2942	0.000	2312942	1	2.322	0.1498	Non-Sign	ificant Effect		
Error	0.001394	708	0.000	099622	14			-			
Total	0.001626	002			15	_					
Distributional	Tests										
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:1%)			
Variances	Variance	Ratio F	Test	3.606	8.885	0.1123	Equal Va	iances			
Distribution	Shapiro-	Wilk W	Normality	0.9804	0.8408	0.9670	Normal D	istribution			
Mean Dry Wei	ight-mg Summa	iry									
C-%	Control Type	Cour	it Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.091	38 0.08588	0.09687	0.09039	0.085	0.104	0.002325	7.2%	0.0%
0		-			0.1094	0.1011	0.079	0.1156	0.004416	12.62%	-8.32%
		8	0.098	98 0.08854	0.1094	0.1011			0.001110	12.0270	010270
100	ght-mg Detail	8	0.098	98 0.08854	0.1094					12.02 /6	
100 Mean Dry Wei	ght-mg Detail Control Type	8 Rep 1			Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	12.0270	
100 Mean Dry Wei C-%			l Rep 2	Rep 3						12.0278	

CETIS Ana	alytical Report			Report Date: Test Code:	15 Sep-16 16:15 (p 2 of 4) B358401hac 12-1807-9938
Hyallela 10-d	Survival and Growth		CH2M HILL - ASL		
Analysis ID:	00-6723-3050	Endpoint:	Mean Dry Weight-mg	CETIS Version:	CETISv1.8.8
Analyzed:	15 Sep-16 16:15	Analysis:	Parametric-Two Sample	Official Results:	Yes

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QA:___

CETIS Summary Report							•	oort Date: t Code:	15 Sep-16 16:19 (p 1 of 1) B358405hac 01-9737-8056		
Hyallela 10-d S	Survival and Gr	owth Sec	diment Tes	t		••••				CH2M I	HILL - ASL
Batch ID: Start Date: Ending Date: Duration:	15-6395-3015 22 Aug-16 01 Sep-16 10d Oh	P S	rotocol: pecies:	Survival-Growth EPA/600/R-99/d Hyalella azteca Chesapeak Cul	064 (2000)	s, Virginia		ient: Mod ie:	t Muckey -Hard Synth	etic Water	<u></u>
Sample ID: Sample Date: Receive Date: Sample Age:	=	M	laterial: ource:	B3584-05 Sediment Kensington Gol Lower Johnson		0050571)	Clie Pro	ent: ject:			
Comparison S	Summary			· · · · · · · · · · · · · · · · · · ·							
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	TU	Method			
19-7018-2435 20-4344-5400	Mean Dry Weig Survival Rate	ght-mg <	100 100	>100	NA NA	8.54% 6.53%	1 1		ance t Two- iance t Two-		
Test Acceptab Analysis ID	oility Endpoint		Attribu	ite	Test Stat	TAC Lin	nits	Overlap	Decision		
20-4344-5400	Survival Rate		Contro		0.9625	0.8 - NL		Yes		ceptability	Criteria 🤛
Mean Dry Wei	ght-mg Summa	ıry									
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.0913	8 0.08588	0.09687	0.085	0.104	0.002325	0.006577	7.2%	0.0%
100		8	0.0917	2 0.0828	0.1006	0.074	0.106	0.003772	0.01067	11.63%	-0.38%
Survival Rate	Summary										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.9625	0.9192	1	0.9	1	0.0183	0.05175	5.38%	0.0%
100		8	0.9125	0.8296	0.9954	0.7	1	0.03504	0.0991	10.86%	5.2%
Mean Dry Wei	ght-mg Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104		
100		0.106	0.0966	7 0.07889	0.1011	0.074	0.09286	0.092	0.09222		
Survival Rate	Detail	,	-								
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
	Dilution Water	1	1	1	0.9	1	0.9	0.9	1		
100		1	0.9	0.9	0.9	1	0.7	1	0.9		
Survival Rate	Binomials						<u> </u>				
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
	Dilution Water	10/10	10/10	10/10	9/10	10/10	9/10	9/10	10/10		
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Analyst: _____ QA:__

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CETIS Analytical Report

Hyallela 10-d S	Survival and Gr	owth Se	ediment Te	st						CH2M	HILL - ASL
Analysis ID: Analyzed:	19-7018-2435 15 Sep-16 16:1		Endpoint: Analysis:	Mean Dry Wei Parametric-Tw				S Version: ial Results:	CETISv1. Yes	8.8	
Batch ID: Start Date: Ending Date: Duration:	15-6395-3015 22 Aug-16 01 Sep-16 10d Oh	I S	Test Type: Protocol: Species: Source:	Survival-Growti EPA/600/R-99/ Hyalella azteca Chesapeak Cu	064 (2000) I	s, Virginia	Anal Dilue Brine Age:	ent: Mod e:	t Muckey -Hard Synth	etic Water	
Sample ID: Sample Date: Receive Date: Sample Age:	11 Aug-16	r	Code: Material: Source: Station:	B3584-05 Sediment Kensington Go Lower Johnson	•	0050571)	Clier Proje				
Data Transform	n	Zeta	Alt H	yp Trials	Seed		PMSD	Test Resu	llt		
Untransformed		NA	С > Т	NA	NA		8.54%	Passes m	ean dry weig	ht-mg	
Equal Variance	e t Two-Sample	Test									
Control	vs C-%		Test S			P-Value	P-Type	Decision(-		
Dilution Water	100		-0.077	/51 1.761	0.008 14	0.5303	CDF	Non-Signil	icant Effect		
Auxiliary Tests	5										
Attribute	Test			Test Stat	Critical	P-Value	Decision(α:5%)			
Control Trend	Mann-Kei	ndall Tre	end			0.3987	Non-signil	ficant Trend	in Controls		
ANOVA Table											
Source	Sum Squa	ares	Mean	Square	DF	F Stat	P-Value	Decision(α:5%)		
Between	4.719144E	-07	4.719	144E-07	1	0.006008	0.9393	Non-Signif	icant Effect		
Error	0.0010996		7.854	368E-05	14						
Total	0.0011000	83			15						
Distributional	Tests										
Attribute	Test			Test Stat	Critical	P-Value	Decision((a:1%)			
Variances	Variance			2.632	8.885	0.2250	Equal Var				
Distribution	Shapiro-V	Vilk W N	lormality	0.9743	0.8408	0.9019	Normal Di	stribution			
Mean Dry Weig	ght-mg Summa	ry									
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
-	Dilution Water	8	0.0913		0.09687	0.09039	0.085	0.104	0.002325	7.2%	0.0%
100		8	0.0917	72 0.0828	0.1006	0.09254	0.074	0.106	0.003772	11.63%	-0.38%
Mean Dry Weig	ght-mg Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104		
100		0.106	0.0966	67 0.07889	0.1011	0.074	0.09286	0.092	0.09222		

CETI	S Ana	alytical Report					Report Date: Test Code:	15 Sep-16 16:19 (p 2 of 4) B358405hac 01-9737-8056
Hyalle	la 10-d	Survival and Growth	Sediment Te	est				CH2M HILL - ASL
Analys Analyz		19-7018-2435 15 Sep-16 16:19	Endpoint: Analysis:	Mean Dry Weight-mg Parametric-Two Sample			CETIS Version: Official Results:	CETISv1.8.8 Yes
Graph	ics							
	0.12 F					^{0.020} F		,
_	0.10					0.015		
Mean Dry Weight-mg					n Be	0.010		9
ny Wei	0.08			Reject Null	Centered Untransformed	0.005		
lean D	0.06				Cutr C	0.000	•••	A
2	0.04					-0.005	0 0 0 0	
	ŀ					-0.010		
	0.02					-0.015	•	
	0.00	0 D	1	100		-0.020	-1.5 -1.0 -0.5 0.0	0.5 1.0 1.5 2.0

C-%

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Analyst:_____QA:_____

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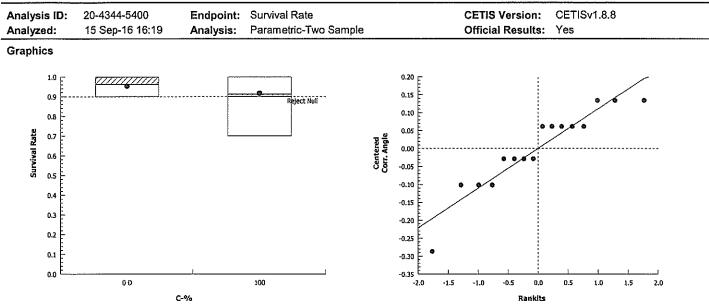
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CETIS Analytical Report							•	ort Date: Code:	15 Sep-16 16:19 (p 3 of 4 B358405hac 01-9737-805			
Hyallela 10-d S	Survival and G	rowth Sedi	ment Te	st							HILL - ASI	
Analysis ID: Analyzed:	20-4344-5400 15 Sep-16 16:		dpoint: alysis:	Survival Rate Parametric-Two	o Sample			IS Version				
Batch ID:	15-6395-3015	Te	st Type:	Survival-Growth	<u></u> າ		Ana	lvst: Bre	ett Muckey			
Start Date:	22 Aug-16		otocol:	EPA/600/R-99/			Dilu	-	d-Hard Synti	netic Water		
Ending Date:	-	Sp	ecies:	Hyalella azteca	• •		Brin					
Duration:	10d Oh	So	urce:	Chesapeak Cul	tures, Naye	s, Virginia	Age	:				
Samala ID:	02-9733-1775	C_	de:	B3584-05	·		Clie					
Sample ID: Sample Date:	•		ue. terial:	Sediment			Proj					
Receive Date:	-		urce:	Kensington Gol	ld Mine (AK)	050571)	FIOJ	661.				
Sample Age:	•		ution:	Lower Johnson	•	,000011						
Data Transfor		Zeta	Alt H	•	Seed		PMSD	Test Res	sult			
Angular (Corre		NA	C > T	NA	NA		6.53%		survival rate			
Equal Varianc	e t Two-Sample	a Test	· · · · · · · · ·									
Control	vs C-%		Test S	Stat Critical	MSD DF	P-Value	P-Type	Decision	n(α:5%)			
Dilution Water	100		1.255	1.761		0.1150	CDF		nificant Effect	:		
Auxiliary Test	\$											
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:5%)				
Control Trend	Mann-Ke	ndall Trend	1		·	0.1964	Non-signi	ficant Tren	d in Controls			
ANOVA Table												
Source	Sum Squ	ares	Mean	Square	DF	F Stat	P-Value	Decision	n(α:5%)			
Between	0.021303	58	0.021	30358	1	1.575	0.2300	Non-Significant Effect				
Error	0.189312	2	0.013	5223	14	_		-				
Total	0.210615	8			15	_						
Distributional	Tests											
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:1%)				
Variances	Variance	Ratio F Te	st	2.802	8.885	0.1975	Equal Va	riances				
Distribution	Shapiro-	Wilk W Nor	mality	0.8908	0.8408	0.0573	Normal D	istribution				
Survival Rate	Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect	
0	Dilution Water	8	0.962	5 0.9192	1	1	0.9	1	0.0183	5.38%	0.0%	
100		8	0.912	5 0.8296	0.9954	0.9	0.7	1	0.03504	10.86%	5.2%	
Angular (Corr	ected) Transfor	med Sumr	nary									
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect	
0	Dilution Water	8	1.351	1.28	1.421	1.412	1.249	1.412	0.02982	6.24%	0.0%	
100		8	1.278	1.16	1.396	1.249	0.9912	1.412	0.04991	11.05%	5.4%	
Survival Rate	Detail											
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
0	Dilution Water	1	1	1	0.9	1	0.9	0.9	1			
100		1	0.9	0.9	0.9	1	0.7	1	0.9			
Angular (Corr	ected) Transfor	med Detai										
	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
	Dilution Water	1.412	1.412	1.412	1.249	1.412	1.249	1.249	1.412			
100		1.412	1.249	1.249	1.249	1.412	0.9912	1.412	1.249			
Survival Rate	Binomials											
C-%	Control Type	Rep 1	Rep 2		Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
		4040	40/40	10/10	0/40	10/10	9/10	0/40	10/10			
0 100	Dilution Water	10/10 10/10	10/10 9/10	10/10 9/10	9/10 9/10	10/10 10/10	9/10 7/10	9/10 10/10	10/10 9/10			

Analyst: Gr QA:_

CETIS Analytical Report	Report Date:	15 Sep-16 16:19 (p 4 of 4)
	Test Code:	B358405hac 01-9737-8056
Hyallela 10-d Survival and Growth Sediment Test		CH2M HILL - ASL



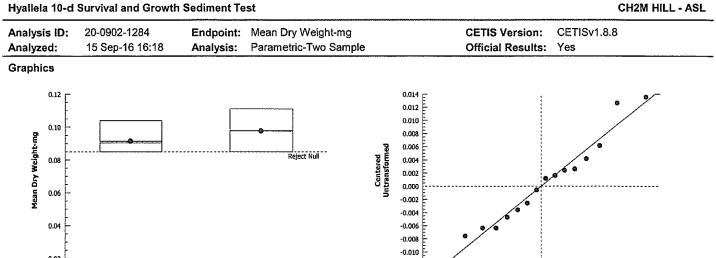
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CETIS Sun	nmary Repo	ort					•	ort Date: Code:		-	8 (p 1 of 1))-2784-0407
Hyallela 10-d	Survival and Gr	owth Sedi	ment Test							CH2M	HILL - ASL
Batch ID: Start Date: Ending Date: Duration:	15-6395-3015 22 Aug-16 01 Sep-16 10d Oh	Pro Sp	otocol: EF ecies: Hy	ırvival-Growth PA/600/R-99/ /alella azteca nesapeak Cul	064 (2000)	s, Virginia	Ana Dilu Brin Age	ent: Mod e:	t Muckey -Hard Synth	etic Water	
Sample ID:	10-0448-9482		1 may 1	3584-04	······. J		Clie				
Sample Date:				diment			Proj	ect:			
Receive Date:			and the second sec	ensington Gol	and the second se	0050571)					
Sample Age:	480 UN	Sta	tion: Lo	wer Slate Cre	еек						
Comparison S	Summary				And and a second s						
Analysis ID	Endpoint		NOEL	-FOÉF-	TOEL	PMSD	TU	Method			
20-0902-1284	Mean Dry Weig	ht-mg <	100	>100)	NA	7.07%	1	Equal Vari	iance t Two-	Sample Te	st
02-7799-3698	Survival Rate		100	>100	NA	6.53%	1	Equal Vari	iance t Two-	Sample Te	st
Test Acceptab	oility										
Analysis ID	Endpoint		Attribute		Test Stat	TAC Lim	lits	Overlap	Decision		
02-7799-3698	Survival Rate		Control R	lesp	0.9625	0.8 - NL		Yes	Passes Ac	ceptability	Criteria
Mean Dry Wei	ght-mg Summa	ry									
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.09138	0.08588	0.09687	0.085	0.104	0.002325	0.006577	7.2%	0.0%
100		8	0.09758	0.09087	0.1043	0.085	0.1111	0.002838	0.008028	8.23%	-6.79%
Survival Rate	Summary										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.9625	0.9192	1	0.9	1	0.0183	0.05175	5.38%	0.0%
100		8	0.9	0.8226	0.9774	0.8	1	0.03273	0.09258	10.29%	6.49%
Mean Dry Wei	ght-mg Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104		
100		0.085	0.097	0.1	0.09	0.09875	0.095	0.1111	0.1038		
Survival Rate	Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
	Dilution Water	1	1	1	0.9	1	0.9	0.9	1		
100		1	1	1	0.9	0.8	0.8	0.9	0.8		
Survival Rate	Binomials										
.	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
C-%	oondor type	iveh i	LOD T								
	Dilution Water	10/10	10/10	10/10	9/10	10/10	9/10	9/10	10/10		*****

Analyst: <u></u>QA:_____

CETIS Ana	lytical Rep	ort						ort Date: Code:			:18 (p 1 of 4) 20-2784-0407
Hyallela 10-d	Survival and G	owth Se	ediment Te	st						CH2M	HILL - ASL
Analysis ID: Analyzed:	20-0902-1284 15 Sep-16 16:		Endpoint: Analysis:	Mean Dry We Parametric-T	• •	*****		IS Version cial Results	• • • • • • • •	.8.8	
Batch ID:	15-6395-3015	-	Test Type:	Survival-Grov	wth		Ana	lvst: Bre	tt Muckey		
Start Date:	22 Aug-16		Protocol:		9/064 (2000)		Dilu	•	d-Hard Synth	etic Wate	r
Ending Date:	01 Sep-16	:	Species:	Hyalella azte			Brin		•		
Duration:	10d 0h	:	Source:	Chesapeak (Cultures, Naye	s, Virginia	Age	:			
Sample ID:	10-0448-9482	(Code:	B3584-04			Clie	nt:			
Sample Date:	05 Jul-16	I	Material:	Sediment			Proj	ect:			
Receive Date:	: 13 Jul-16	;	Source:	Kensington C	Gold Mine (AK	0050571)					
Sample Age:	48d 0h	;	Station:	Lower Slate	Creek						
Data Transfor	m	Zeta	Alt H	yp Trials	Seed		PMSD	Test Res	ult		
Untransformed	1	NA	C > T	NA	NA		7.07%	Passes n	nean dry weig	ght-mg	
Equal Variance	e t Two-Sample	e Test									
Control	vs C-%		Test S	Stat Critical	MSD DF	P-Value	P-Type	Decision	ı(α:5%)		
Dilution Water	100		-1.69	1.761	0.006 14	0.9434	CDF	Non-Sign	ificant Effect		
Auxiliary Test	s										
Attribute	Test			Test Sta	at Critical	P-Value	Decision	(α:5%)			
Control Trend	Mann-Ke	ndall Tre	end			0.3987	Non-signi	ficant Trend	d in Controls		
ANOVA Table											
Source	Sum Squ	ares	Mean	Square	DF	F Stat	P-Value	Decision	ı(α:5%)		
Between	0.0001538	329	0.000	153829	1	2.857	0.1131	Non-Sign	ificant Effect		
Error	0.0007538	3695	5.3847	782E-05	14						
Total	0.0009076	5985			15						
Distributional	Tests										
Attribute	Test			Test Sta	at Critical	P-Value	Decision	(α:1%)			
Variances	Variance	Ratio F	Test	1.49	8.885	0.6119	Equal Va	riances			
Distribution	Shapiro-\	Wilk W N	lormality	0.9678	0.8408	0.8015	Normal D	istribution			
Mean Dry Wei	ight-mg Summa	iry									
C-%	Control Type	Count	Mean	95% LC	L 95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.0913	38 0.08588	0.09687	0.09039	0.085	0.104	0.002325	7.2%	0.0%
100		8	0.0975	58 0.09087	0.1043	0.09788	0.085	0.1111	0.002838	8.23%	-6.79%
Mean Dry Wei	ight-mg Detail										
	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
C-%	control type	Iteh I	Ttop z	Itop o	nop 4	nep o	nep o	1100	1000		
	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104		

CETIS Analytical Report	Report Date:	15 Sep-16 16:18 (p 2 of 4)
	Test Code:	B358404hac 20-2784-0407
		······································



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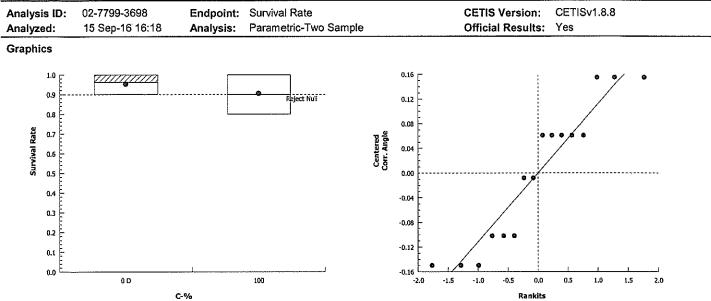
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CETIS An	alytical Rep	ort					•	ort Date: Code:		Sep-16 16: 3404hac 2	18 (p 3 of - 0-2784-04(
Hyallela 10-d	Survival and G	rowth S	ediment Te	st					2000		HILL - AS
Analysis ID:	02-7799-3698		Endpoint:	Survival Rate			CET	IS Version	: CETISv1	.8.8	
Analyzed:	15 Sep-16 16:	18	Analysis:	Parametric-Two	o Sample		Offic	cial Result	s: Yes		
Batch ID:	15-6395-3015			Survival-Growth			Ana	•	ett Muckey		
Start Date:	22 Aug-16		Protocol:	EPA/600/R-99/	. ,		Dilu		od-Hard Synt	hetic Water	
Ending Date: Duration:	: 01 Sep-16 10d 0h		Species: Source:	Hyalella azteca Chesapeak Cul		e Virainia	Brin				
				·	itures, ivaye	s, virginia	Age				
Sample ID:	10-0448-9482		Code:	B3584-04			Clie				
Sample Date Receive Date			Material: Source:	Sediment Kensington Gol	ld Mino (AK)	050571)	Proj	ect:			
Sample Age:			Station:	Lower Slate Cr	•	000071)					
Data Transfo		Zeta	Alt H		Seed		PMSD	Test Re:			
Angular (Corr		NA	C > T		NA		6.53%		survival rate		
Equal Varian	ce t Two-Sampl	a Tast									
Control	vs C-%	o roat	Test	Stat Critical	MSD DF	P-Value	P-Type	Decisio	n(a:5%)		
Dilution Wate		<u> </u>	1.616			0.0642	CDF	····	nificant Effec	t	
Auxiliary Tes	ts							- 3		· ···· · ···	
Attribute	Test			Test Stat	Critical	P-Value	Decision	(a:5%)			
Control Trend		endall Tre	end	Test Oldi	Unival	0.1964		• •	d in Controls		
ANOVA Table											
Source	Sum Squ	aros	Mean	Square	DF	F Stat	P-Value	Decision	n(a:5%)		
Between	0.035309		0.035		1	2.61	0.1285		nificant Effect	+	
Error	0.189381		0.013		, 14	2.01	0.1200	non olgi		•	
Total	0.224690	9			15	-					
Distributiona	l Tests										
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:1%)			
Variances	Variance	Ratio F	Test	2.803	8.885	0.1973	Equal Va	riances			
Distribution	Shapiro-	Wilk W N	lormality	0.8803	0.8408	0.0392	Normal D	istribution			
Survival Rate	e Summary										
C-%	Control Type	Count	. Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.962	5 0.9192	1	1	0.9	1	0.0183	5.38%	0.0%
100		8	0.9	0.8226	0.9774	0.9	0.8	1	0.03273	10.29%	6.49%
Angular (Cor	rected) Transfor	rmed Su	mmary								
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.351	1.28	1.421	1.412	1.249	1.412	0.02982	6.24%	0.0%
100		8	1.257	1.139	1.375	1.249	1.107	1.412	0.04993	11.23%	6.96%
Survival Rate	e Detail									_	_
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	1	1	1	0.9	1	0.9	0.9	1		
100		1	1	1	0.9	0.8	0.8	0.9	0.8		
Angular (Cor	rected) Transfor	med De	tail								
Angulai (COI	Control Type	Rep 1	Rep 2		Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
C-%		1.412	1.412	1.412	1.249	1.412	1.249	1.249	1.412		
C-%	Dilution Water				1 2/0	1.107	1.107	1.249	1.107		
C-%	Dilution Water	1.412	1.412	1.412	1.249						
C-% 0 100	<u> </u>		1.412	1.412	1.243						
C-% 0 100 Survival Rate C-%	Binomials Control Type	1.412 Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
C-% 0 100 Survival Rate	Binomials	1.412					Rep 6 9/10 8/10	Rep 7 9/10 9/10			

Analyst: 3~ QA:_

CETIS Analytical Report	Report Date:	15 Sep-16 16:18 (p 4 of 4)
	Test Code:	B358404hac 20-2784-0407
Hyallela 10-d Survival and Growth Sediment Test		CH2M HILL - ASL
		······································



QA:_

CETIS Sun	nmary Repo	ort					-	ort Date: Code:		•	6 (p 1 of 1) -4580-4296
Hyallela 10-d	Survival and Gr	owth Sedir	nent Test								HILL - ASL
Batch ID: Start Date: Ending Date: Duration:	15-6395-3015 22 Aug-16 01 Sep-16 10d Oh	Pro Spe	tocol: EP cies: Hys	vival-Growth A/600/R-99/ alella azteca esapeak Cul	064 (2000)	s, Virginia	Anal Dilu Brin Age	ent: Mod e:	t Muckey -Hard Synth	etic Water	
Sample ID: Sample Date: Receive Date: Sample Age:	: 13 Jul-16	Sou	erial: Sec arce: Ker	584-02 diment nsington Gol per Slate Cre	the state of the s	050571)	Clie Proj				
Comparison S	-										
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	TU	Method	. –	<u> </u>	
11-0783-3458 10-2248-7243	Mean Dry Weig Survival Rate	ght-mg	100 · · · · · 100	>100) >100	NA NA	8.93% 11.8%	1 1	-	ance t Two- Rank Sum T	-	
Test Acceptal	oility										
Analysis ID	Endpoint		Attribute		Test Stat	TAC Lim	its	Overlap	Decision		
10-2248-7243	Survival Rate		Control R	esp	0.9625	0.8 - NL		Yes	Passes Ac	ceptability	Criteria 🚧
Mean Dry We	ight-mg Summa	iry									
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.09138	0.08588	0.09687	0.085	0.104	0.002325	0.006577	7.2%	0.0%
100		8	0.09285	0.08338	0.1023	0.07625	0.1078	0.004005	0.01133	12.2%	-1.62%
Survival Rate	Summary										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.9625	0.9192	1	0.9	1	0.0183	0.05175	5.38%	0.0%
100		8	0.85	0.6552	1	0.3	1	0.08238	0.233	27.41%	11.69%
Mean Dry We	ight-mg Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104		
100		0.1067	0.09667	0.08444	0.07625	0.094	0.082	0.1078	0.095		
Survival Rate	Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	1	1	1	0.9	1	0.9	0.9	1		
100		0.3	0.9	0.9	0.8	1	1	0.9	1		
Survival Rate	Binomials						· ·				
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	10/10	10/10	10/10	9/10	10/10	9/10	9/10	10/10		
100		3/10	9/10	9/10	8/10	10/10	10/10	9/10	10/10		

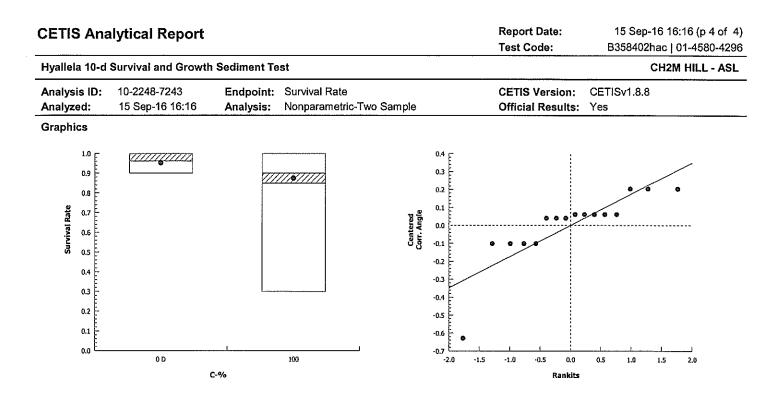
Analyst:______ QA:_____

CETIS Analytical Report

Test Code:

						<u></u>					
Hyallela 10-d	Survival and G	rowth Sec	diment Test							CH2M	HILL - AS
Analysis ID: Analyzed:	10-2248-7243 15 Sep-16 16:			Survival Rate Ionparametric-	Two Sampl	e		IS Version ial Result		.8.8	
Batch ID:	15-6395-3015	T	est Type: S	Survival-Growth	ו		Anal	yst: Bre	ett Muckey		
Start Date:	22 Aug-16	P	rotocol: E	EPA/600/R-99/	064 (2000)		Dilue	ent: Mo	d-Hard Synth	netic Water	
Ending Date:	01 Sep-16	S	pecies: H	lyalella azteca			Brin	e:			
Duration:	10d Oh	S	ource: C	Chesapeak Cul	tures, Naye	s, Virginia	Age:				
Sample ID:	13-2959-2362	С		33584-02			Clier				
Sample Date:				Sediment			Proj	ect:			
Receive Date				Censington Gol	-	0050571)					
Sample Age:	47d 0h	S	tation: L	Jpper Slate Cro	eek						
Data Transfo		Zeta	Alt Hyp		Seed		PMSD	Test Res	sult		
Angular (Corre	ected)	NA	С>Т	NA	NA		11.8%	Passes s	survival rate		
Wilcoxon Ra	nk Sum Two-Sa	mple Test	t								
Control	vs C-%		Test St			P-Value	Р-Туре	Decisior	n(α:5%)		<u></u>
Dilution Water	r 100		57	NA	2 14	0.1508	Exact	Non-Sigr	ificant Effect	·	
Auxiliary Tes	ts										
Attribute	Test			Test Stat	Critical	P-Value	Decision((α:5%)			
Control Trend	Mann-Ke	endall Trer	ıd			0.1964	Non-signi	ficant Trend	in Controls		
ANOVA Table	3										
Source	Sum Squ		Mean S	•	DF	F Stat	P-Value	Decisior			
Between	0.080832		0.08083		1	1.935	0.1859	Non-Sigr	ificant Effect		
Error	0.584723		0.04176	599	14						
Total	0.665556	6			15						
Distributiona											
Attribute	Test			Test Stat		P-Value	Decision(·····			
Variances		Ratio F T		10.74	8.885	0.0057	Unequal \				
Distribution	_	Wilk W No	ormality	0.7382	0.8408	0.0005	Non-norm	al Distribut	ion		
Survival Rate	a Summary										
C-%	Control Type	Count	Mean	95% LCL			Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.9625	0.9192	1	1	0.9	1	0.0183	5.38%	0.0%
100		8	0.85	0.6552	1	0.9	0.3	1	0.08238	27.41%	11.69%
	rected) Transfor	med Sum	imary								
C-%	Control Type	Count	Mean	95% LCL	AC0/ 1101	88 a12	8.62	Max	Std Err	CV%	%Effect
					95% UCL	Median	Min				
-	Dilution Water	8	1.351	1.28	1.421	1.412	1.249	1.412	0.02982	6.24%	0.0%
-	Dilution Water										
100 Survival Rate		8	1.351	1.28	1.421	1.412	1.249	1.412	0.02982	6.24%	0.0%
100 Survival Rate C-%	Detail Control Type	8 8 Rep 1	1.351 1.209 Rep 2	1.28 0.9776 Rep 3	1.421 1.44 Rep 4	1.412 1.249 Rep 5	1.249 0.5796 Rep 6	1.412 1.412 Rep 7	0.02982 0.09774 Rep 8	6.24%	0.0%
100 Survival Rate C-% 0	Detail	8 8 Rep 1 1	1.351 1.209 Rep 2 1	1.28 0.9776 Rep 3 1	1.421 1.44 Rep 4 0.9	1.412 1.249 Rep 5 1	1.249 0.5796 Rep 6 0.9	1.412 1.412 Rep 7 0.9	0.02982 0.09774 Rep 8 1	6.24%	0.0%
100 Survival Rate C-% 0	Detail Control Type	8 8 Rep 1	1.351 1.209 Rep 2	1.28 0.9776 Rep 3	1.421 1.44 Rep 4	1.412 1.249 Rep 5	1.249 0.5796 Rep 6	1.412 1.412 Rep 7	0.02982 0.09774 Rep 8	6.24%	0.0%
100 Survival Rate C-% 0 100 Angular (Corr	Detail Control Type Dilution Water rected) Transfor	8 8 Rep 1 1 0.3	1.351 1.209 Rep 2 1 0.9 il	1.28 0.9776 Rep 3 1 0.9	1.421 1.44 Rep 4 0.9 0.8	1.412 1.249 Rep 5 1 1	1.249 0.5796 Rep 6 0.9 1	1.412 1.412 Rep 7 0.9 0.9	0.02982 0.09774 Rep 8 1 1	6.24%	0.0%
100 Survival Rate C-% 0 100 Angular (Corr C-%	Detail Control Type Dilution Water rected) Transfor Control Type	8 8 Rep 1 1 0.3 med Deta Rep 1	1.351 1.209 Rep 2 1 0.9 il Rep 2	1.28 0.9776 Rep 3 1 0.9 Rep 3	1.421 1.44 Rep 4 0.9 0.8 Rep 4	1.412 1.249 Rep 5 1 1 Rep 5	1.249 0.5796 Rep 6 0.9 1 Rep 6	1.412 1.412 Rep 7 0.9 0.9 Rep 7	0.02982 0.09774 Rep 8 1 1 Rep 8	6.24%	0.0%
100 Survival Rate C-% 0 100 Angular (Corr C-% 0	Detail Control Type Dilution Water rected) Transfor	8 8 Rep 1 1 0.3 med Deta Rep 1 1.412	1.351 1.209 Rep 2 1 0.9 il Rep 2 1.412	1.28 0.9776 Rep 3 1 0.9 Rep 3 1.412	1.421 1.44 Rep 4 0.9 0.8 Rep 4 1.249	1.412 1.249 Rep 5 1 1 Rep 5 1.412	1.249 0.5796 Rep 6 0.9 1 Rep 6 1.249	1.412 1.412 Rep 7 0.9 0.9 Rep 7 1.249	0.02982 0.09774 Rep 8 1 1 Rep 8 1.412	6.24%	0.0%
100 Survival Rate C-% 0 100 Angular (Corr C-% 0 100	Detail Control Type Dilution Water rected) Transfor Control Type Dilution Water	8 8 Rep 1 1 0.3 med Deta Rep 1	1.351 1.209 Rep 2 1 0.9 il Rep 2	1.28 0.9776 Rep 3 1 0.9 Rep 3	1.421 1.44 Rep 4 0.9 0.8 Rep 4	1.412 1.249 Rep 5 1 1 Rep 5	1.249 0.5796 Rep 6 0.9 1 Rep 6	1.412 1.412 Rep 7 0.9 0.9 Rep 7	0.02982 0.09774 Rep 8 1 1 Rep 8	6.24%	0.0%
100 Survival Rate C-% 0 Angular (Corr C-% 0 100 Survival Rate	Detail Control Type Dilution Water rected) Transfor Control Type Dilution Water	8 8 Rep 1 1 0.3 med Deta Rep 1 1.412 0.5796	1.351 1.209 Rep 2 1 0.9 il Rep 2 1.412 1.249	1.28 0.9776 Rep 3 1 0.9 Rep 3 1.412 1.249	1.421 1.44 Rep 4 0.9 0.8 Rep 4 1.249 1.107	1.412 1.249 Rep 5 1 1 1 Rep 5 1.412 1.412	1.249 0.5796 Rep 6 0.9 1 Rep 6 1.249 1.412	1.412 1.412 Rep 7 0.9 0.9 Rep 7 1.249 1.249	0.02982 0.09774 Rep 8 1 1 1 Rep 8 1.412 1.412	6.24%	0.0%
100 Survival Rate C-% 0 Angular (Corr C-% 0 100 Survival Rate C-%	Detail Control Type Dilution Water rected) Transfor Control Type Dilution Water Binomials Control Type	8 8 Rep 1 1 0.3 med Deta Rep 1 1.412 0.5796 Rep 1	1.351 1.209 Rep 2 1 0.9 iil Rep 2 1.412 1.249 Rep 2	1.28 0.9776 Rep 3 1 0.9 Rep 3 1.412 1.249 Rep 3	1.421 1.44 Rep 4 0.9 0.8 Rep 4 1.249 1.107 Rep 4	1.412 1.249 Rep 5 1 1 1 Rep 5 1.412 1.412 Rep 5	1.249 0.5796 Rep 6 0.9 1 1 Rep 6 1.249 1.412 Rep 6	1.412 1.412 Rep 7 0.9 0.9 Rep 7 1.249 1.249 Rep 7	0.02982 0.09774 Rep 8 1 1 1 Rep 8 1.412 1.412 Rep 8	6.24%	0.0%
0 100 Survival Rate C-% 0 Angular (Corr C-% 0 Survival Rate C-% 0 100	Detail Control Type Dilution Water rected) Transfor Control Type Dilution Water	8 8 Rep 1 1 0.3 med Deta Rep 1 1.412 0.5796	1.351 1.209 Rep 2 1 0.9 il Rep 2 1.412 1.249	1.28 0.9776 Rep 3 1 0.9 Rep 3 1.412 1.249	1.421 1.44 Rep 4 0.9 0.8 Rep 4 1.249 1.107	1.412 1.249 Rep 5 1 1 1 Rep 5 1.412 1.412	1.249 0.5796 Rep 6 0.9 1 Rep 6 1.249 1.412	1.412 1.412 Rep 7 0.9 0.9 Rep 7 1.249 1.249	0.02982 0.09774 Rep 8 1 1 1 Rep 8 1.412 1.412	6.24%	0.0%

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QA:___

	lytical Rep	ort					-	ort Date: Code:		•	16 (p 1 of 4)
Hyallela 10-d	Survival and G	owth S	ediment Tes	st						CH2M	HILL - ASL
Analysis ID:	11-0783-3458		-	Mean Dry Wei				IS Version:		.8.8	
Analyzed:	15 Sep-16 16:		•	Parametric-Tw				ial Results			
Batch ID:	15-6395-3015			Survival-Grow			Anal	•	tt Muckey		
Start Date:	22 Aug-16			EPA/600/R-99	,		Dilu		d-Hard Synth	etic Wate	r
Ending Date:	•		•	Hyalella aztec			Brin				
Duration:	10d 0h		Source:	Chesapeak Cu	iltures, Naye	es, Virginia	Age:				
Sample ID:	13-2959-2362		Code:	B3584-02			Clier	nt:			
Sample Date:	06 Jul-16		Material:	Sediment			Proj	ect:			
Receive Date:	: 13 Jul-16		Source:	Kensington Go	old Mine (AK	0050571)					
Sample Age:	47d Oh		Station:	Upper Slate C	reek						
Data Transfor	m	Zeta	Ait Hy	/p Trials	Seed		PMSD	Test Res	ult		
Untransformed	1	NA	С>Т	NA	NA		8.93%	Passes m	iean dry weig	ght-mg	
Equal Varianc	e t Two-Sample	e Test									
Control	vs C-%		Test S	tat Critical	MSD DF	P-Value	P-Type	Decision	(α:5%)		
Dilution Water			-0.318			0.6226	CDF		ificant Effect		
Auxiliary Test	s										
Attribute	Test										
	IUSL			Test Stat	Critical	P-Value	Decision	(α:5%)			
	Mann-Ke	ndall Tr	end	Test Stat	Critical	P-Value 0.3987	Decision Non-signi		in Controls		
Control Trend	Mann-Ke	ndall Tr	end	Test Stat	Critical				in Controls		
Control Trend	Mann-Ke			Test Stat	DF						
Control Trend ANOVA Table Source	Mann-Ke	ares	Mean			0.3987	Non-signi	ficant Trend	(α:5%)		····
Control Trend ANOVA Table Source Between	Mann-Ke Sum Squ	ares Ξ-06	Mean 8.7087	Square	DF	0.3987 F Stat	Non-signi P-Value	ficant Trend			·····
Control Trend ANOVA Table Source Between Error	Mann-Ke Sum Squ 8.708719	ares 5-06 992	Mean 8.7087	Square /19E-06	DF 1	0.3987 F Stat	Non-signi P-Value	ficant Trend	(α:5%)		
Control Trend ANOVA Table Source Between Error Total	Mann-Ke Sum Squ 8.7087191 0.0012009 0.0012091	ares 5-06 992	Mean 8.7087	Square /19E-06	DF 1 14	0.3987 F Stat	Non-signi P-Value	ficant Trend	(α:5%)		·····
Control Trend ANOVA Table Source Between Error Total Distributional	Mann-Ke Sum Squ 8.7087191 0.0012009 0.0012091	ares 5-06 992	Mean 8.7087	Square 19E-06 517E-05	DF 1 14	0.3987 F Stat	Non-signi P-Value	icant Trend Decision Non-Signi	(α:5%)		
Control Trend ANOVA Table Source Between Error Total Distributional Attribute	Mann-Ke Sum Squ 8.7087190 0.0012009 0.0012097	ares E-06 992 701	Mean 8.7087 8.5785	Square 19E-06 517E-05	DF 1 14 15	0.3987 F Stat 0.1015	Non-signi P-Value 0.7547	icant Trend Decision Non-Signi (α:1%)	(α:5%)		
Control Trend ANOVA Table Source Between Error Total Distributional Attribute Variances	Mann-Ke Sum Squ 8.7087190 0.0012009 0.0012097 Tests Test	ares E-06 992 701 Ratio F	Mean 8.7087 8.5785 Test	Square /19E-06 517E-05 Test Stat	DF 1 14 15 Critical	0.3987 F Stat 0.1015 P-Value	Non-signi P-Value 0.7547 Decision	Decision Non-Signi (α:1%) iances	(α:5%)		·····
Control Trend ANOVA Table Source Between Error Total Distributional Attribute Variances Distribution	Mann-Ke Sum Squ 8.7087191 0.0012009 0.001209 Tests Test Variance	ares E-06 992 701 Ratio F Wilk W I	Mean 8.7087 8.5785 Test	Square 19E-06 17E-05 Test Stat 2.967	DF 1 14 15 Critical 8.885	0.3987 F Stat 0.1015 P-Value 0.1747	Non-signi P-Value 0.7547 Decision Equal Var	Decision Non-Signi (α:1%) iances	(α:5%)		
Control Trend ANOVA Table Source Between Error Total Distributional Attribute Variances Distribution Mean Dry Wei	Mann-Ke Sum Squ 8.7087191 0.0012003 0.0012091 Tests Test Variance Shapiro-N	ares E-06 992 701 Ratio F Wilk W I	Mean 8.7087 8.5785 Test Normality	Square '19E-06 517E-05 Test Stat 2.967 0.9607	DF 1 14 15 Critical 8.885	0.3987 F Stat 0.1015 	Non-signi P-Value 0.7547 Decision Equal Var	Decision Non-Signi (α:1%) iances	(α:5%)	CV%	%Effect
Control Trend ANOVA Table Source Between Error Total Distributional Attribute Variances Distribution Mean Dry Wei C-%	Mann-Ke Sum Squ 8.7087191 0.0012009 0.0012091 Tests Test Variance Shapiro-V	ares E-06 992 701 Ratio F Wilk W N	Mean 8.7087 8.5785 Test Normality	Square '19E-06 517E-05 Test Stat 2.967 0.9607 95% LCL	DF 1 14 15 Critical 8.885 0.8408	0.3987 F Stat 0.1015 	Non-signi P-Value 0.7547 Decision Equal Var Normal D	Decision Non-Signi (α:1%) iances stribution	(α:5%) ificant Effect		%Effect 0.0%
Control Trend ANOVA Table Source Between Error Total Distributional Attribute Variances Distribution Mean Dry Wei C-%	Mann-Ke Sum Squ 8.708719 0.001200 0.001209 Tests Test Variance Shapiro-N ight-mg Summa Control Type	ares E-06 992 701 Ratio F Wilk W M	Mean 8.7087 8.5785 Test Normality t Mean	Square '19E-06 :17E-05 Test Stat 2.967 0.9607 95% LCL 8 0.08588	DF 1 14 15 Critical 8.885 0.8408 95% UCL	0.3987 F Stat 0.1015 P-Value 0.1747 0.6736 Median	Non-signi P-Value 0.7547 Decision Equal Var Normal D Min	icant Trend Decision Non-Signi (α:1%) iances istribution Max	(α:5%) ificant Effect Std Err	CV%	
Control Trend ANOVA Table Source Between Error Total Distributional Attribute Variances Distribution Mean Dry Wei C-% D	Mann-Ke Sum Squ 8.708719 0.001200 0.001209 Tests Test Variance Shapiro-N ight-mg Summa Control Type	ares E-06 992 701 Ratio F Wilk W M Iry Count 8	Mean 8.7087 8.5785 Test Normality t <u>Mean</u> 0.0913	Square '19E-06 517E-05 Test Stat 2.967 0.9607 95% LCL 18 0.08588	DF 1 14 15 Critical 8.885 0.8408 95% UCL 0.09687	0.3987 F Stat 0.1015 P-Value 0.1747 0.6736 Median 0.09039	Non-signi P-Value 0.7547 Decision Equal Var Normal D Min 0.085	icant Trend Decision Non-Signi (α:1%) iances istribution Max 0.104	(α:5%) ificant Effect Std Err 0.002325	CV% 7.2%	0.0%
Control Trend ANOVA Table Source Between Error Total Distributional Attribute Variances Distribution Mean Dry Wei 100 Mean Dry Wei	Mann-Ke Sum Squ 8.7087191 0.0012009 0.0012097 Tests Test Variance Shapiro-N ight-mg Summa Control Type Dilution Water	ares E-06 992 701 Ratio F Wilk W M Irry Count 8 8	Mean 8.7087 8.5785 Test Normality t Mean 0.0913 0.0928	Square 19E-06 17E-05 Test Stat 2.967 0.9607 95% LCL 8 0.08588 5 0.08338	DF 1 14 15 Critical 8.885 0.8408 95% UCL 0.09687	0.3987 F Stat 0.1015 P-Value 0.1747 0.6736 Median 0.09039 0.0945	Non-signi P-Value 0.7547 Decision Equal Var Normal D Min 0.085 0.07625	Cant Trend Decision Non-Signi (α:1%) iances stribution Max 0.104 0.1078	(α:5%) ificant Effect Std Err 0.002325 0.004005	CV% 7.2%	0.0%
Control Trend ANOVA Table Source Between Error Total Distributional Attribute Variances Distribution Mean Dry Wei C-% 0 Mean Dry Wei C-%	Mann-Ke Sum Squ 8.7087191 0.0012003 0.0012093 Tests Test Variance Shapiro-V ight-mg Summa Control Type Dilution Water	ares E-06 992 701 Ratio F Wilk W M Iry Count 8	Mean 8.7087 8.5785 Test Normality t Mean 0.0913 0.0928	Square '19E-06 517E-05 Test Stat 2.967 0.9607 95% LCL 18 0.08588	DF 1 14 15 Critical 8.885 0.8408 95% UCL 0.09687 0.1023	0.3987 F Stat 0.1015 P-Value 0.1747 0.6736 Median 0.09039	Non-signi P-Value 0.7547 Decision Equal Var Normal D Min 0.085	icant Trend Decision Non-Signi (α:1%) iances istribution Max 0.104	(α:5%) ificant Effect Std Err 0.002325	CV% 7.2%	0.0%

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CETIS	S Ana	alytical Report					Repor Test C	t Date: Code:				:16 (p 2 of)1-4580-42	•
Hyaile	a 10-d	Survival and Growth	Sediment Te	st							CH2M	HILL - AS	L
Analys Analyz		11-0783-3458 15 Sep-16 16:16	Endpoint: Analysis:	Mean Dry Weight-mg Parametric-Two Sample				Version: al Results		Sv1.8.8	5		
Graph	ics												
Mean Dry Weight-mg	0.12			Reject Null	Centered Untransformed	0.020 0.015 0.010 0.005 -0.005	•_•			8	•		
	0.02			1		-0.015		,	1		,	1	
	0.00	0 D	Ç-%	100		-0.020 -1	5 -1.0	-0.5 0. Rankii		1.0	1.5	2.0	

Analyst: 3~ QA:_____

		Kƙ	Kensington			L	Test Initiation: Date	8-22-16	Test Ten	Test Termination: Date	9-1-19
Contact					Technician						
Test Species/ID	D Chironomus		tertars		CHI U	026				\	
	ngggyuu yaan a t									/	
		Sample I	Sample Information				Test	1D#	ID#	ID#	#QI
Sample ID	Field	Collected	Total Residual Ammonia Chlorine (mg/l) NH ₃ -N	I Ammonia	[Alkalinity mg/l as	Species Information	CHI 2,C Chronic			
Number	Q	Date Tir	ne		caco	caco,	Organism Age at	2nd to 3rd instar			
B3584-01	East Fork Slate Creek T. W. 1300	1-6-11 130	- / - 9	See Tit	See Titration and Ammonia	mmonia	Initiation	(~10 day old)			
B3584-02	Upper Slate Creek 7	7-6-16 1500	- / - 🗸		sheet		Test Container Size	300 ml			
B3584-03	Lower Sherman Creek 74-10 NGO	74-11 NE	- / - 00	1	1	1	Test Volume	100 ml sample,			
B3584-04	Lower Slate Creek 7-5-16 090	75-16 09	00 - / -	1	I	ł		water			
B3584-05	Lower Johnson Creek & & Al, 1530	<u>8-8-11</u> ,153	30 - / -	1	I	1	Feeding: Type	1.5 ml of a 4 g/L			
		1	`				Amount	retrafin slurry daily			
			\ 					1			
			/				Aeration: Began	nae			
			/				Amount				
			/				Dilution Water ID#	5330 US47			
			/				Acclimation Period	Ġ days			
			/				Test Location	0! #			
			/				Initial Size (mg/org)	1			
				Hardness	Alkalinity	Initial	Comments: 🗹 Indic	\blacksquare Indicates the following action was taken, (\square Indicates action not taken):	ction was taken,	(🔲 Indicates action	n not taken)
	Dilution Water		#DI#	mg/l as	mg/l as	μd					
				caco ₃	caco ₃						
Dilution Sediment	iment		H380	-	1	H					
Recon MH (FHM)	EHM)		1207	00	(a)	5.2					
			4400	90	70	62					
			20nh	35	66	2.2					
			Eann	26	64	&.(Water Qua	Water Quality Meters Used/ID#	1/ID#	
			4.107	44	66	9:5	Dissolved Oxygen)xygen #2 [/] H	11 ×# Hd	Conductivity	#2

Kensington- Chironomid with randomization 10 day B3584- updated with emerged and pupee.xism Doc. Control ID: ASL1120-1115

Client	Kensington				Species ID#	сні 2С
Sample Description:	See Randomizati	ion Sheet.			Start Date	8-22-16
Laboratory ID	4	dness s CaCO3) Final		linity 5 CaCO3) Final		nonia s NH ₃ -N) Final
Sediment Control	82	8(62	68	0,12	0,24
B3584-01	115	113	26	114	0,23	0,19
B3584-02	113	104	26	100	<i>D.</i> 22	1.51
B3584-03	21	101	69	ଞ୍ଚ	<0,0	<i>0.48</i>
B3584-04	91	90	66	73	<0,10	OIB
B3584-05	25	48	63	73	D.15	1.24
						-
					· · · · · · · · · · · · · · · · · · ·	
				-		

Client	Kensi	ington	Species ID# CHI 26		
Lab ID:see randomizat	ion sheet batch nur	nber: B3584	Start Date	8/22/2016	
Sample Description:	Weights of Chironomids	at test initiation (= num	ber of replicates as the test,	10 Midge each)	
Technician: Date: Balance Serial #:	MC 8/24/2016 50309851	KJ 8/18/2016 50309851			
Tin ID Number	Total Dry Weight (mg) (including pan)	Tare Weight (mg)	No. of Amphipods Surviving	No. of Amphipods in Tin	
@ Initiation A	63.93	62.90	na	5	
@ Initiation B	63.64	62.99	na	5	
@ Initiation C	64.30	63.73	na	5	
@ Initiation D	63.97	63.20	na	5	
@ Initiation E			na		
@ Initiation F			na		
@ Initiation G			na		
@ Initiation H			na		

weigh to 0.01 mg

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IL FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Dissolved Oxygen (mgt) 1 2 3 4 5 6 7 8 6 7 8 9 64 6.8 7.1 6.7 5.1 5.4 4 0 5.65.3 5.3 6.6 7.0 64 4.9 5.1 5.4 4 0 5.65.3 5.3 6.5 6.8 6.1 5.0 4.9 4.7 4.6 4.5 5.2 6.1 6.5 6.0 4.9 4.7 4.1 4.2 5.2 6.1 6.5 6.0 4.9 4.7 4.1 4.2 5.2 6.1 6.5 6.0 4.9 4.7 4.1 4.2 5.2 6.1 6.5 6.0 4.9 4.7 4.8 4.24.1 2.1 1.2 5.2 6.1 6.5 6.0 4.9 4.7 4.8 4.24.1 5.2 6.1 6.5 6.0 4.9 4.7 4.1 5.2 6.1 6.5 6.0 4.9 4.7 4.1 4.2 5.2 6.1 6.5 6.0 4.9 4.1 4.1 4.2 5.2 6.1 6.5 6.0 4.9 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4.1	Kenskrgton- Chironomid with randomization 10 day B3584- updated with energed and pupaexism
CHANHILL	Client Sample Description Test Species: Chironomus tentans Pole we §22-16 Anne B (E Anne B (E	× × 177000000000000000000000000000000000	

a- Chironomid with random/zation 10 day B3584- updated with emerged and pupae.xism Doc. Control ID: ASL1120-1115

AU /		-				
Client:	Kensington	7	Fest Start Date:			
Laboratory ID:	Field ID:	Alternate ID / Dilutions:	Replicate ID:	Random Number	Test Chamber Number:	
Sediment Control	Beaver Creek	Control	F	0.90407	51	
Sediment Control	Beaver Creek	Control	В	0.88971	52	
Sediment Control	Beaver Creek	Control	С	0.76041	61	
Sediment Control	Beaver Creek	Control	D	0.73942	66	
Sediment Control	Beaver Creek	Control	G	0.63191	72	
Sediment Control	Beaver Creek	Control	E	0.55508	73	
Sediment Control	Beaver Creek	Control	H	0.45454	78	
Sediment Control	Beaver Creek	Control	A	0.01631	94	
33584-05	Lower Johnson Creek		Н	0.93879	50	
B3584-05	Lower Johnson Creek		F	0.88696	53	
B3584-05	Lower Johnson Creek		A	0.76600	59	
33584-05	Lower Johnson Creek		В	0.49618	75	
33584-05	Lower Johnson Creek		G	0.48773	76	
33584-05	Lower Johnson Creek		D	0.44359	79	
33584-05	Lower Johnson Creek		С	0.23540	87	
33584-05	Lower Johnson Creek		E	0.21939	88	
33584-04	Lower Slate Creek		D	0.77809	58	
33584-04	Lower Slate Creek		A	0.75842	62	
33584-04	Lower Slate Creek		С	0.74187	65	
33584-04	Lower Slate Creek		B	0.50409	74	
33584-04	Lower Slate Creek		H	0.43420	80	
33584-04	Lower Slate Creek		E	0.38522	82	
33584-04	Lower Slate Creek		G	0.14000	90	
33584-04	Lower Slate Creek		F	0.00219	96	
33584-03	Lower Sherman Creek		A	0.82549	56	
33584-03	Lower Sherman Creek		B	0.80014	57	
33584-03	Lower Sherman Creek		D	0.75695	63	
B3584-03	Lower Sherman Creek		E	0.71313	67	
B3584-03	Lower Sherman Creek		G	0.67422	71	
33584-03	Lower Sherman Creek		C	0.27353	85	
33584-03	Lower Sherman Creek			0.25418	86	
B3584-03	Lower Sherman Creek		F	0.08580	92	
B3584-02	Upper Slate Creek			0.94785	49	
B3584-02	Upper Slate Creek		D	0.88528	54	
B3584-02	Upper Slate Creek		B	0.76290	60	
33584-02	Upper Slate Creek		A	0.41629	81	
33584-02 33584-02	Upper Slate Creek			0.37773	83	
33584-02	Upper Slate Creek		G	0.21876	89	
33584-02 33584-02	Upper Slate Creek		E	0.10843	91	
B3584-02 B3584-02	Upper Slate Creek		C C	0.06515	93	
33584-02 33584-01	East Fork Slate Creek		<u> </u>	0.83515	55	
33584-01	East Fork Slate Creek		F	0.83515	64	
33584-01 33584-01	East Fork Slate Creek		E F	0.74752	68	
33584-01	East Fork Slate Creek		G	0.69883	69	
	East Fork Slate Creek				70	
33584-01			A	0.69417		
B3584-01	East Fork Slate Creek			0.48029	77	
33584-01	East Fork Slate Creek		<u> </u>	0.37157	84	
33584-01	East Fork Slate Creek		B	0.01058	95	
			Z			
			Z			
			Z			

CHA	MHIL	L	FRE	SHWATE	R TOXIC	CITY TES	ST SURV	IVAL AN	D EMER	GENCE I	DATA	
Client				Kensingto	n	- 720			Beginning,	Date 2	122/16	
Sample E Test Spec		: See Rand	lomization S	Sheet(s). Bat	ch number:	<u>в 576</u> Сні 24	<u> </u>		Ending, Da	te <u>$1-1$</u>	-10	Time <u>0 81 ></u> Survival = (total number of live pupae + live
-			water renev	val, record th			lults in each	container (c	an be left bl	ank if there	are none)	larvae + emerged adults) / Start count
••••••			, 							supri		If Growth endpoint to be used, place only the
'l'ech:	Start	#	#	#	#	#	#	#	# pupae	# larvae	# larvae	live larvae collected @ Day 10 final into tin. (pupae and emerged adults are discarded)
Beaker	Count	emerged	emerged	emerged	emerged	emerged	emerged	emerged	alive	# laivae alive	dead	
Number	0	Day 7 pm	Day 8 am	Day 8 pm	Day 9 am	Day 9 pm	Day 10 am	Day 10 final	Day 10 final	Day 10 final	Day 10 final	Comments:
49	10									8		
50	10									10		
51	10									11		
52	10	<u> </u>										
53	10									10 .		
54	10									10		
55	10				L <u></u>					10		
								\$	ì			
56	10								<u> ↓</u>	000		
57	10									9		
58	10									10		
59	10									10		
60	10										199-1-1C	
61 62	10 10									10	rg-1-16	
63	10									8		
										11		D in the second day
64 65	10 10									10		Dre other go of own found. Dr One other sp of worm found of
66	10		·							10		One other sport worm touring
67	10								,	7		
68	10		۵					<u>8</u> ,		(
	10									g		
69 70	10									7		Managements
71	10									- G		
72	10									10	_	
72	10									2		
73	10									A		
75	10									10		One other sp worm found of
76	10									10		Une when sp warm tourd. On
77	10									10		
78	10									10		· · · · · · · · · · · · · · · · · · ·
							•	<u>14.91</u>	1			

Kansington, Chicone	nid with randomization 10 day A3584, updated with a	D
185.	Dec. Co	21

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net with amarged and puppe view Doc. Control ID: ASL1120-1115

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CHA	MHIL	<u>L</u>	FRE	SHWATE	R TOXIC	CITY TES	ST SURV					
Client			11 III 11 111	Kensingto	n				Beginning, Ending, Da	Date	122/16	Time
		See Rand					<u>í </u>		Ending, Da	te	((16	Time
Test Spec		Chironomu				<u>CHI 26</u>			- 1 - 1 - 0 - 51			<u>Survival</u> = (total number of live pupae + live larvae + emerged adults) / Start count
Starting	g on the D	ay 7 evening	water renev	val, record ti	ie number of	emerged ac	iuits in each	container (c	an de lett ol	ank if inere a	are none)	If Growth endpoint to be used, place only the
Tech:	<u> </u>	ļ <u> </u>			ļ		<u> </u>	<u> </u>				live larvae collected @ Day 10 final into tin.
Beaker	Start Count	# emerged	# emerged	# emerged	# emerged	# emerged	# emerged	# emerged	# pupae alive	# larvae alive	# larvae dead	(pupae and emerged adults are discarded)
Number	0	Day 7	Day 8	Day 8	Day 9	Day 9	Day 10	Day 10	Day 10	Day 10	Day 10	
		pm	am	pm	am	pm	am	final	final	final	final	Comments:
79	10					·····				8		
80	10									10		
81	10									10		
82	10									10		
83	10									10		
84	10									9		
85	10									q		
86	10									9		••••••••••••••••••••••••••••••••••••••
87	10									10		
										10		
88	10									$\frac{10}{10}$		
89	10									10		
90	10				1					10		
91	10											
92	10									9		
93	10									9		
94	10									10		·····
95	10									10		
96	10									9		
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Client	Kens	ington	Species ID# CHI 26	
Lab ID: see randomiza	tion sheet batch nu	mber: B3584	Start Date	8/22/2016
Sample Description:				
Technician: Date: Balance Serial #:	MC 9/7/2016 50309851	MC 9/8/2016 50309851	Note: Empty tins should b prior to use to allow for a NO TARE weights neede	ny oxidation to occur.
Tin ID Number	Total Dry Weight (mg) (including pan)	Total Ashed Weight (mg) (including pan)	No. of Chironomids Surviving (larval+pupae+adult)	No. of larval Chironomids in Tin
<u>49</u> 50	82.29 91.27	71.45	8 10	<u>8</u> 10
50	88.48	73.01	10	10
52	87.99	73.01	11 11	11
53	88.78	75.17	10	10
53	84.53	70.57	10	10
55	87.29	70.37	10	10
56	85.83	72.86	10	9
57	84.21	71.84	8	8
58	88.52	73.62	9	9
59	92.65	78.05	10	10
60	83.08	71.11	10	10
61	87.11	71.63	11	11
62	86.92	72.03	10	10
63	81.84	71.40	8	8
64	84.66	70.85	11	11
65	89.29	74.57	10	10
66	87.73	71.76	10	10
67	81.92	71.24	8	7
68	83.68	70.20	11	11
69	83.67	70.47	9	9
70	81.37	70.25	7	7
71	80.74	71.62	6	6
72	87.42	71.62	10	10
73	87.78	72.61	10	10
74	87.01	72.74	9	9
75	94.53	78.83	10	10
76	89.27	75.25	10	10
77	85.00	70.77	10	10
78	87.77	71.84	10	10

ient		ngton	Species ID# CHI 26			
ab ID: <u>see randomization</u>	on sheet batch nun	nber: B3584	_ Start Date	8/22/2016		
Technician: Date: Balance Serial #:	MC 9/7/2016 50309851	MC 9/8/2016 50309851	Note: Empty tins should be prior to use to allow for an NO TARE weights needed	y oxidation to occur.		
Tin ID Number	Total Dry Weight (mg) (including pan)	Total Ashed Weight (mg) (including pan)	No. of Chironomids Surviving (larval+pupae+adult)	No. of larval Chironomids in Tin		
79	88.97	75.60	8	8		
80	86.04	71.97	10	10		
81	85.12	71.33	10	10		
82	84.38	71.60	10	10		
83	85.67	70.54	10	10		
84	82.84	70.38	9	9		
85	84.05	71.60	9	9		
86	83.79	71.54	9	9		
87	90.29	75.36	10	10		
88	88.02	74.01	10	10		
89	85.68	71.17	10	10		
90	87.07	72.41	10	10		
91	83.81	70.55	9	9		
92	85.49	73.97	9	9		
93	84.35	71.23	9	9		
94	84.42	71.96	10	10		
95	83.58	70.79	10	10		
96	85.63	73.00	9	9		
		· · · · · · · · · · · · · · · · · · ·				

Client	Kensi	ngton	Species ID# CHI					
Lab ID: see randomiza	tion sheet batch nun	nber: B 3524	Start Date	22-16				
Sample Description:								
Technician: Date: Balance Serial #:	50309851	50309851	Note: Empty tins should b prior to use to allow for ar NO TARE weights needed	ny oxidation to occur.				
Tin ID Number	Total Dry Weight (mg) (including pan)	Total Ashed Weight (mg) (including pan)	No. of Chironomids Surviving (larval+pupae+adult)	No. of larval Chironomids in Tin				
49			13	S				
50		#*************************************	10	10				
51			11	(
52			ά					
53			د)	(2				
54			(7	10				
55			0	10				
56			3	G				
57			8	ย				
58			9	9				
59			(0	10				
60			10	10				
61			(1	ι (
62			(0	(7				
63			3	ಕ				
64			εl	ει				
65			(0	(0				
66			[]	61				
67			8	7				
68			i l	(1				
69			4	9				
70			7	7				
71			6	6				
72			Ū	GI				
73	andar di mili Milaka Walaka kana yang waka kata yang waka kata 1976 ali yang		(0	(0				
74			9	9				
75			(0	10				
76			10	6 ا				
77			()	ιO				
78			0	(0				

Client		Kens	sington	Species ID# CHI					
Lab I	D: see randomiza	tion sheet batch nu	mber: B 35%4	Start Date	22-16				
	e Description:								
	Technician: Date: Balance Serial #:	50309851	50309851	Note: Empty tins should b prior to use to allow for an NO TARE weights needed	ny oxidation to occur.				
	Tin ID Number	Total Dry Weight (mg) (including pan)	Total Ashed Weight (mg) (including pan)	No. of Chironomids Surviving (larval+pupae+adult)	No. of larval Chironomids in Tin				
	79			¥	8				
	80			10	1 <i>0</i>				
	81		· · · · · · · · · · · · · · · · · · ·		10				
	82		-	10	j <i>o</i>				
	83			10	(0				
	84			9	9				
	85			G ·	م				
	86			9	- -				
	87		· · · · · · · · · · · · · · · · · · ·	<u>ت</u>	12				
	88			(0	51				
	89			(0	(0				
	90			0,	0				
	91			9	4				
	92		<u></u>	4	2				
	93			9	Ŷ				
	94			(0	10				
	95			10	10				
	96			9	9				
		,, , , , , , , , , , , , , , , , , , ,							

CETIS Sun	n <mark>mary Repo</mark>	rt						port Date: st Code:	15 Sep-16 16:38 (p 1 of 1) B358403ctc 09-6386-7058			
Chironomus 1	I0-d Survival and	d Growth S	Sediment	Test						CH2M	HILL - ASL	
Batch ID: Start Date: Ending Date: Duration:	08-6381-0778 22 Aug-16 01 Sep-16 10d Oh	Pro Spe	Protocol: EPA/600/R-99/064 (2000) Species: Chironomus tentans					Analyst: Brett Muckey Diluent: Mod-Hard Synthetic Water Brine: Age:				
Sample ID: Sample Date: Receive Date: Sample Age:	13 Jul-16 47d Oh	Sou	erial:	33584-03 Sediment Kensington Gol Lower Sherman	and the second s	0050571)		ent: oject:				
Comparison S	-			1.0.00								
Analysis ID 07-7096-6286 03-9500-1344	Endpoint Mean AF Weigh Suprival Rate	it-mg 🤇	100 <100	LOEL >100 100	NA NA	PMSD 6.78% 6.63%	TU 1 >1	-	iance t Two /ariance t Tv	•		
		(nn.	0.0070	- 1					
Test Acceptat Analysis ID	Endpoint		Attribu	te	Test Stat	TAC Lin	nits	Overlap	Decision			
03-9500-1344	Survival Rate		Control	Resp	1	0.7 - NL		Yes	Passes Acceptability Criteria 🗸			
Mean AF Weig	ght-mg Summary	/										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect	
0	Dilution Water	8	1.473	1.371	1.575	1.246	1.597	0.04326	0.1224	8.31%	0.0%	
100		8	1.42	1.334	1.507	1.28	1.546	0.03664	0.1036	7.3%	3.57%	
Survival Rate	Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect	
0	Dilution Water	8	1	1	1	1	1	0	0	0.0%	0.0%	
100		8	0.8375	0.7382	0.9368	0.6	1	0.04199	0.1188	14.18%	16.25%	
Mean AF Weig	ght-mg Detail					•						
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
0	Dilution Water	1.246	1.436	1.407	1.597	1.517	1.406	1.58	1.593			
100		1.441	1.546	1.383	1.305	1.526	1.28	1.5 2	1.361			
Survival Rate	Detail											
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
0	Dilution Water	1	1	1	1	1	1	1	1	i		
100		1	0.8	0.9	0.8	0.8	0.9	0.6	0.9			
Survival Rate	Binomíals											
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
0	Dilution Water	10/10	11/11	11/11	10/10	10/10	11/11	10/10	10/10			
0												

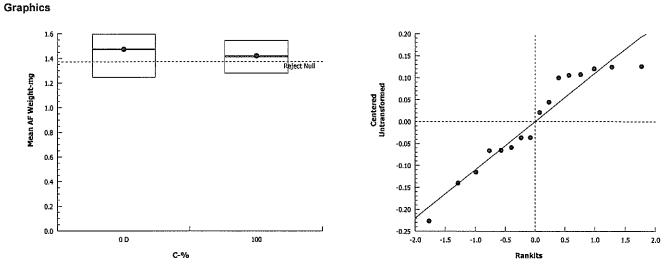
Analyst:______QA:_____

CETIS Ana	lytical Repo	ort			Report Date: 15 Sep-16 ⁻⁷ Test Code: B358403ctc			•	38 (p 1 of 4) 9-6386-7058			
Chironomus '	10-d Survival an	d Grov	vth Sedime	nt Test								HILL - ASL
Analysis ID: Analyzed:	07-7096-6286 15 Sep-16 16:3	8	Endpoint: Analysis:		AF Weigl	0		CETIS Version: CETISv1.8.8 Official Results: Yes				
Batch ID:	08-6381-0778		Test Type:	Surviv	al-AF Gro	wth		Ana	lyst: Bre	ett Muckey		
Start Date:	22 Aug-16		Protocol:			064 (2000)			•	d-Hard Synth	netic Wate	-
Ending Date:	01 Sep-16		Species:		nomus ter			Brir		······································		
Duration:	10d 0h		Source:	Aquat	ic Biosyst	ems, CO		Age):			
Sample ID:	05-1582-8506		Code:	B3584	B3584-03				ent:			
Sample Date:	06 Jul-16		Material: Sediment						ject:			
Receive Date:	: 13 Jul-16		Source:	e: Kensington Gold Mine (AK0050571)								
Sample Age:	47d Oh		Station:	Lower	Shermar	Creek						
Data Transfor	m	Zeta	Alt H	Іур Т	rials	Seed		PMSD	Test Res	suit		
Untransformed	1	NA	C > T	N	IA	NA		6.78%	Passes r	nean af weig	ht-mg	
Equal Variance	ce t Two-Sample	Test										
Control	vs C-%		Test	Stat C	ritical	MSD DF	P-Value	P-Type	Decisior	n(α:5%)		
Dilution Water	100		0.927	' 1 1	.761	0.1 14	0.1848	CDF	Non-Sigr	nificant Effect	t	
Auxiliary Test	s											
Attribute	Test			T	'est Stat	Critical	P-Value	Decisior	n(α:5%)			
Control Trend	Mann-Ke	ndall Ti	rend				0.1788	Non-sign	Non-significant Trend in Controls			
ANOVA Table)											
Source	Sum Squ	ares	Mean	squar	e	DF	F Stat	P-Value Decision(α:5%)				
Between	0.0110502	25	0.011	05025		1	0.8595	0.3696	Non-Sigr	nificant Effect	t	
Error	0.1799895	5	0.012	85639	<u> </u>	14	_					
Total	0.1910397	7				15						
Distributional	Tests											
Attribute	Test			Т	est Stat	Critical	P-Value	Decisior	n(α:1%)			
Variances	Variance	Ratio F	Test	1	.394	8.885	0.6725	Equal Va				
Distribution	Shapiro-V	Nilk W	Normality	C	.9116	0.8408	0.1236	Normal C	Distribution			
Mean AF Weig	ght-mg Summar	У										
C-%	Control Type	Cour	nt Mear	1 9	5% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.473		.371	1.575	1.477	1.246	1.597	0.04326	8.31%	0.0%
100		8	1.42	1	.334	1.507	1.412	1.28	1.546	0.03664	7.3%	3.57%
Mean AF Wei	ght-mg Detail											
C-%	Control Type	Rep [•]	1 Rep 2	2 F	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
G-70			• • • • • • • • •									
0	Dilution Water	1.246			.407	1.597	1.517	1.406	1.58	1.593		

Analyst: 3- QA:

Chironomus 10-d Survival and Growth Sediment Test		CH2M HILL - ASL
CETIS Analytical Report	Report Date: Test Code:	15 Sep-16 16:38 (p 2 of 4) B358403ctc 09-6386-7058

Analysis ID: Analyzed:	07-7096-6286 15 Sep-16 16:38	 Mean AF Weight-mg Parametric-Two Sample	CETIS Version: Official Results:	
Creshies				·····



QA:

Chironomus 10-d Survival and Growth Sediment Test CH2M HILL - ASL 03-9500-1344 CETISv1.8.8 Analysis ID: Endpoint: Survival Rate **CETIS Version:** Parametric-Two Sample Official Results: Analyzed: 15 Sep-16 16:38 Analysis: Yes 08-6381-0778 Test Type: Survival-AF Growth Brett Muckey Batch ID: Analyst: EPA/600/R-99/064 (2000) Mod-Hard Synthetic Water Start Date: 22 Aug-16 Protocol: Diluent: Ending Date: 01 Sep-16 Species: Chironomus tentans Brine: 10d 0h Source: Aquatic Biosystems, CO Duration: Age: 05-1582-8506 Code: B3584-03 Client: Sample ID: Sample Date: 06 Jul-16 Material: Sediment Project: Receive Date: 13 Jul-16 Source: Kensington Gold Mine (AK0050571) Sample Age: 47d 0h Station: Lower Sherman Creek **Data Transform** Zeta Trials PMSD **Test Result** Alt Hyp Seed NA C > T NA NA 6.63% Angular (Corrected) Fails survival rate **Unequal Variance t Two-Sample Test** Control C-% Test Stat Critical MSD **DF P-Value** P-Type Decision(a:5%) ٧S **Dilution Water** 100* 4.43 1.895 0.104 7 0.0015 CDF Significant Effect Auxiliary Tests Attribute Test Stat Critical **P-Value** Test Decision(a:5%) **Control Trend** Mann-Kendall Trend 1.0000 Non-significant Trend in Controls ANOVA Table Decision(a:5%) Source Mean Square DF F Stat P-Value Sum Squares Between 0.238094 0.238094 1 19.62 0.0006 Significant Effect Error 0.169878 0.01213414 14 Total 0.4079719 15 **Distributional Tests** Attribute Test **Test Stat** Critical **P-Value** Decision(a:1%) Variance Ratio F Test 1632 8.885 <0.0001 Variances Unequal Variances Distribution Shapiro-Wilk W Normality 0.8416 0.8408 0.0103 Normal Distribution Survival Rate Summary C-% **Control Type** Count Mean 95% LCL 95% UCL Median Min Max Std Err CV% %Effect 0 **Dilution Water** 8 1 1 1 1 1 1 0 0.0% 0.0% 100 8 0.8375 0.7382 0.9368 0.85 0.6 1 0.04199 14.18% 16.25% Angular (Corrected) Transformed Summary C-% **Control Type** Count 95% LCL 95% UCL Median Min Std Err CV% Mean Max %Effect 0 **Dilution Water** 8 1.415 1.412 1.418 1.412 1.412 1.419 0.001366 0.27% 0.0% 1.171 1.041 1.178 0.8861 1.412 0.05506 100 8 1.301 13.3% 17.24% Survival Rate Detail C-% **Control Type** Rep 5 Rep 1 Rep 2 Rep 3 Rep 4 Rep 6 Rep 7 Rep 8 Ó **Dilution Water** 1 1 1 1 1 1 1 1 100 1 0.8 0.9 0.8 0.8 0.9 0.6 0.9 Angular (Corrected) Transformed Detail **Control Type** Rep 1 Rep 2 Rep 3 Rep 4 Rep 5 Rep 6 C-% Rep 7 Rep 8 0 Dilution Water 1.419 1.412 1.419 1.412 1.419 1.412 1.412 1.412 1.107 100 1.412 1.249 1.107 1.107 1.249 0.8861 1.249

Report Date:

Test Code:

15 Sep-16 16:38 (p 3 of 4)

B358403ctc | 09-6386-7058

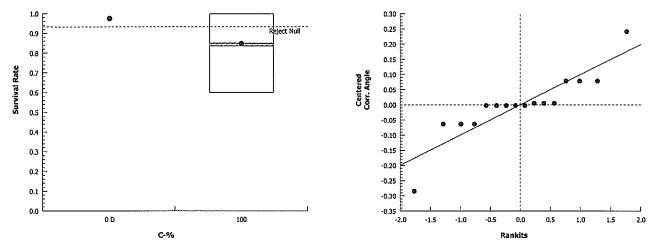
Survival Rate Binomials C-% **Control Type** Rep 1 Rep 2 Rep 3 Rep 4 Rep 5 Rep 6 Rep 7 Rep 8 **Dilution Water** 11/11 11/11 10/10 10/10 10/10 0 10/10 11/11 10/10 100 10/10 8/10 9/10 8/10 8/10 9/10 6/10 9/10

CETIS Analytical Report

Analyst:_____

QA:__

CETIS Ana	alytical Report		Report Date: Test Code:	15 Sep-16 16:38 (p 4 of 4) B358403ctc 09-6386-7058		
Chironomus	10-d Survival and Gr	rowth Sedime		CH2M HILL - ASL		
Analysis ID:	03-9500-1344	Endpoint:	Survival Rate	CETIS Version:	CETISv1.8.8	
Analyzed:	15 Sep-16 16:38	Analysis:	Parametric-Two Sample	Official Results:	Yes	



QA:

CETIS Summary Report							-	oort Date: t Code:		15 Sep-16 16:36 (p 1 of 1) B358401ctc 02-1469-9480		
Chironomus	10-d Survival an	nd Growth	Sediment 1	lest			·			CH2M	HILL - ASL	
Batch ID: Start Date: Ending Date: Duration:	08-6381-0778 22 Aug-16 : 01 Sep-16 10d 0h	Pr Sp	otocol: Ef	urvival-AF Gro PA/600/R-99/(hironomus ter quatic Biosyst	064 (2000) Itans			ient: Mod ne:	tt Muckey I-Hard Synth	ietic Water		
Sample ID: Sample Date Receive Date Sample Age:	e; 13 Jul-16	Ma So	aterial: Se ource: Ke	3584-01 ediment ensington-Gol ast Fork Slate		0050571)	Clie Pro	ent: ject:				
Comparison												
Analysis ID	Endpoint			LOEL	TOEL	PMSD	TU	Method				
18-2377-4367	-	ht-mg	100	>100	NA	8.34%	1	•	iance t Two	•		
16-8056-7322	Survival Rate		100	>100	NA	6.18%	1	Wilcoxon	Rank Sum	fwo-Sample	e Test	
Test Accepta	-											
Analysis ID	Endpoint		Attribute			TAC Lim	iits	Overlap	Decision			
16-8056-7322	Survival Rate		Control F	Resp	1	0.7 - NL		Yes	Passes A	cceptability	Criteria 44	
	ight-mg Summai	ry										
<u>C-%</u>	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect	
0	Dilution Water	8	1.473	1.371	1.575	1.246	1.597	0.04326	0.1224	8.31%	0.0%	
100	· .	8	1.409	1.279	1.538	1.225	1.648	0.05472	0.1548	10.99%	4.35%	
Survival Rate	e Summary											
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Мах	Std Err	Std Dev	CV%	%Effect	
0	Dilution Water	8	1	1	1	1	1	0	0	0.0%	0.0%	
100		8	0.9375	0.8488	1	0.7	1	0.0375	0.1061	11.31%	6.25%	
Mean AF Wei	ight-mg Detail											
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
0	Dilution Water	1.246	1.436	1.407	1.597	1.517	1.406	1.58	1.593			
100		1.589	1.279	1.384	1.423	1.225	1.255	1.467	1.648			
Survival Rate	e Detail											
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
0	Dilution Water	1	1	1	1	1	1	1	1			
100		0.7	1	0.9	1	1	1	0.9	1			
Survival Rate	Binomials											
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8			
									-			
0	Dilution Water	10/10	11/11	11/11	10/10	10/10	11/11	10/10	10/10			

Analyst:_____ QA:_____

CETIS Analytical Report

Chironomus 10-d Survival and Growth Sediment Test

Report Date:

Test Code:

15 Sep-16 1	6:36 (p 1 of 4)
B358401ctc	02-1469-9480

CH2M HILL - ASL

Analysis ID: Analyzed:	18-2377-4367 15 Sep-16 16:		ndpoint: nalysis:	Mean AF We Parametric-T				IS Version: cial Results		.8.8	
Batch ID: Start Date: Ending Date: Duration:	08-6381-0778 22 Aug-16 01 Sep-16 10d 0h	P S	est Type: rotocol: pecies: ource:	Survival-AF (EPA/600/R-9 Chironomus Aquatic Biosy	9/064 (2000) tentans		Anal Dilu Brin Age:	ent: Moo e:	tt Muckey d-Hard Synth	etic Water	
Sample ID: Sample Date: Receive Date Sample Age:	: 13 Jul-16	M	ode: laterial: ource: tation:	B3584-01 Sediment Kensington G East Fork Sla		(0050571)	Clie Proj				
Data Transfor		Zeta	Alt H		Seed		PMSD	Test Res			
Untransformed	1	NA	C > T	NA	NA		8.34%	Passes m	iean af weigl	nt-mg	
Equal Variano Control	ce t Two-Sample vs C-%	e Test	Test	Stat Critical	MSD D	F P-Value	P-Type	Decision	(a:5%)		
Dilution Water			0.918		0.123 14		CDF		ificant Effect		
Auxiliary Test	ts										
Attribute	Test			Test Sta	at Critical	P-Value	Decision	(α:5%)			
Control Trend	Mann-Ke	ndall Trer	nd			0.1788	Non-signi	ficant Trend	in Controls		
ANOVA Table	•										
Source	Sum Squ	ares	Mean	Square	DF	F Stat	P-Value	Decision	(α:5%)		
Between	0.0164100)2	0.016	41002	1	0.8432	0.3740	Non-Sign	ificant Effect		
Error	0.272448	7	0.019	46063	14						
Total	0.2888588	3			15						
Distributional	Tests										
Attribute	Test			Test Sta	at Critical	P-Value	Decision	(α:1%)			
Variances	Variance	Ratio F T	est	1.6	8.885	0.5503	Equal Va	riances			
Distribution	Shapiro-\	Wilk W No	ormality	0.9796	0.8408	0.9605	Normal D	istribution			
Mean AF Wei	ght-mg Summai	ry									
C-%	On the Trees	Count	Mean	95% LC	L 95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0 /0	Control Type	Count	mean								
0	Dilution Water	8	1.473	1.371	1.575	1.477	1.246	1.597	0.04326	8.31%	0.0%
					1.575 1.538	1.477 1.404	1.246 1.225	1.597 1.648	0.04326 0.05472	8.31% 10.99%	0.0% 4.35%
0	Dilution Water	8	1.473	1.371							

C-% 0 **Dilution Water** 1.246 1.436 1.407 1.597 1.517 1.406 1.58 1.593 100 1.589 1.279 1.384 1.423 1.225 1.255 1.467 1.648

Analyst: _____ QA:____

CETIS Ana	alytical Report				Report Date: Test Code:	15 Sep-16 16:36 (p 2 of 4 B358401ctc 02-1469-948
Chironomus	10-d Survival and Gr	owth Sedime	nt Test	 		CH2M HILL - ASL
Analysis ID: Analyzed:	18-2377-4367 15 Sep-16 16:36	Endpoint: Analysis:	Mean AF Weight-mg Parametric-Two Sample	 	CETIS Version: Official Results:	CETISv1.8.8 Yes
Graphics 1.8 1.6 1.4 1.4 1.2 1.2 1.0 0.8 0.6 0.4 0.2 0.0	0 D		Rjett Null	 15 10 05 10 15 15	96666666666666	9.8 9.8 0.5 1.0 1.5 2.0
		C-%			Rankits	

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Analyst: 3~ QA:

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CETIS Ana	alytical Rep	ort					-	ort Date:		-	36 (p 3 of 4
<u></u>	40.10.1.44						les	Code:	8358	·····	2-1469-948
Chironomus	10-d Survival ar	Id Grow	in Sedimer	it lest						CH2M	HILL - ASL
Analysis ID: Analyzed:	16-8056-7322 15 Sep-16 16:		Endpoint: Analysis:	Survival Rate Nonparametric-	Two Sampl	e		IS Version cial Results		.8.8	
Batch ID:	08-6381-0778	ר	fest Type:	Survival-AF Gro	owth		Ana	lyst: Bre	ett Muckey		
Start Date:	22 Aug-16	F	Protocol:	EPA/600/R-99/	064 (2000)		Dilu	ent: Mo	d-Hard Synth	etic Water	•
Ending Date:	: 01 Sep-16	5	Species:	Chironomus ter	ntans		Brin	le:			
Duration:	10d 0h	5	Source:	Aquatic Biosyst	tems, CO		Age	:			
Sample ID:	18-2203-5030	C	Code:	B3584-01			Clie	nt:			
Sample Date		n	Aaterial:	Sediment			Proj	ect:			
Receive Date		-	Source:	Kensington Gol	•	0050571)					
Sample Age:	47d 0h	5	Station:	East Fork Slate	e Creek						
Data Transfo		Zeta	Alt H	yp Trials	Seed		PMSD	Test Res	ult		
Angular (Corre	ected)	NA	C > T	NA	NA		6.18%	Passes s	urvival rate		
Wilcoxon Ra	nk Sum Two-Sa	mple Tes	st						····		
Control	vs C-%		Test S	Stat Critical	Ties DF	P-Value	P-Type	Decision	ı(α:5%)		
Dilution Water	r 100		56	NA	1 14	0.1000	Exact	Non-Sign	ificant Effect		
Auxiliary Tes	its										
Attribute	Test			Test Stat	Critical	P-Value	Decision	(a:5%)			
Control Trend		endall Tre	nd			1.0000			in Controls		
ANOVA Table											
Source	- Sum Squ	ares	Mean	Square	DF	F Stat	P-Value	Decision	u(a:5%)		
Between	0.035555		0.035		1	3.045	0.1029		ificant Effect		
Error	0.163495		0.0116		14	0.010	0.1020	Non oign			
Total	0.199051	3			15						
Distributiona	l Tests										
Attribute	Test			Test Stat	Critical	P-Value	Decision	(a:1%)			
Variances		Ratio F	Test	1571	8.885	<0.0001		Variances			
Distribution	Shapiro-'	Wilk W N	ormality	0.7362	0.8408	0.0004	Non-norn	nal Distributi	ion		
Survival Rate	a Summary										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1	1	1	1	1	1	0	0.0%	0.0%
100		8	0.9375		1	1	0.7	1	0.0375	11.31%	6.25%
Angular (Cor	rected) Transfor	med Sur	nmarv			· · ·					
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.415	1.412	1.418	1.412	1.412	1.419	0.001366	0.27%	0.0%
100	2000000 7 10(Q)	8	1.321	1.193	1.448	1.412	0.9912	1.419	0.05402	11.57%	6.66%
Survival Rate	e Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	<u>1 1</u>	1	1	1 1	1	1	1	1		
100		0.7	1	0.9	1	1	1	0.9	1		
· · · · ·	rooted) Transfer										
	rected) Transfor			Pan 3	Bon 4	Don F	Don 6	Den 7	Den 9		
C-%	Control Type	Rep 1 1.412	Rep 2	Rep 3 1.419	Rep 4	Rep 5 1.412	Rep 6	Rep 7	Rep 8		<u></u>
0 100	Dilution Water	0.9912	1.419 1.412	1.419	1.412 1.412	1.412 1.419	1.419 1.419	1.412 1.249	1.412 1.412		
· · · · ·		0.0012	1.714	1.473	1.716	1.713	1.413	1.273	1.714		
Survival Rate	e Binomials										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	10/10	11/11	11/11	10/10	10/10	11/11	10/10	10/10		
100		7/10	10/10	0/10	10/10	11/11	44/44	0/10	10/10		

Report Date:

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CETIS Analytical Report

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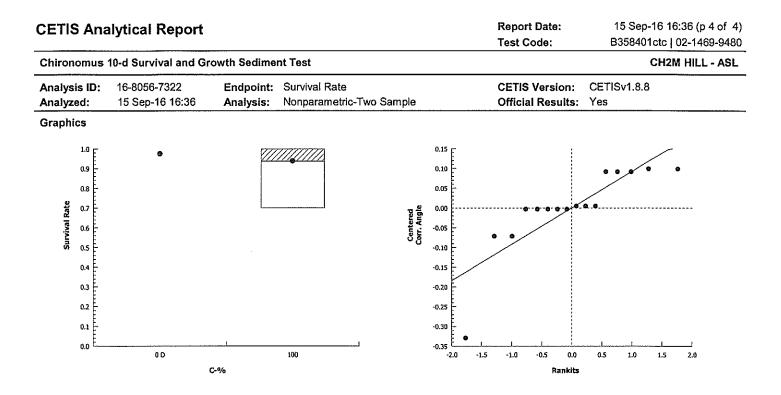
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Analyst:______QA:____

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CETIS Summary Report									15 Sep-16 16:40 (p 1 of 1) B358405ctc 18-5976-9394		
Chironomus 1	I0-d Survival an	d Grow	/th Sedimer	nt Test						CH2M	HILL - ASL
Batch ID: Start Date: Ending Date: Duration:	08-6381-0778 22 Aug-16 01 Sep-16 10d Oh		Test Type: Protocol: Species: Source:	Survival-AF Gr EPA/600/R-99/ Chironomus ter Aquatic Biosys	064 (2000) ntans			•	t Muckey I-Hard Syntł	netic Water	
Sample ID: Sample Date: Receive Date: Sample Age:			Code: Material: Source: Station:	B3584-05 Sediment Kensington-Go Lower Johnson		0050571)		Client: Project:		u e 186 1811	
Comparison S	Summary			* • · · · · · · · · · · · · · · · ·							
Analysis ID	Endpoint		NOEL	. LOEL	TOEL	PMSD	TU	Method			
17-6869-3558 12-7074-1598	Mean AF Weig Survival Rate	ht-mg	100 100	>100 >100	NA NA	7.1% 4.9%	1 1		iance t Two Rank Sum		
Test Acceptat	oility										
Analysis ID	Endpoint		Attrib	ute	Test Stat	TAC Lir	nits	Overlap	Decision		
12-7074-1598	Survival Rate		Contro	ol Resp	1	0.7 - NL		Yes	Passes A	cceptability	Criteria -
Mean AF Weig	ght-mg Summar	у									
C-%	Control Type	Coun	t Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	1.473	1.371	1.575 ·	1.246	1.597	0.04326	0.1224	8.31%	0.0%
100		8	1.499	1.403	1.595	1.361	1.671	0.04065	0.115	7.67%	-1.78%
Survival Rate	Summary										
C-%	Control Type	Coun	t Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	1	1	1	1	1	0	0	0.0%	0.0%
100		8	0.975	0.9159	1	0.8	1	0.025	0.07071	7.25%	2.5%
Mean AF Weig	ght-mg Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep	6 Rep 7	Rep 8		
0	Dilution Water	1.246	1.436	1.407	1.597	1.517	1.406	1.58	1.593		
100		1.46	1.57	1.493	1.671	1.401	1.361	1.402	1.634		
Survival Rate	Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep	6 Rep 7	Rep 8		
0	Dilution Water	1	1	1	1	1	1	1	1		
100		1	1	1	0.8	1	1	1	1		
Survival Rate	Binomials								· ·		
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep	6 Rep 7	Rep 8		
0	Dilution Water	10/10			10/10	10/10	11/11	10/10	10/10		
100		10/10	10/10	10/10	8/10	10/10	10/10	10/10	10/10		

Analyst:______QA:_____

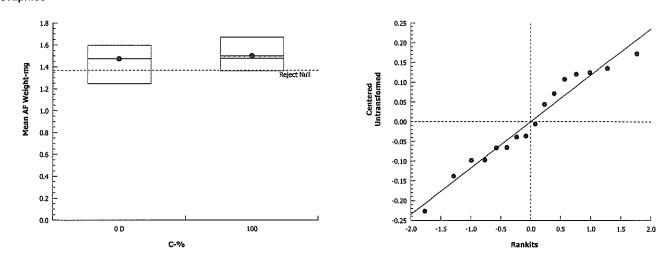
CETIS Ana	lytical Rep	ort						•	ort Date: t Code:		-	40 (p 1 of 4
Chironomus 1	10-d Survival ar	nd Grov	wth Sedi	ment T	est							HILL - ASL
Analysis ID:	17-6869-3558		Endpoi		an AF Weigl	-			IS Version		.8.8	
Analyzed:	15 Sep-16 16:	39	Analysi	s: Pa	rametric-Two	Sample		Offi	cial Result	s: Yes		
Batch ID:	08-6381-0778		Test Ty	pe: Su	rvival-AF Gro	owth		Ana	lyst: Bro	ett Muckey		
Start Date:	22 Aug-16		Protoco	ol: EP	A/600/R-99/	064 (2000)		Dilu	ent: Mo	od-Hard Syntl	hetic Wate	r
Ending Date:	01 Sep-16		Species	: Ch	ironomus ter	ntans		Brir	le:			
Duration:	10d Oh		Source	: Aq	uatic Biosyst	ems, CO		Age	:			
Sample ID:	02-9733-1775		Code:	B3	584-05			Clie	nt:			T
Sample Date:	08 Aug-16		Materia	l: Se	diment			Pro	ject:			
Receive Date:	11 Aug-16		Source	: Ke	nsington Gol	d Mine (AK	0050571)					
Sample Age:	14d Oh		Station	Lo	wer Johnson	Creek						
Data Transfor	m	Zeta	A	t Hyp	Trials	Seed		PMSD	Test Res	sult		
Untransformed		NA	С	> T	NA	NA		7.1%	Passes I	mean af weig	ht-mg	
Equal Varianc	e t Two-Sample	e Test										
Control	vs C-%		Те	st Stat	Critical	MSD DF	P-Value	P-Type	Decisio	n(a:5%)		
Dilution Water	100		-0	.4406	1.761	0.105 14	0.6669	CDF		nificant Effec	t	
Auxiliary Test	s											
Attribute	Test				Test Stat	Critical	P-Value	Decision	(a:5%)			
Control Trend	Mann-Ke	ndall T	rend				0.1788	Non-sign	ificant Tren	d in Controls		
ANOVA Table												
Source	Sum Squ	ares	M	ean Sq	uare	DF	F Stat	P-Value	Decisio	n(α:5%)		
Between	0.002736			002736		1	0.1941	0.6662		nificant Effect	t	
Error	0.197342	7	0.0	014095	91	14			Ĵ			
Total	0.2000793	3				15						
Distributional	Tests											
Attribute	Test				Test Stat	Critical	P-Value	Decision	ı(α:1%)			
Variances	Variance	Ratio F	= Test		1.132	8.885	0.8740	Equal Va	riances			
Distribution	Shapiro-	Wilk W	Normalit	У	0.955	0.8408	0.5724	Normal D	Distribution			
Mean AF Weig	ght-mg Summai	ry										
C-%	Control Type	Cour	nt Me	ean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.4	473	1.371	1.575	1.477	1.246	1.597	0.04326	8.31%	0.0%
100		8	1.4	499	1.403	1.595	1.476	1.361	1.671	0.04065	7.67%	-1.78%
·	nht-mg Detail											
Mean AF Weig												
-	Control Type	Rep	1 Re	ep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
		Rep 1.246		9 p 2 436	Rep 3 1.407	Rep 4 1.597	Rep 5 1.517	Rep 6 1.406	Rep 7 1.58	Rep 8 1.593		

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Analyst:_____ QA:_____

CETIS Analytical Report	Report Date:	15 Sep-16 16:40 (p 2 of 4)
	Test Code:	B358405ctc 18-5976-9394
Chironomus 10-d Survival and Growth Sediment Test		CH2M HILL - ASL

Analysis ID: Analyzed:	17-6869-3558 15 Sep-16 16:39	•	Mean AF Weight-mg Parametric-Two Sample	CETIS Version: Official Results:	
Graphics					



CETIS An	alytical Rep	ort			•	ort Date: t Code:		-	40 (p 3 of 4 8-5976-939		
Chironomus	10-d Survival ar	nd Grow	th Sedimen	t Test						HILL - ASL	
Analysis ID:	12-7074-1598			Survival Rate				IS Version		.8.8	
Analyzed:	15 Sep-16 16:	39	Analysis:	Nonparametric	-Two Sampl	e	Offi	cial Result	s: Yes		
Batch ID:	08-6381-0778		÷ -	Survival-AF Gro			Ana		ett Muckey		
Start Date:	22 Aug-16			EPA/600/R-99/					od-Hard Synth	etic Wate	r
Ending Date			Species:	Chironomus ter			Brir				
Duration:	10d 0h		Source:	Aquatic Biosys	tems, CO		Age	:			
Sample ID:	02-9733-1775		Code:	B3584-05			Clie	nt:			
Sample Date	e: 08 Aug-16		Material:	Sediment			Pro	ject:			
Receive Date	e: 11 Aug-16		Source:	Kensington Go	ld Mine (AK	0050571)					
Sample Age:	: 14d Oh		Station:	Lower Johnson	Creek						
Data Transfo	>rm	Zeta	Alt Hy	/p Trials	Seed		PMSD	Test Res	sult		
Angular (Corr	rected)	NA	C > T	NA	NA		4.9%	Passes s	survival rate		
Nilcoxon Ra	unk Sum Two-Sa	mple Te	st								
Control	vs C-%	-	Test S	tat Critical	Ties DF	P-Value	P-Type	Decision	n(α:5%)		
Dilution Wate			64	NA	••••	0.5000	Exact		nificant Effect		
Auxiliary Tes											
-				Test Stat	Critical	D Value	Declaiar	(~·· E9/)			
Attribute Control Trenc	Test 1 Mann-Ke	ndall Tr		Test Stat	Gritical	P-Value 1.0000	Decision	<u></u>	d in Controls		
			ena			1.0000	Non-sign				
ANOVA Tabl	e										
Source	Sum Squ			Square	DF	F Stat	P-Value	Decision			
Between	0.006691		0.0066		1	1.15	0.3016	Non-Sigr	nificant Effect		
Error	0.081430		0.0058	316436	14 15						
Total	0.088121				10						
Distributiona											
Attribute	Test Variance	D-#- C	T	Test Stat		P-Value	Decision				
Variances Distribution			l est Vormality	782 0.4807	8.885 0.8408	<0.0001 <0.0001	•	Variances nal Distribut	tion		
	······					-0.0001					
Survival Rate C-%	e Summary Control Type	Count	t Mean	95% LCL	95% UCL	Modian	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1	1	1	1	1	1	0	0.0%	0.0%
100	Bildton frater	8	0.975	0.9159	1	1	0.8	1	0.025	7.25%	2.5%
Angular (Cor	rrected) Transfor	mod Su	mmanı								
	-			059/ 1.01		Modion	B.F.L.	May	Ctd Era	CV9/	D/ Effect
C-%	Control Type Dilution Water	Count 8	t Mean 1.415	1.412	95% UCL 1.418	Median 1.412	Min 1.412	Max 1.419	Std Err 0.001366	CV%	%Effect 0.0%
100	Dilution water	8	1.374	1.284	1.464	1.412	1.107	1.412	0.03811	7.85%	2.89%
	- Dotail										
Survival Rate											
<u>C-%</u>	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
)	Dilution Water	1 1	1 1	1 1	1 0.8	1	1	1	1		
100			,	<u> </u>	0.0	1	1	1	1		
Angular (Cor	rrected) Transfor	med De	tail								
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
D	Dilution Water	1.412	1.419	1.419	1.412	1.412	1.419	1.412	1.412		
100		1.412	1.412	1.412	1.107	1.412	1.412	1.412	1.412		
Survival Rate	e Binomials										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
)	Dilution Water	10/10	11/11	11/11	10/10	10/10	11/11	10/10	10/10		
		40/40	10/10	40/40	0/40	10/10	10/10	10/10	40/40		

10/10

10/10

10/10

100

10/10

10/10

10/10

8/10

Analyst:______QA:_____

10/10

CETIS Ana	alytical Report				Report Date: Test Code:	•	16 16:40 (p 4 of 4 ctc 18-5976-939
Chironomus	10-d Survival and G	owth Sedime	nt Test			C	CH2M HILL - ASL
Analysis ID: Analyzed:	12-7074-1598 15 Sep-16 16:39	Endpoint: Analysis:	Survival Rate Nonparametric-Two Sample		CETIS Version: Official Results:	CETISv1.8.8 Yes	
Graphics							
1.0 E	0	777	<u></u>	0.05			e
0.9				0.00			
I Rate			រដ្ឋាត រដ្ឋាត	-0.05			
Survival Rate			Centered Cont. Angle	-0.10			
0.4				-0.15			
0.3				-0.20			
0.2				-0.25			
0.0 E	0 D	<u>l</u>	100	-0.30	.5 -1.0 -0.5 0.0	0.5 1.0	1.5 2.0
		C-%			Rankits		

Analyst: <u>3~</u> QA:_____

CETIS Sun	nmary Repo	ort			port Date: st Code:	15 Sep-16 16:39 (p 1 of 1) B358404ctc 12-6122-7241					
Chironomus '	10-d Survival an	d Growth	Sediment T	est						CH2M	HILL - ASL
Batch ID: Start Date: Ending Date: Duration:	08-6381-0778 22 Aug-16 01 Sep-16 10d Oh	Pro Spe	otocol: EF ecies: Ch	urvival-AF Gro PA/600/R-99/ nironomus ter quatic Biosyst	064 (2000) ntans		Dil	uent: Moo ne:	t Muckey I-Hard Syntf	netic Water	
Sample ID: Sample Date: Receive Date: Sample Age:	13 Jul-16	So	terial: Se urce: Ke	8584-04 ediment ensington Gol ower Slate Cro		0050571)		ent: Dject:			
Comparison S	Summary										
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	TU	Method			
19-0870-1575 17-1479-8981	Mean AF Weig Survival Rate	ht-mg	100 100	>100 \ >100 /	NA NA	7.11% 4.29%	1 1		iance t Two Rank Sum ⁻		
Test Acceptal	oility			and and a second s							
Analysis ID	Endpoint		Attribute	•	Test Stat	TAC Lin	nits	Overlap	Decision		
17-1479-8981	Survival Rate		Control F	Resp	1	0.7 - NL		Yes	Passes Acceptability Criteria		
Mean AF Weig	ght-mg Summai	гу									
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	1.473	1.371	1.575	1.246	1.597	0.04326	0.1224	8.31%	0.0%
100		8	1.47	1.373	1.566	1.278	1.656	0.04085	0.1155	7.86%	0.23%
Survival Rate	Summary										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	1	1	1	1	1	0	0	0.0%	0.0%
100		8	0.9625	0.9192	1	0.9	1	0.0183	0.05175	5.38%	3.75%
Mean AF Weig	ght-mg Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	1.246	1.436	1.407	1.597	1.517	1.406	1.58	1.593		
100		1.489	1.586	1.472	1.656	1.278	1.403	1.466	1.407		
Survival Rate	Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	1	1	1	1	1	1	1	1		
100		1	0.9	1	0.9	1	0.9	1	1		
Survival Rate	Binomials							•			
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	10/10	11/11	11/11	10/10	10/10	11/11	10/10	10/10		_
100		10/10	9/10	10/10	9/10	10/10	9/10	10/10	10/10		

Analyst:_____ QA:_____

CETIS Analytical Report

Report Date:15 SepTest Code:B358404

15 Sep-16 16:39 (p 1 of 4) B358404ctc | 12-6122-7241

Chironomus	10-d Survival an	d Grov	vth Sedimer	nt Test								CH2M	HILL - ASL
Analysis ID:	19-0870-1575		Endpoint:		F Weigl	+			CET	IS Version	: CETISv1	.8.8	
Analyzed:	15 Sep-16 16:3	39	Analysis:	Parame	etric-Two	Sample			Offic	cial Result	s: Yes		
Batch ID:	08-6381-0778		Test Type:	Surviva	I-AF Gro	owth			Anal	lyst: Br	ett Muckey		
Start Date:	22 Aug-16		Protocol:			064 (2000)		Dilu	ent: Mo	od-Hard Synti	hetic Wate	•
Ending Date:			Species:		omus ter				Brin	e:			
Duration:	10d 0h		Source:	Aquatic	Biosyst	ems, CO			Age	:			
Sample ID:	10-0448-9482		Code:	B3584-	04				Clie	nt:			
Sample Date:	05 Jul-16		Material:	Sedime	ent				Proj	ect:			
Receive Date	: 13 Jul-16		Source:	Kensing	gton Gol	d Mine (A	K0050	571)					
Sample Age:	48d Oh		Station:	Lower S	Slate Cre	eek							
Data Transfor	m	Zeta	Ait H	yp Tri	ials	Seed			PMSD	Test Re:	sult		
Untransformed	4	NA	C > T	NA	4	NA			7.11%	Passes I	mean af weig	ht-mg	
Equal Varian	ce t Two-Sample	e Test											
Control	vs C-%		Test S	Stat Cr	itical	MSD E)F P-\	/alue	Р-Туре	Decisio	n(α:5%)		
Dilution Water	100		0.055	79 1.7	761	0.105 1	4 0.4	781	CDF	Non-Sig	nificant Effec	t	
Auxiliary Test	s												
Attribute	Test			Te	st Stat	Critical	P-\	/alue	Decision	(α:5%)			
Control Trend	Mann-Ke	ndall Tr	rend				0.1	788	Non-signi	ficant Tren	d in Controls		
ANOVA Table													
Source	Sum Squ	ares	Mean	Square		DF	FS	Stat	P-Value	Decisio	n(α:5%)		
Between	4.4076378	E-05	4.407	637E-05		1	0.0	03113	0.9563	Non-Sig	nificant Effec	t	
Error	0.1982333		0.014	15952	······	14							
Total	0.1982774	1				15							
Distributional	l Tests												
Attribute	Test				st Stat			/alue	Decision				
Variances	Variance				121	8.885		837	Equal Va				
Distribution	Shapiro-\	Wilk W	Normality	0.9	9511	0.8408	0.5	068	Normal D	istribution			
Mean AF Wei	ght-mg Summar	у											
C-%	Control Type	Coun	it Mean	95	% LCL	95% UC	L Me	dian	Min	·Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.473		371	1.575	1.4		1.246	1.597	0.04326	8.31%	0.0%
100		8	1.47	1.3	373	1.566	1.4	69	1.278	1.656	0.04085	7.86%	0.23%
Mean AF Wei	ght-mg Detail												
C-%	Control Type	Rep 1	I Rep 2	? Re	ep 3	Rep 4	Re	p 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	1.246	1.436	1.4	407	1.597	1.5	17	1.406	1.58	1.593		
100		1.489	1.586	1.4	472	1.656	1.2	78	1.403	1.466	1.407		

Analyst:______ QA:_____

lytical Report					Report Date: Test Code:	15 Sep-16 16:39 (p 2 of 4) B358404ctc 12-6122-7241		
10-d Survival and Gr	owth Sedime	nt Test				CH2M HILL - ASL		
19-0870-1575 15 Sep-16 16:39	Endpoint: Analysis:	Mean AF Weight-mg Parametric-Two Sample			CETIS Version: Official Results			
		Reject Nuil	Centered Untransformed	0.25 0.20 0.15 0.10 0.05 0.00 -0.05 -0.10 -0.15 -0.20 -0.25	• • • •			
	C-%	100		-2.0				
	10-d Survival and Gr 19-0870-1575 15 Sep-16 16:39	10-d Survival and Growth Sedimer 19-0870-1575 Endpoint: 15 Sep-16 16:39 Analysis:	10-d Survival and Growth Sediment Test 19-0870-1575 Endpoint: Mean AF Weight-mg 15 Sep-16 16:39 Analysis: Parametric-Two Sample Reject Null 0D 100	10-d Survival and Growth Sediment Test 19-0870-1575 Endpoint: Mean AF Weight-mg 15 Sep-16 16:39 Analysis: Parametric-Two Sample Parametric-Two Sample Parametric-Two Sample Parametric-Two Sample Parametric-Two Sample 0D 100	10-d Survival and Growth Sediment Test 19-0870-1575 Endpoint: Mean AF Weight-mg 15 Sep-16 16:39 Analysis: Parametric-Two Sample	Test Code: Test Code: 10-d Survival and Growth Sediment Test 19-0870-1575 Endpoint: Mean AF Weight-mg CETIS Version: Official Results 15 Sep-16 16:39 Analysis: Parametric-Two Sample Official Results 00 00 0.05 0.05 00 100 0.05 0.00 00 100 0.05 0.00		

Analyst:_____QA:_____

CETIS Analytical Report

Chironomus 10-d Survival and Growth Sediment Test

Report Date:

Test Code:

15 Sep-16 16:39 (p 3 of 4) B358404ctc | 12-6122-7241

CH2M HILL - ASL

Chironomus	10-u Survival ar	Id Growt	n Seaimer							CHZIVI	HILL - ASI
Analysis ID: Analyzed:	17-1479-8981 15 Sep-16 16:		indpoint: nalysis:	Survival Rate Nonparametric	-Two Sample	e		IS Version: cial Results		.8.8	
Batch ID:	08-6381-0778	т	est Type:	Survival-AF Gro	owth		Ana	lyst: Bre	tt Muckey		
Start Date:	22 Aug-16	Р	rotocol:	EPA/600/R-99/	064 (2000)		Dilu	ent: Moo	I-Hard Synth	etic Water	
Ending Date:	: 01 Sep-16	s	pecies:	Chironomus ter	ntans		Brin	e:			
Duration:	10d Oh	S	ource:	Aquatic Biosyst	tems, CO		Age	:			
Sample ID:	10-0448-9482		ode:	B3584-04			Clie				
Sample Date			laterial:	Sediment			Proj	ect:			
Receive Date			ource:	Kensington Gol	•	0050571)					
Sample Age:	: 48d Oh	S	tation:	Lower Slate Cr	eek						
Data Transfo		Zeta	Alt H		Seed		PMSD	Test Res			
Angular (Corr	rected)	NA	C > T	NA	NA		4.29%	Passes si	urvival rate		
Wilcoxon Ra	ink Sum Two-Sa	mple Tes	t								
Control	vs C-%		Test S			P-Value	Р-Туре	Decision	·····		
Dilution Wate	r 100		56	NA	1 14	0.1000	Exact	Non-Signi	ficant Effect		
Auxiliary Tes	sts										
Attribute	Test			Test Stat	Critical	P-Value	Decision				
Control Trend	Mann-Ke	ndall Trei	nd			1.0000	Non-signi	ficant Trend	in Controls		
ANOVA Table	e										
Source	Sum Squ			Square	DF	F Stat	P-Value	Decision	. ,		
Between	ween 0.016330		0.0163		1	4.583	0.0504	Non-Signi	ficant Effect		
Error	0.049902		0.0035	564482	14						
Total	0.0662390	J2			15						
Distributiona	al Tests										
Attribute	Test			Test Stat		P-Value	Decision				
Variances		Ratio F T		478.8	8.885	<0.0001	Unequal V				
Distribution		Wilk W No	ormality	0.802	0.8408	0.0029	Non-norm	al Distributi	on		
Survival Rate	e Summary										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0 100	Dilution Water	8 8	1 0.9625	1 5 0.9192	1 1	1 1	1 0.9	1	0 0.0183	0.0% 5.38%	0.0% 3.75%
		-		0.3132	•	1	0.5	•	0.0105	5.5676	5.1576
	rrected) Transfor		-								
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0 100	Dilution Water	8 8	1.415 1.351	1.412 1.28	1.418 1.421	1.412 1.412	1.412 1.249	1.419 1.412	0.001366 0.02982	0.27% 6.24%	0.0% 4.52%
Survival Rate	n Dotail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	1	1	<u> </u>	<u>1 1</u>	1 1	1	1	1		
100	Diduon water	1	0.9	1	0.9	1	0.9	1	1		
Ammula- 10	mantad) Transfer		411				D 0	Dev. 7			
÷ ,	rected) Transfor			Den 2	Pop 4	Don F			Dong		
C-%	Control Type	Rep 1	Rep 2		Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
C-%	-	Rep 1 1.412	Rep 2	1.419	1.412	1.412	1.419	1.412	1.412		
C-% 0 100	Control Type Dilution Water	Rep 1	Rep 2						**************************************		
C-% 0 100 Survival Rate	Control Type Dilution Water e Binomials	Rep 1 1.412 1.412	Rep 2 1.419 1.249	1.419 1.412	1.412 1.249	1.412 1.412	1.419 1.249	1.412 1.412	1.412 1.412		
C-% 0 100 Survival Rate C-%	Control Type Dilution Water e Binomials Control Type	Rep 1 1.412 1.412 Rep 1	Rep 2 1.419 1.249 Rep 2	1.419 1.412 Rep 3	1.412 1.249 Rep 4	1.412 1.412 Rep 5	1.419 1.249 Rep 6	1.412 1.412 Rep 7	1.412 1.412 Rep 8		
C-% 0 100 Survival Rate C-% 0	Control Type Dilution Water e Binomials	Rep 1 1.412 1.412 Rep 1 10/10	Rep 2 1.419 1.249 Rep 2 11/11	1.419 1.412 <u>Rep 3</u> 11/11	1.412 1.249 Rep 4 10/10	1.412 1.412 Rep 5 10/10	1.419 1.249 Rep 6 11/11	1.412 1.412 Rep 7 10/10	1.412 1.412 Rep 8 10/10		
C-% 0 100 Survival Rate C-%	Control Type Dilution Water e Binomials Control Type	Rep 1 1.412 1.412 Rep 1	Rep 2 1.419 1.249 Rep 2	1.419 1.412 Rep 3	1.412 1.249 Rep 4	1.412 1.412 Rep 5	1.419 1.249 Rep 6	1.412 1.412 Rep 7	1.412 1.412 Rep 8		

Analyst: 3~ QA:_

CETIS Ana	lytical Report				Report Date: Test Code:	15 Sep-16 16:39 (p 4 of 4 B358404ctc 12-6122-724
Chironomus	10-d Survival and G	rowth Sediment	Test			CH2M HILL - ASL
Analysis ID: Analyzed:	17-1479-8981 15 Sep-16 16:39		Survival Rate Nonparametric-Two Sample		CETIS Version: Official Results:	CETISv1.8.8 Yes
Graphics						
^{1.0} E	¢	7777		^{0.08} F		
		<u> </u>		0.06 -		8 8 8 8 8 8
0.8				0.04		
17.0 Kate				0.02		
Survival Rate			Centered Corr. Anole	0.00		0 0
ਤੌ <u>0.5</u>			~0	-0.02		
0.4				-0.04		
0.3				-9.06		
0.2				-0.08		
0.1				-0.10	6 9	
0.0 Ē	0 D	ł	100	-0.12	1.5 -1.0 -0.5 0.0	i i i 0.5 1.0 1.5 2.0
		C-%	100	-2.0 -	1.5 -1.0 -0.5 0.0 Rankits	u.a 1.0 1.0 2.0

Analyst:_____ QA:_____

CETIS Sur	nmary Repo	ort					•	oort Date: t Code:		•	37 (p 1 of 1) 2-8841-2087
Chironomus	10-d Survival an	d Growth	Sediment	t Test							HILL - ASL
Batch ID: Start Date: Ending Date: Duration:	08-6381-0778 22 Aug-16 01 Sep-16 10d Oh	Pre Sp	otocol: ecies:	Survival-AF Gro EPA/600/R-99/ Chironomus ter Aquatic Biosyst	064 (2000) ntans			uent: Moo ne:	t Muckey I-Hard Synth	netic Water	
Sample ID: Sample Date: Receive Date: Sample Age:	: 13 Jul-16	Ma So	iterial: urce:	B3584-02 Sediment Kensington Go Upper Slate Cr		050571)	Clie Pro	ent: ject:			
Comparison	Summary		· · · · ·	··· // ··· // ····							
Analysis ID 08-2648-1221 17-8188-8523	Endpoint Mean AF Weigl Survival Rate	nt-mg <	NOEL 100 100	LOEL >100 >100	TOEL NA NA	PMSD 6.64% 5.16%	TU 1 1	•	iance t Two Rank Sum ⁻		
Test Acceptal Analysis ID	Endpoint		Attribu		Test Stat		nits	Overlap	Decision		- O-iti
17-8188-8523	Survival Rate		Contro	Resp	1	0.7 - NL		Yes	Passes A	cceptability	Cnteria 🖉
C-% 0 100	Control Type Dilution Water	Count 8 8	Mean 1.473 1.403	95% LCL 1.371 1.321	95% UCL 1.575 1.485	Min 1.246 1.197	Max 1.597 1.513	Std Err 0.04326 0.03477	Std Dev 0.1224 0.09835	CV% 8.31% 7.01%	%Effect 0.0% 4.76%
Survival Rate	Summary										
C-% 0 100	Control Type Dilution Water	Count 8 8	Mean 1 0.95	95% LCL 1 0.8868	95% UCL 1 1	Min 1 0.8	Max 1 1	Std Err 0 0.02673	Std Dev 0 0.07559	CV% 0.0% 7.96%	%Effect 0.0% 5.0%
Mean AF Wei	ght-mg Detail										
C-% 0 100	Control Type Dilution Water	Rep 1 1.246 1.379	Rep 2 1.436 1.197	Rep 3 1.407 1.458	Rep 4 1.597 1.396	Rep 5 1.517 1.473	Rep 6 1.406 1.513	Rep 7 1.58 1.451	Rep 8 1.593 1.355		
Survival Rate	Detail										
C-% 0 100	Control Type Dilution Water	Rep 1 1 1	Rep 2 1 1	Rep 3 1 0.9	Rep 4 1 1	Rep 5 1 0.9	Rep 6 1 1	Rep 7 1 1	Rep 8 1 0.8		
Survival Rate	Binomials										
C-% 0 100	Control Type Dilution Water	Rep 1 10/10 10/10	Rep 2 11/11 10/10	Rep 3 11/11 9/10	Rep 4 10/10 10/10	Rep 5 10/10 9/10	Rep 6 11/11 10/10	Rep 7 10/10 10/10	Rep 8 10/10 8/10		

Analyst:_____ QA:____

CETIS Analytical Report

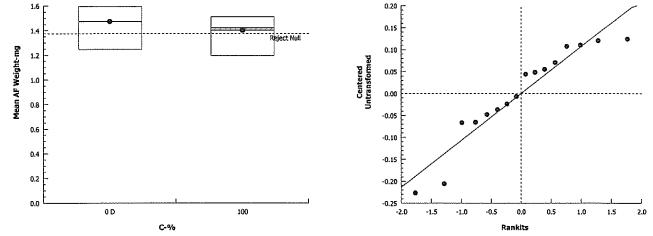
Report Date: Test Code:

15 Sep-16 16:37 (p 1 of 4) B358402ctc | 02-8841-2087

							les	t Code:	B30	8402CtC L	2-8841-20
Chironomus 1	10-d Survival an	d Grow	rth Sedime	nt Test						CH2M	HILL - AS
Analysis ID:	08-2648-1221		Endpoint:	Mean AF Weig	ht-mg		CET	IS Version	CETISv1	.8.8	
Analyzed:	15 Sep-16 16:3	37	Analysis:	Parametric-Two	o Sample		Offi	cial Results	: Yes		
Batch ID:	08-6381-0778		Test Type:	Survival-AF Gr	owth		Апа	lyst: Bre	tt Muckey		
Start Date:	22 Aug-16		Protocol:	EPA/600/R-99/			Dilu	ent: Mo	d-Hard Synti	hetic Wate	r
Ending Date:	01 Sep-16		Species:	Chironomus ter	ntans		Brin	ie:			
Duration:	10d Oh		Source:	Aquatic Biosysi	tems, CO		Age	:			
Sample ID:	13-2959-2362		Code:	B3584-02			Clie	nt:			
Sample Date:	06 Jul-16		Material:	Sediment			Proj	ject:			
Receive Date:	: 13 Jul-16		Source:	Kensington Go	ld Mine (AK	0050571)					
Sample Age:	47d Oh		Station:	Upper Slate Cr	eek						
Data Transfor	m	Zeta	Alt H		Seed		PMSD	Test Res	ult		
Untransformed	3	NA	C > T	NA	NA		6.64%	Passes n	nean af weig	ht-mg	
Equal Varianc	e t Two-Sample	Test									
Control	vs C-%		Test	Stat Critical	MSD DF	P-Value	P-Type	Decision	ı(α:5%)		
Dilution Water	100		1.263	1.761	0.098 14	0.1136	CDF	Non-Sign	ificant Effec	t	
Auxiliary Test	5										
Attribute	Test			Test Stat	Critical	P-Value	Decision	. ,			
Control Trend	. Mann-Ke	ndall Tr	end			0.1788	Non-sign	ificant Trend	in Controls		
ANOVA Table											
Source	Sum Squ	ares	Mean	Square	DF	F Stat	P-Value	Decision	ı(α:5%)		
Between	0.0196622	27	0.019	66227	1	1.596	0.2271	Non-Sign	ificant Effec	t	
Error	0.1725082	2	0.012	32201	14						
Total	0.1921705	5			15						
Distributional	Tests										
Attribute	Test			Test Stat	Critical	P-Value	Decision	ι(α:1%)			
Variances	Variance			1.548	8.885	0.5787	Equal Va				
Distribution	Shapiro-V	Vilk W I	Vormality	0.9016	0.8408	0.0854	Normal D	istribution			
Mean AF Weig	ght-mg Summar	у									
C-%	Control Type	Coun	t Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
-	Dilution Water	8	1.473		1.575	1.477	1.246	1.597	0.04326	8.31%	0.0%
)		8	1.403	1.321	1.485	1.424	1.197	1.513	0.03477	7.01%	4.76%
-		<u> </u>									
100	ght-mg Detail										
100 Mean AF Weig	ght-mg Detail Control Type	Rep 1		Prep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0 100 Mean AF Weig C-% 0					Rep 4 1.597	Rep 5 1.517	Rep 6 1.406	Rep 7 1.58	Rep 8		

Analyst:_____ QA:_____

CETIS Ana	alytical Report				Report Date: Test Code:	•	6 16:37 (p 2 of 4) ctc 02-8841-2087
Chironomus	10-d Survival and Gr	owth Sedime	nt Test			c	H2M HILL - ASL
Analysis ID: Analyzed:	08-2648-1221 15 Sep-16 16:37		Mean AF Weight-mg Parametric-Two Sample		CETIS Version: Official Results:	CETISv1.8.8 Yes	
Graphics							
1.6 C				0.20 F	:		/

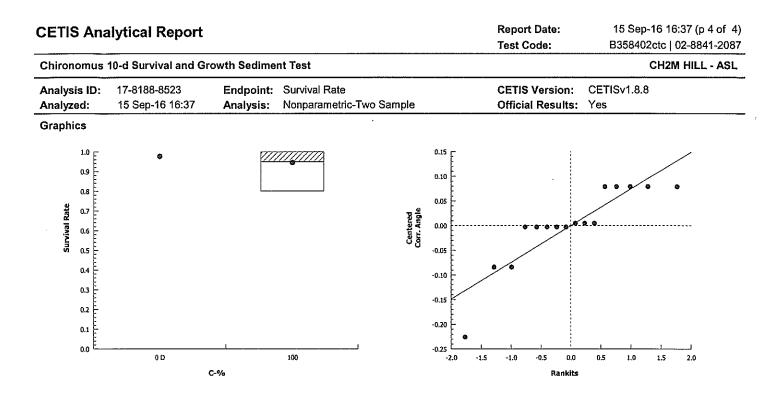


CETIS Analytical Report

15 Sep-16 16:37 (p 3 of 4) B358402ctc | 02-8841-2087

							Test	Code:	B358	402ctc 0	2-8841-20
Chironomus	s 10-d Survival ar	nd Grow	th Sedimen	t Test						CH2M	HILL - AS
Analysis ID:	17-8188-8523	E	Endpoint:	Survival Rate			CET	IS Version:	CETISv1.	8.8	
Analyzed:	15 Sep-16 16:	37 🌙	Analysis:	Nonparametric-	Two Sample	3	Offic	cial Results	Yes		
Batch ID:	08-6381-0778	Г	fest Type:	Survival-AF Gro	owth		Ana	lyst: Bret	t Muckey		
Start Date:	22 Aug-16			EPA/600/R-99/			Dilu		- Hard Synth	etic Wate	r
Ending Date	: 01 Sep-16	5	Species:	Chironomus ter	ntans		Brin	e:			
Duration:	10d 0h	\$	Source:	Aquatic Biosyst	ems, CO		Age	:			
Sample ID:	13-2959-2362	(Code:	B3584-02			Clie	nt:			•
Sample Date	a: 06 Jul-16	ſ	Material:	Sediment			Proj	ect:			
Receive Date		5	Source:	Kensington Gol	d Mine (AK	050571)	•				
Sample Age	: 47d Oh	5		Upper Slate Cre							
Data Transfo	orm	Zeta	Alt Hy	/p Trials	Seed		PMSD	Test Resi	ult		
Angular (Corr	rected)	NA	C > T	NA	NA		5.16%	Passes su	irvival rate		
Wilcoxon Ra	ank Sum Two-Sa	mple Tes	st				· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·			
Control	vs C-%		Test S	tat Critical	Ties DF	P-Value	P-Type	Decision(a:5%)		
Dilution Wate	er 100		56	NA	1 14	0.1000	Exact	Non-Signi	ficant Effect		<u></u>
Auxiliary Tes	sts										
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:5%)			
Control Trend	d Mann-Ke	endall Tre	nd			1.0000		ficant Trend	in Controls		
ANOVA Tabl	e		<u>,</u>								
Source	Sum Squ	ares	Mean	Square	DF	F Stat	P-Value	Decision(α:5%)		
Between	0.026662	87	0.0266	6287	1	3.871	0.0693	Non-Signi	ficant Effect		
Error	0.096426	93	0.0068	87638	14	_					
Total	0.123089	8			15	_					
Distributiona	al Tests										
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:1%)			
Variances	Variance	Ratio F	Test	926.2	8.885	<0.0001	Unequal	Variances			
Distribution	Shapiro-	Wilk W N	ormality	0.8003	0.8408	0.0027	Non-norm	nal Distributio	n		
Survival Rat	e Summary										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effec
0	Dilution Water	8	1	1	1	1	1	1	0	0.0%	0.0%
100		8	0.95	0.8868	1	1	0.8	1	0.02673	7.96%	5.0%
Angular (Cor	rrected) Transfor	med Su	nmarv								
C-%	Control Type	Count	•	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effec
0	Dilution Water	8	1.415		1.418	1.412	1.412	1.419			
0 100		8	1.415	1.412 1.235	1.418	1.412	1.412	1.419	0.001366 0.04147	0.27% 8.8%	0.0% 5.77%
Survival Rate	e Detail										
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8		
0	Dilution Water	1	1	1	1	1	1	1	1		
100		1	1	0.9	1	0.9	1	1	0.8		
		med Det	ail								
	rrected) Transfor						Rep 6	Rep 7	Rep 8		
Angular (Cor	rrected) Transfor Control Type	Ren 1	Ren 2	Rep 3	Rep 4	Rep 5			Repo		
Angular (Cor C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5					
Angular (Cor C-% 0	•	1.412	1.419	1.419	1.412	1.412	1.419	1.412	1.412		
Angular (Cor C-% 0 100	Control Type Dilution Water										
Angular (Con C-% 0 100 Survival Rate	Control Type Dilution Water e Binomials	1.412 1.412	1.419 1.412	1.419 1.249	1.412 1.412	1.412 1.249	1.419 1.412	1.412 1.412	1.412 1.107		
Angular (Cor C-% 0 100 Survival Rate C-%	Control Type Dilution Water e Binomials Control Type	1.412 1.412 Rep 1	1.419 1.412 Rep 2	1.419 1.249 Rep 3	1.412 1.412 Rep 4	1.412 1.249 Rep 5	1.419 1.412 Rep 6	1.412 1.412 Rep 7	1.412 1.107 Rep 8		
Angular (Con C-% 0 100 Survival Rate	Control Type Dilution Water e Binomials	1.412 1.412	1.419 1.412	1.419 1.249	1.412 1.412	1.412 1.249	1.419 1.412	1.412 1.412	1.412 1.107		

Analyst:______QA:_____

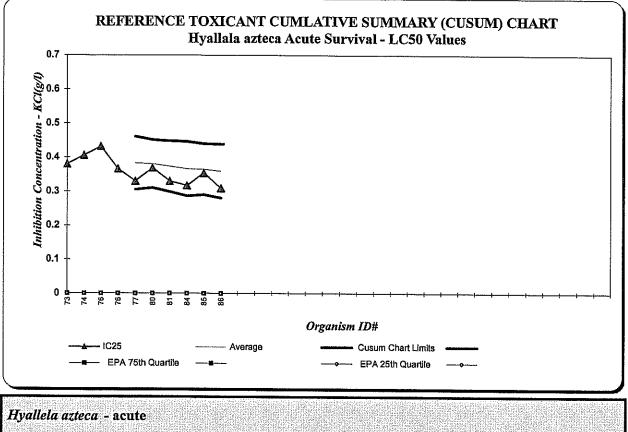


Analyst: Br QA:

APPENDIX B

REFERENCE TOXICANT DATA SHEETS

														,						-	
											Cond.	96	25	733	731	636	2030	3720			
	1505	1250					~	0	26 NONE		ථ 	0	310	530	Lh2	0110	2010	3670			s.xis
	<u>S</u>	5		I		23° C ± 2° C	345	120	136 NO			96	ZJ. L	22.9	22.9	22.4	1	5			0 96 hr.
	Time	Time		1.		23°C	96 hr	96 hr	96 hr 96 hr		င္ သိ	72	22-3	1.55	27.5	5-22	l	1		ی بر ا	et. Laward Laward
	2-16	5/-						n	NONE		Temperature °C	48	227	2.27	22.7	225		1		Temperature ± X°C	correct
	8-22-16 Time	8-26-16		Ç	ŋ :	rature	M	0955	NON		Tem	24	22.0	7-22	2.13	177	22.3	072		Tempe Pfc	A-1-the itrue and X-Hyall
	Date	Date		C	1 otal Alkalinity as CaCU3	I emperature	72 hr	72 hr	72 hr 72 hr			0	21.7	21-7	21,7		21.822.3	21-8		C4	
	sgin:	ij			Trainit			9				96	76	22	22	62	i	1			i na se a i
	Test Begin:	Test End:			l otal A		2	0251	159 2011			72	1	(3	(1		< 9.0	We verify this Task Manager Project Manag QA Officer R
IEET				120 120			48 hr	48 hr	48 hr 48 hr	1	pH	48	۱	١	62	98	۱)		> 6.0 and < 9.0	
LA SH		50 g/L		∣ ∄		ζ C	Z	٩	Ë			24	1	1	}	87	0.1	8,1		рН: >	0 NC
r dat	KCI				3		2 M C	<u>-</u>	1860 NONE			0	2.7	2.3	1:3	7.3	14	7.5			50
REFERENCE TOXICANT DATA SHEET		olution	6	HW	5 9	(He	24 hr	24 hr	24 hr _		â	96	4	22	282	26	1	1		<8.6	-309 -70 0.430
TOXI		Stock Solution	, Q	Recon MH		(add) <u>famme</u> /					n (mg/	72	┟╌──	(7.5	}	1		>4.0 and	0 8 0
INCE			B O (ی ان ان		НC		186 11,24		Dissolved Oxygen (mg/l)	48	1	1	62	02		1		23°C): >	0.280 9 9 9 9
FERE	cant	Milli-Q water	# 7			muosvci			- 백0 대 0		solved	24		,	1	4	7,7	9.4 Ø.4		llela (at	1
RE	Reference Toxicant		Reagent Log ID #	*Dilution Water		Conductivity (Jumnos/cm)	lan		# # 0 0		Dis	0	0,0	00 -	8-1	~1		4		For Hyallela (at 23°C): >4.0 and <8.6	96 hr LC5 Cusum Chart Limits Statistical Method
	ceferen	Solvent:	keagent	Dilutio		onduci	Technician	Time	Therm. ID # Food I.D. #		su	96		Q,	7 (1	1			usum C tatistica
	P	10	hund	π L	•	-	£	ţ	.		rganisı	72		10	9]		j		~ or = 9(<u></u> 800
	[ç				er		Number of Live Organisms Surviving	48	ĊĮ	01	9	R22	17-18- 0	0		Survival in Controls: $> $ or = 90%	
		ca			8. 10 h-	X 40 E	┛		: chamb		ber of . Su	24		0	0	S S	- 0	0	 	al in Co	
	SC	Hyallela azteca	ultures	م يۇ		n dy n	30 ml	20 ml	per test		Num	0	10	10	10	10	10	10	 	Surviv	vater rd • Water
	<u> </u> ΔΛΟC	Hyalle	cake C	М,			ł	cate –	ganism		t ber	Jer J					. a.		 	níts:	ater Code reconstituted water soft moderately hard hard - Artificial Sea Water
		sm	Cheasepeake Cultures	AMA	0.1 ml V/ Cr An Davi 0 & 48 hee	0.1 IIII	er Size	Volume per Replicate	*10 reps. w/1 organism per test chamber		Test Chamber	Number	A	A	A	Α	Å	A		Test Acceptability Limits:	*Dilution Water Code Recon reconstituted water S - soft MH - moderately hard H - hard Art. Sea - Artificial Sea Wat
	Ħ	Test Organism		≜œ		- Sunn	Test Chamber Size	ume pe	10 reps.		Toxicant Concen.	g/L	Cont	0.125	0.250	0.500	1.00	2.00		Accepta	K W K K
	Client	Test	Source		Цеел	р У	Test	Vol	*		Cor Cor	50)	Ŭ	0.	0.0	0.1	1.	2		Test	*Dilutio Recon. S Art. Sea



POTASIUM CHLORIDE (g/L)

Endpoint: 96 hour Survival

Stats Method: Probit, Spearman-Karber, Linear Interpolation

Test Conditions: Recon MH, 23 oC

From EPA 833-R-00-003: 10th Quartule CV (control limit) = na 25th Quartule CV (warning limit) = na 75th Quartule CV (warning limit) = na

na

90th Quartile CV (control limit) =

							and the		

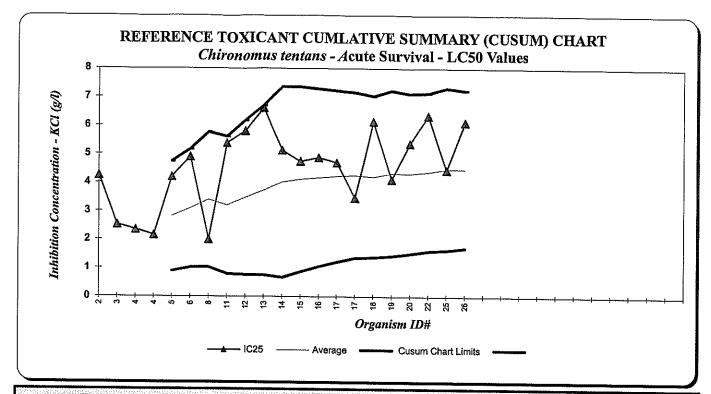
Event #	AMP ID #	Test Start Date	LC50	Running Average	Running SD	Cusum Cl AVG-2SD	art Limits AVG+2SD	Intralab CV
1	73	9/17/2008	0.380	0.380	Control on a channel of a good or of	an an an the Propagation of Sound 11, 51		
2	74	4/24/2009	0.406	0.393				##
3	76	1/28/2011	0.432	0.406	0.026			
4	76	1/28/2011	0.366	0.396	0.029	, <u></u>		
5	77	3/27/2014	0.330	0.383	0.039	0.305	0.461	0.07
6	80	8/14/2014	0.369	0.381	0.035	0.310	0.451	0.10
7	81	11/12/2014	0.330	0.373	0.037	0.299	0.448	0.09
8	84	7/15/2015	0.317	0.366	0.040	0.286	0.446	0.10
9	85	2/17/2016	0.354	0.365	0.038	0.290	0.440	0.11
10	86	8/22/2016	0.309	0.359	0.040	0.280	0.439	0.10
11								
12								
13								
14								
15								
16								
17								
18			···					

be considered typical or representative. Cusum limits are based on ASL data only.

											_				_	2	1247	17					
		I				I					Cond.	┝	-	2 345	0272 0	0622 03	223 0	52.71. C	30 1634				
	15,0	12.55				C C	2.t	ارحنك	186 NONF				96 0	52.9 247	062 8.22	22.9 4330	229 3390	- 11952	- 15930				REFTOX - Chironomids.xls
	Time	Time			9 C 1	23° C ± 2° C	96 hr	96 hr	96 hr		ç		72	22.0.22	21-22	22.3 23	21.4 2	10,22,	ł		 22	(- The second s	Chirone
	1	1					6		9		Temperature °C		48	21.63 2	22.1	225	22.4 6	22.3)		 Temperature ナ [*] C たちょし	correct.	EFTOX -
	91-22-6	2-26-14			CO3	Temperature	J J	1005	159 NONE		Tem		24	21.9	51.9	22.1	12.3	27.5	21.9		Jemper なくなどく	true and	RI
	Date	Date		.1	Total Alkalinity as CaCO3	_ Tempe	72 hr	- 72 hr	72 hr 	ш 7 / —			0	21.7	21.8	21,8	21.9	21.9	21,9		ĘQ.	We verify this data is true and correct. Task Manager Control	
	Test Begin:	Test End:	Poly i	2124	l Alkalin		1	1320	رحط 12-11	/ /			96	82 -	- 8,0	3	20]	١			We verify this da Task Manager Project Manager QA Officer	
L	T	Test	 4	775	•	\ر					pH		48 72	-2-2	2.7	<u>}</u>	5.1	5 17,7	•		 and < 9.(We Proj	
SHEI		10 g/L				36S	48 hr		48 hr		'n.		24 4	е 	,	- &(3	A. 25	5.9 1		pH: > 6.0 and < 9.0		
REFERENCE TOXICANT DATA SHEET		10		曲 			rry Jw	1400	181	INONE			0	7.5	7.5				3 62		 1	2.7.24 Karber	
ICANT	KCI	olution	7	1 MH	95	þt)	24 hr	24 h	24 hr	24 III 	(Į,	Ţ	96	28 7		1	<u>-</u> 52)		d <8.6		
TOX		Stock Solution	10.000	Recoi		/ Salinity (ppt)	24 hr 24 hr				ten (mg		72	7.3	2.7	1	7.2	73	۱		 : >4.0 an	- IL	
RENCE		water	2B 00		CO3	-				l	Dissolved Oxygen (mg/l)		48	1	۱	<u>75</u>	1	81	1		 (at 23°C)	50 1.71 7 Sparman	
REFE	oxicant	distilled water	g ID #	/ater	Total Hardness as CaCO3	Conductivity (µmhos/cm)	0 hr	년 0 1년 0			Dissolv		24	ر ۱	- 6-2	1 0	1	2 7 ig	28.0		For Hyallela (at 23°C): >4.0 and <8.6		
	Reference Toxicant	Solvent:	Reagent Log ID #	*Dilution Water	al Hardn	aductivit	Technician	ne De	Therm. ID #	F00d 1.D.#			96 0	521		0~		17 E	87			Cusum Chart Limi Statistical Method	
	Ref	Sol	Re	Q*	Tot			Time	Π ₀	0,I	ganisms		72 9	5	v T	9	0	0)		 or = 90%	Sta Cui	
						& 48 hrs			ц.		Number of Live Organisms	Surviving	48	(a)	<i>5</i>	9	0)) 			Survival in Controls: $> $ or $= 90\%$		
		ntans				min @ 0	la Ia		t chambe		nber of	Su	24	01	0_	2	2	<u>م</u>	0		ival in Cc	La La	
	QA/QC	Chironomus tentans		. 9	101	/L Tetra	400 ml	250 ml	m per tes		MM		0	10	10	10	10	10	10		Surv	id water hard Sea Wati	
	QA		ABS	CHI 26	2 nd instan	0.1 ml of 4 g/L Tetramin @ 0 & 48 hrs.	her Size	Volume per Replicate	*1 rep. w/10 organism per test chamber		Test	Chamber	Number	Ą	A	A	A	A	A		Test Acceptability Limits:	*Dilution Water Code Recon reconstituted water S - soft MH - moderately hard H - hard Art. Sea - Artificial Sea Water	
	Client	Test Organism	Source	 #	Age			Volume p	*1 rep.		Toxicant	Concen.	g/L	Cont	1.25	2.50	5.00	7.50	10.0		Test Accept	*Dilution V Recon. S MH H Art. Sea	

REFTOX - Chironomids.xls Dec Control ID: ASL687-0510

DENLIF



Chironomus tentans - acute POTASSIUM CHLORIDE (g/L)

Endpoint: 96 hour Survival

Stats Method: Probit, Spearman-Karber, Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

10th Quartile CV (control limit) = na

25th Quartile CV (warning limit) = na

75th Quartile CV (warning limit) = na

90th Quartile CV (control limit) = na

Event #	Chi D#	Test Start Date	LC50	Running	Running		art Limits	Intralab
1	2	9/10/1999	4.24	Average	SD	AVG-2SD	AVG+2SD	CV
2	3	10/5/1999	2.52					
3	4	10/12/1999	2.34					
4	4	10/12/1999	2.16					
5	5	10/20/1999	4.20	2.82	0.96	0.89	4.74	0.34
6	6	11/2/1999	4.90	3.09	1.04	1.02	5.17	0.34
7	8	7/29/2002	2.00	3.39	1.19	1.02	5.77	0.35
8	11	10/1/2004	5.38	3.19	1.20	0.79	5.60	0.35
9	12	4/26/2005	5.80	3.47	1.36	0.76	6.18	0.39
10	13	4/29/2005	6.61	3.73	1.49	0.75	6.70	0.39
11	14	5/6/2005	5.13	4.02	1.67	0.67	7.36	0.40
12	15	7/14/2006	4.74	4.12	1.62	0.87	7.36	0.39
13	16	7/20/2006	4.87	4.17	1.56	1.05	7.28	0.37
14	17	1/28/2011	4.70	4.22	1.50	1.22	7.23	0.36
15	17	1/28/2011	3.46	4.26	1.45	1.36	7.16	0.34
16	18	7/1/2014	6.14	4.20	1.41	1.38	7.03	0.34
17	19	8/19/2014	4.11	4.32	1.45	1.43	7.22	0.33
18	20	11/14/2014	5.37	4.31	1.40	1.51	7.12	0.33
19	22	7/21/2015	6.35	4.37	1.38	1.60	7.14	0.32
20	25	3/2/2016	4.44	4.47	1.42	1.64	7.31	0.32
21	26	8/22/2016	6.12	4.47	1.38	1.71	7.24	0.31
22								0.31

As per EPA 833-R-00-003, section B.2.1, the quartiles listed above are from just a few labs (4) and therefore not to be considered typical or representative. Cusum limits are based on ASL data only

Chirono (KCl). 8/30/2016

APPENDIX C

CHAIN OF CUSTODY

\bigcirc	CH2MHILL
Sec.	Applied Sciences Laboratory (ASL)

Sample Receipt Record

Batch Number: <u>B3584A</u> Client/Project: <u>COEUS Haska</u>	/ Alaska Dept. of Fish + Game	Date Received: Received By:	7/13/16 RS	1050	
Were custody seals intact?				No	
Packing Material:			/ -	Blue Ice	
Temp OK? (<6C) Therm ID: TH173 E	xp. 7/16	4.2	Ź °C □Yes	No No	□ N/A
Was a Chain of Custody (CoC) Provided	?		X Yes	🗌 No	🗌 N/A
Was the CoC correctly filled out (If No, d	ocument below)		XYes	No No	□ N/A
Were the sample containers in good con	dition (not broken or leaking)?		Yes Yes	🗌 No	🗌 N/A
Are all samples within 36 hours of collect	ion?		Tes 🗌	XN0	□ N/A
Method of Shipment:	Hand Delivered FedEx	UPS Greyhound [Other:		□ N/A

Sample Exception Report (The following exceptions were noted)

Client was notified on:	Client contact:	
Resolution to Exception:		

Client Count Muche /4	CHAIN CHAIN	OF CUST	roby RI	ECORI	FOR NPDE	CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING	CE BIOI	LINOW	ORII	Ū,		
Address 002 Zrd St.	ALLANCA JULY - I LIN & CHUNG	+ HOH	s clane	NFUEU#					r S F C	p Sam 2M Hil	Ship Samples to: CH2M HII - Annlied Sciences I aboratory	ton
Douglas, dr. 99824	- 99824				1 -	Composite Sample Information:	on:		Atte	intion:	Attention: Bioasssay Lab	
Person: V	ate Kanouse			Initiated: Ended:	Date	Time	ne Ne	,	5 1 0	0 NE C valiis (1100 NE Circle Blvd. Suite 300 Corvallis OR 97330	
Phone: (Aor) 405-4290 E-mail: Kake. Kanovee a laska. Gov	445-4290 anovee (2 ala	SKA. GOV		Chilled echlorine	urinç ed pr	Yes Yes	2 2	J .	C at n	Phone tomer	Lab Phone: (541) 768-3160 Customer Service: (541) 768-3120	
CH2M HILL Project # / Purchase Order #	ase Order #	s					Ana	lysis R	equire	d / Coi	Analysis Required / Comments	
			Sample Type	ontainers	tab tab	Chronic ute ronic gae	ead Acute	Chronic Acute	ronic	<u>ארצ כוויסיווס</u> at	Concentration and/or	
Sample ID	Date	Time	Comp.	ab	<u>5</u>	Fathead Fathead Cerio Ac Gerio Ch Green Al		v sibineM Menidia (Mysid Ac	seW zeH	Ŭ 	
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work Authorized by	(Please sign ai	nd print name)		temarks	returned	2 unused + 1 used	Spare	containers late
A MARKAN) 							

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B3584A

Stanaway, Mike/CVO

From: Sent: To: Subject: Kanouse, Kate M (DFG) <kate.kanouse@alaska.gov> Monday, August 15, 2016 8:17 PM Stanaway, Mike/CVO RE: B3610 Exceptions [EXTERNAL]

Sounds good, Mike. Thank you for letting me know.

From: Mike.Stanaway@CH2M.com [mailto:Mike.Stanaway@CH2M.com] Sent: Thursday, August 11, 2016 1:54 PM To: Kanouse, Kate M (DFG) Cc: Brett.Muckey@CH2M.com Subject: FW: B3610 Exceptions

Hi Kate,

We received the sample today. It was delivered a day late and the temperature was outside of the recommended temperature at sample receipt. ASTM recommends the temperature be below 6 C but it is not a requirement, so I think we are good to go on the testing and will just flag that sample, unless you tell us otherwise.

Thanks Mike

Mike Stanaway Biologist / Laboratory Project Manager D 1 541 768 3161 M 1 503 551 1567

CH2M Applied Sciences Laboratory (ASL) 1100 NE Circle Blvd., Suite 300 Corvallis, OR 97330 USA www.ch2m.com | LinkedIn | Twitter | Facebook

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From: Castro, Pierrette/CVO Sent: Thursday, August 11, 2016 12:00 PM To: Stanaway, Mike/CVO <<u>Mike.Stanaway@CH2M.com</u>> Subject: B3610 Exceptions

Mike,

Attached is the exceptions report, along with the COC and shipping tag, for the Alaska shipment we received today.

Pierrette Castro Laboratory Technician/Sample Receiving D 541-768-3106

CH2M Applied Sciences Laboratory (ASL) 1100 NE Circle Blvd., Suite 300 Corvallis, OR 97330 www.ch2mlab.com





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Sample Receipt Record

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Batch Number:	Date Received:			······
Client/Project:	Received By:			
			ere <u>leti</u> er ettelete	t and the state of the state o
Were custody seals intact?		∐ Yes	No No	∐ N/A
Packing Material:	αν πραγματικός διατικός μεγά που παραγορη το γραποιότας του δουργοριστικός του γραποιότασα το παραγοριστικός π Τα πραγματικός διατικός μεγά που προσφοριατικός που του που προγραφοριατικός του γραποιότασα το παραγοριστικός π	Ice [Blue Ice	Box
Temp OK? (<6C) Therm ID: TH173 E	ф.	Yes	∏ No	□ N/A
Was a Chain of Custody (CoC) Provided	s Senakaharan keralakan kerakan kerakan berinta dari bara keralakan berakan kerakan kerakan kerakan kerakan kerak I	[] Yes	🗌 No	N/A
Was the CoC correctly filled out (If No, do	ocument below)	🗌 Yes	🗌 No	□ N/A
Were the sample containers in good cond	dition (not broken or leaking)?	🗌 Yes	🗌 No	□ N/A
Are all samples within 36 hours of collect	ion?	Tes 🗌	🔲 No	□ N/A
Method of Shipment:	Hand Delivered FedEx UPS Greyhound Oth	er:	1.449.469.469.469.479.4796	N/A

Sample Exception Report (The following exceptions were noted)

Client was notified on:	Client contact:
Deschulter to Executions	
Resolution to Exception:	
<u>Resolution to Exception:</u>	

E BIOMONITORING Ship Samples to: CH7M HILL - Annlied Sciences Laboratory			N N N N N N	Analysis Required / Comments	read Acute Pead Chronic Acute Dronic bronic ste รte รte กากก่เร	Sheepsl						(Please sign and print name) Date/Time	(Please sign and print name) Date/f1me	(Please sign and print name) Date/Time	Fed-Ex Hand Other	6 Julyzoll	
CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING しん Dept. of 石 sh ・ Game _ NPDES#	Composite Sample Information: Initiated: Date		Chilled During Collection ? Yes Dechlorinated prior to shipping ? Yes		Chronic sute ironic	G ab to to C thead Fathead		A Participant	5 p-28-2-69 2			Date/Time 2/8/10 J Relinquished By	Date/Time Relinquished By	Date/Time Relinquished By	Date/Time Shipped Via Shipped Via Ki () ((、 /(、 () UPS Bus Fe	ks 2C B3610A	B3584
CIENT COLOR CHAIN OF CUSTODY RECC Client Coeur Alaska Dept. of Tish & Game NPD Address 800 210 St.		Person:	Phone: (907) 465-4290 E-mail: <u>Kate. Kanouse @ alas ka.gov</u>	CH2M HILL Project # / Purchase Order #	Sam	Sample ID Date Time Comp.	Laury State Greek - 15/16 0900 X	thetre tees Z	> Lewer Johnson Creek 8/8/36 1530 X			Sampled By & Title (Please sign and print name) Kate Kanouse, Habitat Biologist W, Kale Koueuse		Received By (Please sign and print name)	Received By (Please sign and print name) Thus Word New Tilt W nork with	(Please sign and print name)	

CH2MHILL Applied Sciences Laboratory (ASL)	Sample Receipt Record
Pole MC 9-2016 B3610A B3584	Date Received: 8/11/16
Client/Project: CORU-Alasta /Alasta Dept Fish obame	Received By: W
Were custody seals intact?	XYes 🗌 No 🗌 N/A
Packing Material:	🗌 Ice 🔀 Blue Ice 🗌 Box
Temp OK? (<6C) Therm ID: TH173 Exp. ()(()	S.2.°C □Yes KNO □N/A
Was a Chain of Custody (CoC) Provided?	Yes 🗌 No 🔲 N/A
Was the CoC correctly filled out (If No, document below)	Yes 🗌 No 🗌 N/A
Were the sample containers in good condition (not broken or leaking)?	🗶 Yes 🗌 No 🗌 N/A
Are all samples within 36 hours of collection?	🗌 Yes 🖾 No 🗌 N/A
1] UPS 🔲 Greyhound 🗌 Other: 🗌 N/A
Sample Exception Report (The follo) Arrived I day late.	wing exceptions were noted)
Client was notified on: Client contact:	
Resolution to Exception:	