Technical Report No. 19-01

Freshwater Resource Investigations Near Greens Creek Mine

by

Katrina M. Kanouse and Evan Fritz

January 2020

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

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in reports by the Habitat Section, and Divisions of Sport Fish and Commercial Fisheries. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figures or figure captions.

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
no data	ND
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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By

Katrina M. Kanouse

and

Evan Fritz

Alaska Department of Fish and Game
Habitat Section, Region I
802 3rd Street, Douglas, Alaska 99824

January 2020

This investigation was fully financed by Hecla Greens Creek Mining Co.

Cover: Hawk Inlet Head Creek mouth at Hawk Inlet on May 15, 2018.

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Alaska Department of Fish and Game, Habitat Section
802 3rd Street, Douglas, Alaska, 99824, USA

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ACKNOWLEDGEMENTS

Hecla Greens Creek Mining Co. provided financial support for this project. Environmental Manager Chris Wallace and Senior Environmental Engineer Dave Landes collaborated on study design. Mr. Landes provided field support and collected and handled the water samples, and Environmental Technician Gunner Fredheim provided transportation to sampling sites by skiff. Mr. Wallace and Mr. Landes reviewed the draft report.

Many Habitat Section staff contributed to this project. Former Southeast Regional Supervisor Jackie Timothy collaborated on study design, Habitat Biologist Greg Albrecht collected field data, former Habitat Biologist Nicole Legere verified data entry, and Habitat Biologist Bill Kane prepared the report for publication. Habitat Section Operations Manager Dr. Al Ott and Ms. Timothy reviewed and edited the report.

Thank you all for your contribution.

EXECUTIVE SUMMARY

In 2012, the Alaska Department of Environmental Conservation (DEC) listed the tidal and submerged lands around the Greens Creek Mine ore concentrate loading dock on the Clean Water Act Section 303(d) Impaired Waters List for elevated cadmium, copper, mercury, lead, and zinc in sediments. In 2017, DEC published a total maximum daily load (TMDL) for the site, and Site S-3 at the head of Hawk Inlet, recommending additional data collection to characterize element concentrations in water, sediment, and fish in fresh water bodies draining to Hawk Inlet at undisturbed sites and sites near historic and current hard rock mining activities (DEC 2017).

During 2018, Alaska Department of Fish and Game (ADF&G) habitat biologists sampled sediment and resident Dolly Varden char[a] *Salvelinus malma* at 12 sites in nine streams draining to Hawk Inlet for total concentrations of cadmium, copper, lead, mercury, and zinc.[b] Hecla Greens Creek Mining Co. (Hecla) staff sampled water at each site. Of the 12 sample sites, 6 sites were in streams where no known hard rock mining has occurred, 4 sites were downstream of historic or active hard rock mining, and 2 sites were upstream of active hard rock mining.

We found similar sediment median cadmium, copper, lead, mercury, and zinc concentrations among sites undisturbed and near historic and active hard rock mining activities. Many sediment cadmium, copper, and zinc concentrations exceeded the National Oceanic and Atmospheric Administration's freshwater sediment toxicity screening guidelines (Buchman 2008). The range of freshwater sediment median element concentrations was similar to the range of medians observed across Hawk Inlet 1984–2015 (DEC 2017)[c], indicative of area mineralization, except median copper, lead, mercury, and zinc concentrations were elevated at the ore concentrate loading dock and median mercury concentration was elevated at Empire Creek due to known contaminants. At the head of Hawk Inlet, most median cadmium, copper, lead, mercury, and zinc concentrations in freshwater sediments were similar or greater than medians observed at Hawk Inlet Site S-3 1984–2015 (DEC 2017).

We found similar median copper, lead, and zinc concentrations in fish among sites undisturbed and near historic and active hard rock mining activities. Median cadmium concentrations were greater among the Greens Creek fish samples, above and below active mining operations, and median mercury concentration was greater among the Tributary Creek fish samples. Comparing the 2018 Greens Creek and Tributary Creek fish element concentration data with the 2001–2017 biomonitoring data (Zutz 2018a), the 2018 Greens Creek fish median element concentrations were greater than the 2001–2017 medians, and the 2018 Tributary Creek fish median element concentrations were similar or less than the 2001–2017 medians, except the 2018 median mercury concentration was greater.

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[a] Where present.

[b] Evan Fritz, Habitat Biologist, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Division of Habitat. Memorandum: 2018 GCM freshwater resource investigations; dated 11/9/2018. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Habitat Section, 802 3rd Street, Douglas, AK.

[c] Six sample sites: S-1 near the Greens Creek Mine outfall 002 wastewater discharge mixing zone; S-2 near the mouth of Hawk Inlet (reference site); S-3 near the head of Hawk Inlet (reference site with inherent variability); S-4 near the ore concentrate loading dock; and S-5N and S-5S below the ore concentrate loading dock.

INTRODUCTION

The Greens Creek Mine is located about 29 km southwest of Juneau by air near Hawk Inlet on the west side of Admiralty Island, within the Tongass National Forest and the Admiralty Island National Monument (USFS 2013). The mine has operated since 1989, except between 1993 and 1996 when the mine was temporarily closed, and exports gold, lead, silver, and zinc concentrates. Hecla, a subsidiary of Hecla Mining Co. of Coeur d'Alene, ID, has owned and operated the mine since April 2008.

Most mine infrastructure is located in two drainages that support resident and anadromous fish: the dry-stack tailings disposal facility (TDF) at the headwaters of Tributary Creek, and the mill, mine facilities, and waste rock storage areas adjacent to Greens Creek (Figure 1).

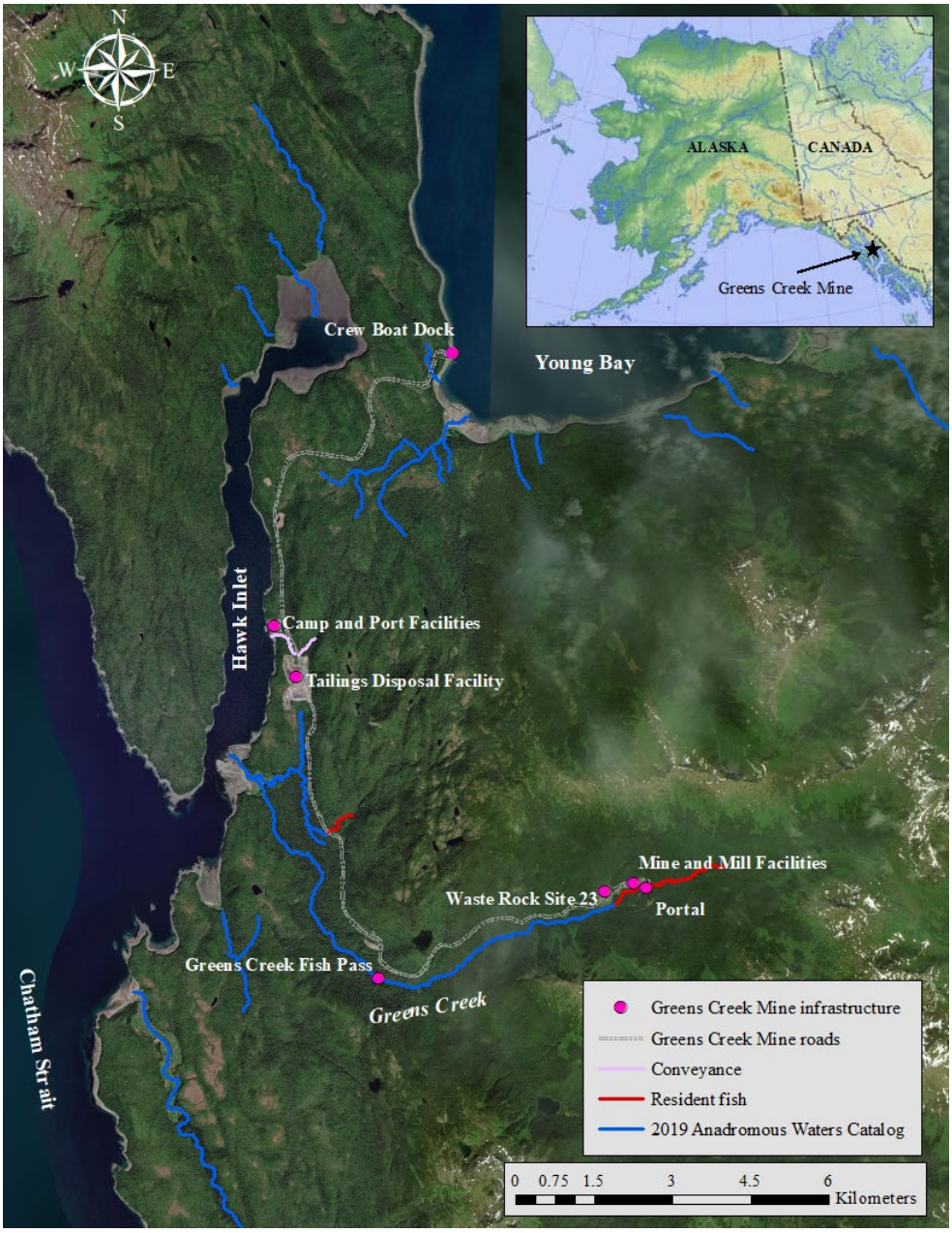

Figure 1.–Greens Creek Mine area map.

In 1989, when former mine owner Greens Creek Mining Co. first attempted to load a barge with ore concentrate, the conveyor belt system broke spilling concentrate into Hawk Inlet. In 1994, the company used a suction dredge to remove about 420 m^3 of material, however remnant debris from a cannery that operated at the site since the early 1900s and burned down in 1974 complicated their cleanup efforts (DEC 2017, USFS 2003).[d]

Cadmium, copper, lead, mercury, and zinc concentrations in sediments at the site continue to exceed marine sediment guidelines developed by the National Oceanic and Atmospheric Administration (Buchman 2008), and in 2012, DEC listed 1.12 acres of the tidal and submerged lands around the ore concentrate loading dock on the Clean Water Act Section 303(d) Impaired Waters List as a Category 5 water body.[e] In 2017, DEC (2017) published the TMDL for the area and included an area of concern at the head of Hawk Inlet where cadmium, copper, mercury and zinc also exceed the marine sediment guidelines.

The TMDL recommends collecting data on freshwater inputs to Hawk Inlet, specifically characterizing element concentrations in water, sediment, and fish in areas undisturbed and disturbed by historic and active mining operations (DEC 2017). In 2018, Hecla and Habitat staffs developed and implemented a plan to investigate sediment and whole body Dolly Varden char element concentrations in several water bodies draining to Hawk Inlet in response to the recommendation; Hecla staff concurrently sampled water and will report those data separately. In this report, we present the sampling results and compare the data with sediment and whole body Dolly Varden char element concentrations data collected by ADF&G, including Greens Creek Mine aquatic biomonitoring data (Zutz 2018a) and baseline Glacier Creek aquatic studies data for the Palmer Exploration Project (Legere and Kanouse 2018), a hard rock mineral exploration project located about 55 km north of Haines on the same volcanogenic massive sulfide belt as the Greens Creek Mine.

PURPOSE

The purpose of this investigation and technical report is to document fish use and sediment and fish element concentrations in water bodies draining to Hawk Inlet near the Greens Creek Mine.

AQUATIC STUDIES

Between May 15 and August 8, 2018, we collected sediment samples at 12 locations and fish samples at nine locations in water bodies draining to Hawk Inlet near the Greens Creek Mine (Table 1; Figure 2).

[d] Hecla annually voluntarily removes lead acid batteries and other debris disposed at the Hawk Inlet site during cannery operation (C. Wallace, Environmental Manager, Hecla, Juneau, personal communication).

[e] For contaminated sediments; the marine water column meets Alaska water quality standards (DEC 2017).

Table 1.–2018 sample sites (WGS84 datum).

Sample Site	Sample Date	Lattitude	Longitude
Hawk Inlet Head Creek Site 2061	05/15/18	58.1939	–134.7414
Unnamed Creek Site 2062	05/15/18	58.1892	–134.7523
Jimmy Green Creek Site 2063	05/15/18	58.1767	–134.7595
Empire Creek Site 2064	05/16/18	58.1693	–134.7712
Piledriver Creek Site 2065	05/16/18	58.0708	–134.7673
Zinc Creek Site 371	05/16/18	58.0910	–134.7358
Cannery Creek Site 37	07/12/18	58.1220	–134.7450
Tributary Creek Site 9	07/12/18	58.1047	–134.7449
Tributary Creek Site 1847	07/12/18	58.1018	–134.7458
Greens Creek Site 54	07/10/18	58.0785	–134.6473
Greens Creek Site 63A	07/11/18	58.0829	–134.6295
Greens Creek Site 63B	08/08/18	58.0835	–134.6255

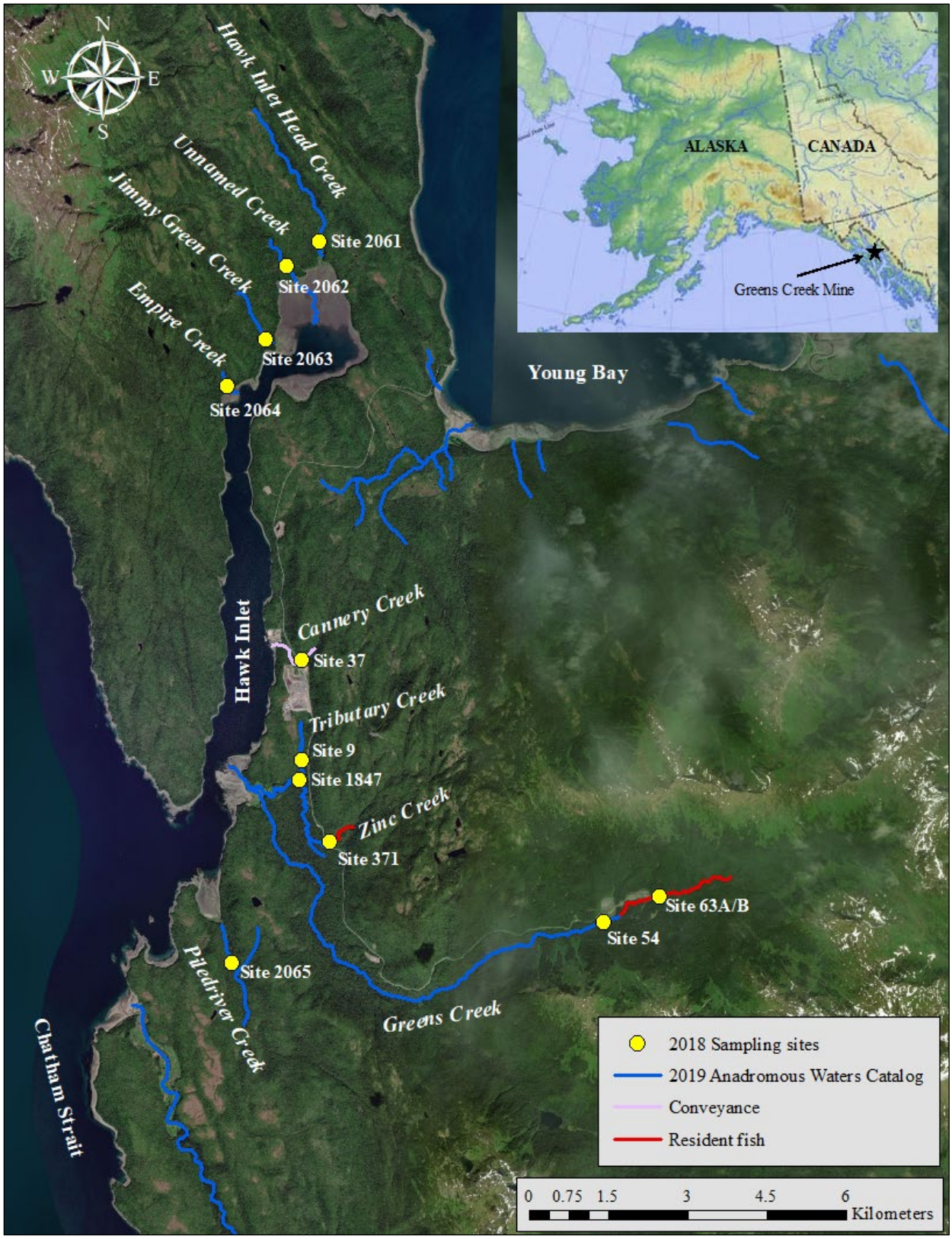

Figure 2.–2018 sampling site map.

STUDY AREA

Hawk Inlet Head Creek

Hawk Inlet Head Creek (Stream No. 112-65-10150; Johnson and Blossom 2019), the northern most drainage to Hawk Inlet, provides habitat for chum salmon *Oncorhynchus keta* and pink salmon *O. gorbuscha* (Figure 3).[f] We captured juvenile coho salmon *O. kisutch* and Dolly Varden char in the water body. About 320 m upstream of the mouth, a 9 m waterfall prevents anadromous fish migration (Figure 4). Below the falls, the stream gradient is 3–4%, gravel substrate provides salmon spawning habitat, and we observed a tributary of 15–20% gradient about 18 m downstream of the falls on river right.

We collected sediment and fish samples about 250 m upstream of tidal influence at Hawk Inlet Head Creek Site 2061 where the stream is characterized as a small moderate gradient mixed control channel (Paustian 2010).

Figure 3.–Hawk Inlet Head Creek Site 2061.

Figure 4.–Hawk Inlet Head Creek barrier falls.

[f] Nomination No. 09-153; we submitted Nomination No. 19-503 to correct the stream course and include coho salmon rearing (Appendix A).

Unnamed Creek

Unnamed Creek (Stream No. 112-65-10140; Johnson and Blossom 2019), located about 600 m southwest of Hawk Inlet Head Creek, provides habitat for chum and pink salmon.[g] We captured juvenile coho and pink salmon, cutthroat trout *O. clarkii*, and Dolly Varden char in the water body. Low-gradient gravel substrate provides salmon spawning habitat near the stream mouth (Figure 5). About 60 m upstream of the mouth, stream gradient increases to 3–5% and large gravel and cobble substrates are dominant. About 450 m upstream of the mouth, the channel splits into two braids that rejoin near tidal influence (Figure 6). We also observed a stagnant tributary about 120 m upstream of the mouth on river right with iron floc prevalent (Figure 7).

We collected sediment and fish samples about 200 m upstream of tidal influence at Unnamed Creek Site 2062 where the stream is characterized as a small moderate gradient mixed control channel (Paustian 2010).

Figure 5.–Unnamed Creek, tidally influenced reach.

Figure 6.–Unnamed Creek channel braid.

Figure 7.–Unnamed Creek tributary.

[g] Nomination No. 84-710; we submitted Nomination No. 19-506 to correct the lower stream course and include coho salmon rearing (Appendix A).

Jimmy Green Creek

Jimmy Green Creek (Stream No. 112-65-10120; Johnson and Blossom 2019), located about 1,300 m southwest of Unnamed Creek, provides habitat for chum salmon.[h] We captured Dolly Varden char in the water body. About 60 m upstream of tidal influence, a 2.5 m tall debris jam (Figure 8) recently caused the stream to flood through the forest on both sides, creating three new channels (Figure 9); upstream fish passage through the developing channels is limited to the 0.5–1.2 m wide main channel. Where the channels converge, salmonid spawning gravel and rearing habitats are present (Figure 10). About 220 m upstream of tidal influence, the channel gradient increases to 15% and steepens to greater than 25% about 380 m upstream from the mouth, indicating the upper extent of anadromous fish habitat.

We collected sediment and fish samples about 200 m upstream of tidal influence at Jimmy Green Creek Site 2063 where the stream is characterized as a low incision high gradient contained channel (Paustian 2010).

Figure 8.–Jimmy Green Creek debris jam.

Figure 9.–Jimmy Green Creek new channel.

Figure 10.–Jimmy Green Creek spawning gravel.

[h] Nomination No. 09-153; we submitted Nomination No. 19-504 to correct the stream course (Appendix A).

Empire Creek

Empire Creek[i] (Stream No. 112-65-10110; Johnson and Blossom 2019), located about 1,300 m southwest of Jimmy Green Creek, provides habitat for chum and pink salmon.[j] We captured juvenile coho and pink salmon, rainbow trout *O. mykiss*, and Dolly Varden char in the water body. At the mouth, the stream gradient is 3–4% and the substrate is composed of shale cobble with gravel, providing salmon spawning habitat (Figure 11). About 80 m upstream of tidal influence, the stream gradient increases to 5% and the streambed contains cobble and boulder substrates; about 100 m upstream of tidal influence, the stream gradient increases to 12–18% and several debris jams and step falls prevent anadromous fish migration (Figures 12, 13).

Given the limited fish habitat available for sampling, we collected sediment and fish samples within 100 m of tidal influence at Empire Creek Site 2064 where the stream is characterized as a small moderate gradient mixed control channel (Paustian 2010).

Figure 11.–Empire Creek near tidal influence.

Figure 13.–Empire Creek.

Figure 12.–Empire Creek.

[i] Named for the abandoned Empire Mine that operated between 1931 and 1942 near the creek headwaters at 300 m elevation. In 2014, U.S. Forest Service, DEC, and ADF&G staffs studied contaminated soils at the site and aquatic resources in Empire Creek, finding arsenic, cadmium, copper, lead, mercury, and nickel concentrations in lower Empire Creek sediment samples exceeding background concentrations and screening guidelines (Buchman 2008), and aluminum, cadmium, iron, nickel, and zinc concentrations in lower Empire Creek water samples exceeding background concentrations and aquatic life criteria. Portage, Inc. (2015) summarizes the Empire Mine history, results from U.S. Forest Service site investigations completed in the 1990s, and the 2014 sampling results.

[j] Nomination No. 87-210; we submitted Nomination No. 19-502 to correct the stream course and include coho salmon rearing (Appendix A).

Piledriver Creek

Piledriver Creek (Stream No. 112-65-10280; Johnson and Blossom 2019), the southernmost drainage near the mouth of Hawk Inlet, provides habitat for pink salmon.[k] We captured juvenile coho and pink salmon, cutthroat trout, and Dolly Varden char in the water body. Throughout the lower 800 m of Piledriver Creek, the stream gradient is 1–2%, and we observed many remnant pink salmon redds from the prior year (Figures 14–16). About 200 m upstream of tidal influence, an unnamed tributary (Stream No. 112-65-10280-2006; Johnson and Blossom 2019) joins Piledriver Creek on river right and provides habitat for pink salmon.

We collected sediment and fish samples about 400 m upstream of tidal influence at Piledriver Creek Site 2065 where the stream is characterized as a narrow low gradient flood plain channel (Paustian 2010).

Figure 14.–Piledriver Creek.

Figure 15.–Piledriver Creek, tidally influenced reach.

Figure 16.–Piledriver Creek.

[k] Nomination # 09-153; we submitted Nomination No. 19-505 to correct the lower stream course and include coho salmon rearing (Appendix A).

Cannery Creek

Cannery Creek, which crosses the Greens Creek Mine B Road near the TDF, does not support resident or anadromous fish populations though suitable resident rearing, spawning, and overwintering habitats exist.[1] Bedrock falls near the upper extent of tidal influence prevent anadromous fish migration. Between the falls and the B Road, mean streambed gradient is 7% and debris and historic timber dams from cannery operations remain in the creek. Streambed gradients range 8–15% within 100 m upstream of the road.

We collected sediment samples within 50 m upstream of the B Road at Cannery Creek Site 37 (Figures 17–19), upstream of mine influence, where the stream is characterized as a low incision high gradient contained channel (Paustian 2010).

Figure 17.–Cannery Creek Site 37.

Figure 18.–Cannery Creek Site 37.

Figure 19.–Cannery Creek.

[1] Greg Albrecht, Habitat Biologist, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Division of Habitat. Memorandum: Tributary and Cannery Creeks fish resource investigations trip report; dated 10/8/2018. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Habitat Section, 802 3rd Street, Douglas, AK.

Zinc Creek

Zinc Creek (Stream No. 112-65-10230; Johnson and Blossom 2019), a tributary of Greens Creek that crosses the Greens Creek Mine B Road, provides habitat for chum, coho, and pink salmon and Dolly Varden char. Under the bridge, about 1.2 km upstream of tidal influence, a 7.5–9 m waterfall prevents anadromous fish migration (Figure 20). Above the falls, the streambed is composed of bedrock, cobble, and boulders with pockets of gravel, the gradient ranges 8–15% within 150 m of the falls (Figures 21, 22), and the stream supports a resident Dolly Varden char population.[m]

We collected sediment and fish samples within 50 m above the falls at Zinc Creek Site 371, upstream of the road and mine influence, where the stream is characterized as a low incision high gradient contained channel (Paustian 2010).

Figure 20.–Zinc Creek and the barrier falls.

Figure 21.–Zinc Creek above the falls.

Figure 22.–Zinc Creek Site 371.

[m] Kate Kanouse and Benjamin Brewster, Habitat Biologists, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Division of Habitat. Memorandum: Zinc Creek investigation trip report; dated 9/21/2012. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Habitat Section, 802 3rd Street, Douglas, AK.

Tributary Creek

Tributary Creek (Stream No. 112-65-10230-2007; Johnson and Blossom 2019), a tributary of Zinc Creek, provides habitat for coho and pink salmon and Dolly Varden char. We captured juvenile coho salmon, Dolly Varden char, and sculpin *Cottus* sp.[n] The Greens Creek Mine TDF is located at the original headwaters of the creek, and ADF&G has completed annual aquatic biomonitoring studies at Tributary Creek Site 9 since 2001, also finding cutthroat in the system (Figure 23; Zutz 2018a). Streambed gradient varies 1–2% and organics and sand substrates are common throughout the 1.6 km stream; spawning habitat for pink salmon and small salmonids is present near the mouth (Figures 24, 25).[o]

We collected sediment and fish samples at Tributary Creek Site 9, and sediment at Site 1847, where the stream is characterized as a narrow low gradient flood plain channel (Paustian 2010).[p]

Figure 23.–Tributary Creek Site 9.

Figure 24.–Tributary Creek Site 1847.

Figure 25.–Tributary Creek mouth.

[n] Johnny Zutz, Habitat Biologist, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Division of Habitat. Memorandum: 2018 Greens Creek Mine aquatic biomonitoring; dated 9/13/2018. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Habitat Section, 802 3rd Street, Douglas, AK.

[o] Greg Albrecht, Habitat Biologist, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Division of Habitat. Memorandum: Tributary and Cannery Creeks fish resource investigations trip report; dated 10/8/2018. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Habitat Section, 802 3rd Street, Douglas, AK.

[p] We did not sample fish at Tributary Creek Site 1847 given its proximity to Zinc Creek and unknown fish residency time in Tributary Creek.

Greens Creek

Greens Creek (Stream No. 112-65-10240; Johnson and Blossom 2019) provides habitat for chum, coho, and pink salmon, and Dolly Varden char. Greens Creek flows adjacent to Greens Creek Mine development and operations,[q] and Hecla maintains a concrete weir fish pass in a natural bedrock chute about 5.6 km upstream of the mouth that would otherwise prevent anadromous fish migration. Since 2001, ADF&G has completed annual aquatic biomonitoring studies at Greens Creek Site 54 and captured juvenile coho salmon and Dolly Varden char (Zutz 2018a); we also captured juvenile coho salmon and Dolly Varden char.[r] Streambed gradient varies 2–4% and cobble is the dominant substrate at Site 54.

We collected sediment and fish samples at Greens Creek Site 54 (Figures 26–28) where the stream is characterized as a medium width mixed control channel (Paustian 2010).

Figure 26.–Greens Creek Site 54.

Figure 27.–Greens Creek.

Figure 28.–Greens Creek.

[q] Such as the portal, mill facilities, waste rock storage sites, and storm water ponds.

[r] Johnny Zutz, Habitat Biologist, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Division of Habitat. Memorandum: 2018 Greens Creek Mine aquatic biomonitoring; dated 9/13/2018. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Habitat Section, 802 3rd Street, Douglas, AK.

Upstream of mine development and operations,[s] ADF&G completed annual aquatic biomonitoring studies capturing Dolly Varden char 2001–2017 at Greens Creek Site 48 (Zutz 2018a), a reference sampling site for comparing data collected downstream of mining at Greens Creek Site 54.[t] In fall 2017, river evulsion bypassed Site 48, and in July 2018, ADF&G established and sampled aquatic resources at Greens Creek Site 63 instead, within about 100 m downstream of Site 48, also capturing Dolly Varden char.[u,v] Future sampling at the site will depend on site stability and change observed each year.

We collected sediment and fish samples at Greens Creek Site 63 (Site 63A; Figure 29), and sediment upstream of the newly carved channel (Site 63B; Figures 30, 31),[w] where the stream is characterized as a medium width mixed control channel (Paustian 2010).[x]

Figure 29.–Greens Creek Site 63A.

Figure 30.–Greens Creek Site 63B.

Figure 31.–Greens Creek new channel.

[s] Except mineral exploration drilling.

[t] Hecla's infiltration gallery concrete weir in Greens Creek near the mine portal prevents upstream fish migration.

[u] Kate Kanouse and Johnny Zutz, Habitat Biologists, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Division of Habitat. Memorandum: GCM Greens Creek sampling sites 48 and 63; dated 9/6/2018. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Habitat Section, 802 3rd Street, Douglas, AK.

[v] Johnny Zutz, Habitat Biologist, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Division of Habitat. Memorandum: 2018 Greens Creek Mine aquatic biomonitoring; dated 9/13/2018. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Habitat Section, 802 3rd Street, Douglas, AK.

[w] To compare sediment element concentrations above and below the new channel; Site 63B is located downstream of the Big Sore Creek tributary confluence and upstream of the new Greens Creek channel.

[x] We did not sample fish at Greens Creek Site 63B as those fish are of the same population at Greens Creek Site 63A.

METHODS

SEDIMENT COMPOSITION AND ELEMENT CONCENTRATIONS

Sediment element 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). Subsequently, sediment element concentrations influence benthic aquatic productivity.

We sampled fine sediments for total organic carbon, total volatile solids, total solids, total sulfide, and total concentrations of cadmium (Cd), copper (Cu), mercury (Hg), lead (Pb), selenium (Se), and zinc (Zn) at 12 sites in water bodies draining to Hawk Inlet (Table 2).[y]

Table 2.–2018 sediment sampling sites.

No known mining	Downstream of mining	Upstream of mining
Hawk Inlet Head Creek Site 2061	Empire Creek Site 2064	Greens Creek Site 63A
Unnamed Creek Site 2062	Tributary Creek Site 9	Greens Creek Site 63B
Jimmy Green Creek Site 2063	Tributary Creek Site 1847	
Piledriver Creek Site 2065	Greens Creek Site 54	
Zinc Creek Site 371		
Cannery Creek Site 37		

Sample Collection and Analysis

Wearing latex gloves, we opportunistically collected 1 sample each from submerged sand and silt deposits and retained 3 replicate samples in glass jars for composition and element analyses. We stored the samples in a camp refrigerator while onsite, and shipped the sediment samples in coolers with ice packs via overnight air freight to the ALS Environmental lab in Kelso, WA.

ALS Environmental measured particle size, total solids, total volatile solids, total organic carbon, total sulfide, and total concentrations of Cd, Cu, Hg, Pb, Se, and Zn, on a dry-weight basis using methods listed in Table 3. The laboratory provided Tier II quality control information, including results for matrix spikes, sample blanks, and sample duplicates.

Table 3.–2018 sediment tests, analytes, and methods.

Test Description	Analyte	Method
Standard test method for particle-size analysis of soils	Particle size determination	ASTM D422M
Total solids on liquids, modified for solids	Total solids	EPA 160.3 Modified
Total volatile solids, modified for solids	Total volatile solids	EPA 160.4 Modified
Puget Sound Estuary Program sediment total organic carbon	Total organic carbon	PSEP TOC
Puget Sound Estuary Program sediment sulfide	Total sulfide	PSEP Sulfide
Mercury in solid or semisolid waste	Hg	EPA 7471B
Determination of trace elements in waters and wastes by ICP/MS	Cd, Cu, Pb, Se, Zn	EPA 200.8

[y] We incidentally collected the Se concentration data; Se was not an element of concern listed in the TMDL (DEC 2017).

Data Presentation

We present the minimum, median, and maximum sediment element concentrations by site in figures, and median concentration data comparisons in a table, using mean values when sample duplicate data are available and the method reporting limits for element concentrations not detected.

We compare the element concentration data with the 2016–2018 Glacier Creek sediment data (Legere and Kanouse 2018), and with the threshold effects concentrations (TEC) and the probable effects concentrations (PEC) sediment toxicity guidelines developed by the National Oceanic and Atmospheric Administration (Buchman 2008). The guidelines are based on results of controlled laboratory bioassays, wherein element concentrations below the TECs are not expected to adversely affect aquatic life survival and growth, and element concentrations above the PECs are expected to adversely affect aquatic life survival and growth more often than not (MacDonald et al. 2000). Appendix B contains the sediment element concentrations data in tables and the 2018 laboratory reports.

RESIDENT FISH ELEMENT CONCENTRATIONS

Heavy metals bioavailability and bioaccumulation depends on physical and chemical factors and interactions among biological communities (Tchounwou et al. 2012). Similar to other studies in Alaska (Legere and Kanouse 2018, Legere and Timothy 2016, Zutz 2018a), we sampled resident Dolly Varden char and measured whole body concentrations of Cd, Cu, Pb, Hg, Se, and Zn in water bodies draining to Hawk Inlet (Table 4).

Table 4.–2018 resident fish sampling sites.

No known mining	Downstream of mining	Upstream of mining
Hawk Inlet Head Creek Site 2061	Empire Creek Site 2064	Greens Creek Site 63A
Unnamed Creek Site 2062	Tributary Creek Site 9	
Jimmy Green Creek Site 2063	Greens Creek Site 54	
Piledriver Creek Site 2065		
Zinc Creek Site 371		

Note: Greens Creek Site 63A is downstream of the newly carved river channel.

Sample Collection and Analysis

We captured fish using a Smithroot LR-24 backpack electrofisher and retained 6 whole body Dolly Varden char samples in each water body.[z] We attempted to only retain fish measuring 90–130 mm FL as other Southeast Alaska Dolly Varden char sampling programs require (Legere and Timothy 2016, Timothy and Kanouse 2014, Zutz 2018a), however we found few fish in several water bodies and retained fish measuring 81–155 mm FL. A 90 mm fish generally provides the 5 g minimum weight requirement for laboratory testing, while a 130 mm fish is 2–3 years old and young enough to reasonably conclude it is resident. We retained fish as they were captured, and each sample contained only one fish.

We wore latex gloves when handling fish, placed each fish in an individually labeled plastic bag, and measured FL to the nearest 1 mm. We placed samples from each site in a larger plastic bag labeled with the sample location. We stored the samples in a cooler with frozen icepacks during

[z] Except, at biomonitoring sites Tributary Creek Site 9, Greens Creek Site 54, and Greens Creek Site 63A we captured fish using baited minnow traps and retained 10 samples per the Freshwater Monitoring Plan (Hecla 2014).

transport, in a camp freezer while onsite, and in a -20 ºC freezer in the ADF&G Douglas laboratory. Upon returning to the lab, we measured fish weight to the nearest 0.1 g in the sample bag and corrected for bag weight.

We shipped the samples to ALS Environmental in Kelso, WA in a cooler with frozen icepacks via overnight air freight and maintained written chain of custody documentation. ALS Environmental measured total concentrations of silver,[aa] Cd, Cu, Pb, Hg, Se, and Zn in each sample on a dry-weight basis, following method EPA 1631E (Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry) for Hg, and method EPA 200.8 for the other elements. The laboratory provided Tier II quality control information including results for sample duplicates and sample blanks, matrix spikes, and standard reference materials.

Data Presentation

We present the minimum, median, and maximum whole body Dolly Varden char element concentrations by site in figures, and median concentration data comparisons in a table, using mean values when sample duplicate data are available and the method reporting limits for element concentrations not detected.

We compare the data with the 2001–2017 biomonitoring data collected per Hecla's (2014) Freshwater Monitoring Plan (Zutz 2018a)[bb], the 2016–2018 whole body Dolly Varden char data collected at Glacier Creek (Legere and Kanouse 2018), and the 2014 Empire Creek whole body Dolly Varden char data collected by ADF&G Habitat staff[cc]. Appendix C contains the fish element concentrations data for each sample in tables and the 2018 laboratory reports.

[aa] We obtained silver concentration data as required in the Freshwater Monitoring Plan (Hecla 2014) for the annual aquatic biomonitoring whole body Dolly Varden char samples. The data are included in the laboratory reports in Appendix C, however we do not report silver concentration data for this investigation.

[bb] Excluding the 2012 Cu data as we suspect those fish samples were contaminated by the laboratory, given the above normal Cu concentrations observed at all sites that year.

[cc] Gordon Willson-Naranjo and Benjamin Brewster, Habitat Biologists, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Division of Habitat. Memorandum: Empire Mine investigation Stream No. 112-65-10110; dated 7/24/2015. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Habitat Section, 802 3rd Street, Douglas, AK.

RESULTS

SEDIMENT COMPOSITION AND ELEMENT CONCENTRATIONS

The 2018 sediment samples were predominantly composed of sand; the Tributary Creek Site 9, Zinc Creek, and Cannery Creek samples contained the coarsest material. Sulfide was not detected in any of the samples, and total organic carbon varied among sites with the greatest percentage observed in the Empire Creek samples.

We found similar sediment median Cd, Cu, Hg, Pb, and Zn concentrations among sites undisturbed and near historic and active hard rock mining activities. Figures 32–37 present the 2018 sediment element concentrations and the 2016–2018 Glacier Creek sediment data (Legere and Kanouse 2018)[dd] with the National Oceanic and Atmospheric Administration's freshwater sediment toxicity screening guidelines (Buchman 2008)[ee], and show:

- Cd concentrations exceeding the TEC value at many sample sites, and one sample from Zinc Creek exceeding the PEC value;
- Cu concentrations exceeding the TEC value at all sample sites, except at Cannery Creek and Tributary Creek Site 1847;
- Hg concentrations exceeding the TEC value at Empire Creek;
- Pb concentration in one sample at Greens Creek Site 63A exceeding the TEC value, and one sample at Zinc Creek exceeding the PEC value; and
- Zn concentrations exceeding the TEC value at many sample sites, and one sample each from Zinc Creek and Greens Creek Site 63A exceeding the PEC value.

Comparing the 2018 aquatic biomonitoring site sediment data to the 2013 sample results for each site (Kanouse and Brewster 2014)[ff,gg], we found the 2013 sample concentrations for:

- Tributary Creek Site 9 within the range of the 2018 concentrations, except the Se concentration was lower;
- Greens Creek Site 54 greater than the 2018 concentrations, except the Hg and Zn concentrations were lower; and
- Greens Creek Site 48 had similar Cd and Se concentrations compared to Site 63B, a greater Cu concentration, and lower Pb, Hg, and Zn concentrations.

We found greater Cu, Hg, Pb, and Se concentrations among the 2018 Empire Creek sediment samples compared to the 2014 sediment samples, and similar Cd concentrations.[hh,ii]

[dd] Sample size n=22.

[ee] Guidelines are not published for Se (Buchman 2008).

[ff] Of note, we used a 1.7 mm sieve to avoid coarse material while collecting the 2013 sediment samples; we no longer sieve sediment samples to ensure the samples represent natural conditions (Zutz 2018b).

[gg] In 2014, we sampled five tributaries to Greens Creek near sites 48 and 54 for the same elements, and found greater concentrations in tributaries compared to the 2013 Greens Creek sites 54 and 48 results (Kanouse 2015).

[hh] Alaska Department of Environmental Conservation Division of Water, Contaminated Sites Program. Trip Report: August 6–7, 2014 USFS Empire Mine, Admiralty Island, Alaska. Unpublished document, can be obtained from the Contaminated Sites Program Manager, DEC Division of Spill Prevention and Response, 555 Cordova Street, Anchorage, AK.

[ii] DEC staff collected random sediment samples using a trowel and the samples included larger particle sizes than the 2018 sediment samples; the DEC Environmental Health laboratory in Anchorage, AK analyzed the 2014 samples using EPA method 6020.

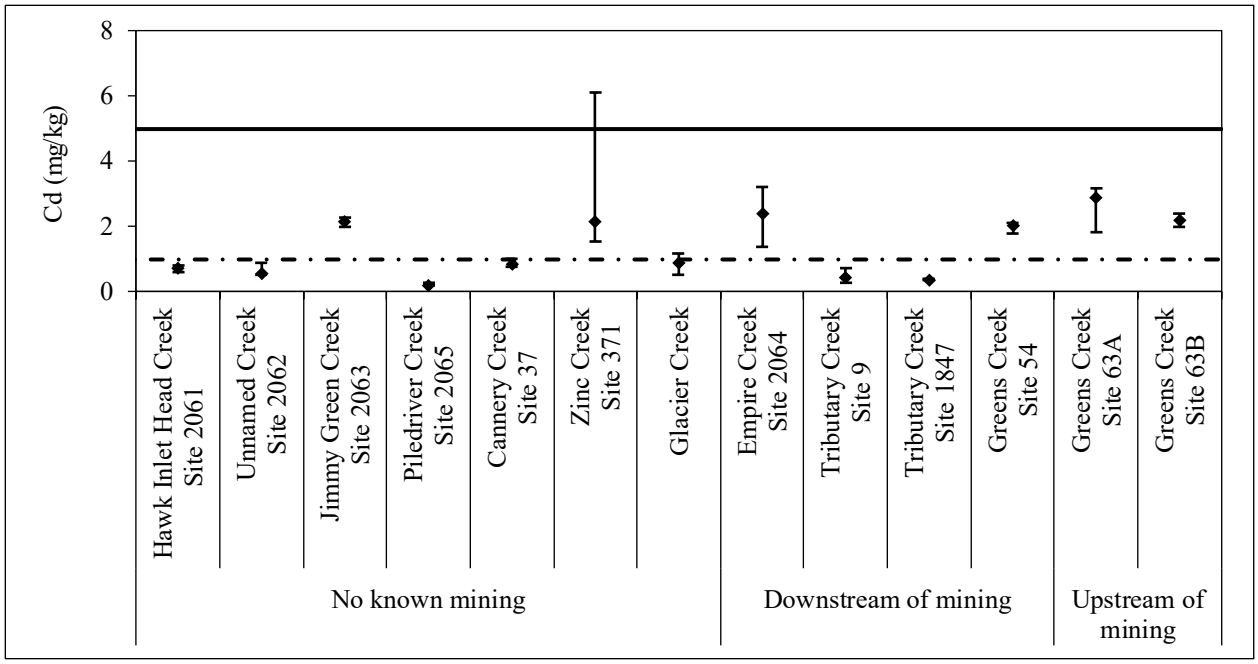

Figure 32.–Sediment cadmium concentrations.

Note: Minimum, median (♦), and maximum concentrations presented. The dashed line represents the TEC and the solid line represents the PEC for freshwater sediments (Buchman 2008).

Note: Including the 2016–2018 Glacier Creek data (Legere and Kanouse 2018).

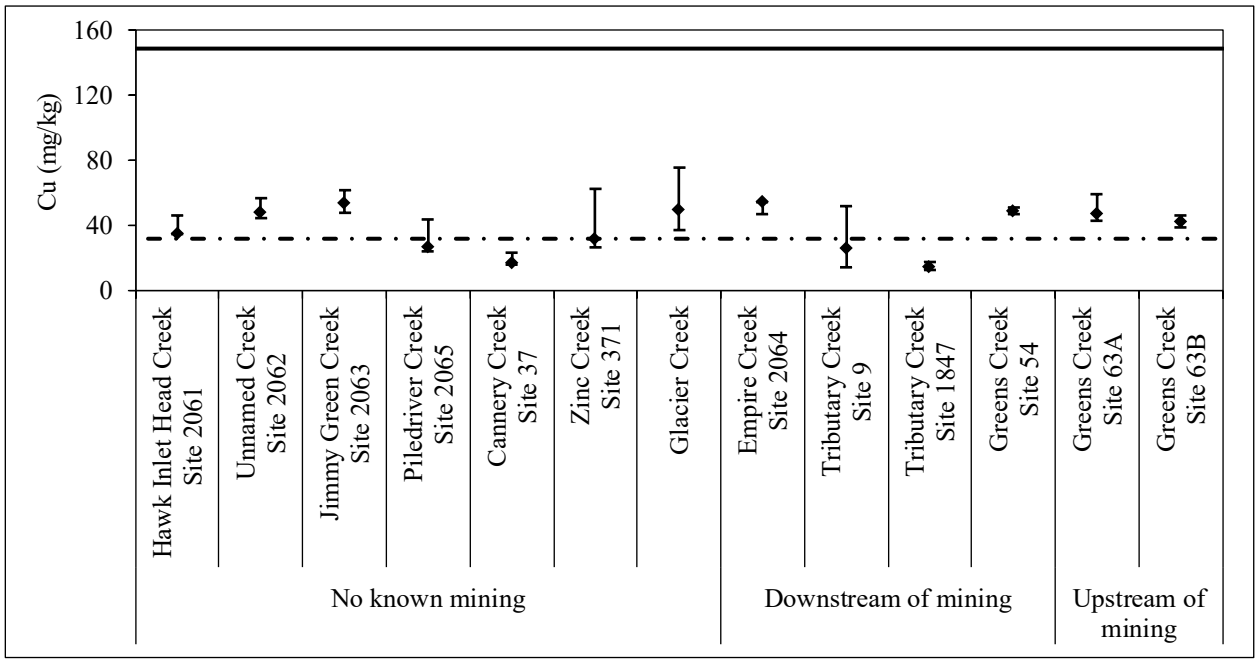

Figure 33.–Sediment copper concentrations.

Note: Minimum, median (♦), and maximum concentrations presented. The dashed line represents the TEC and the solid line represents the PEC for freshwater sediments (Buchman 2008).

Note: Including the 2016–2018 Glacier Creek data (Legere and Kanouse 2018).

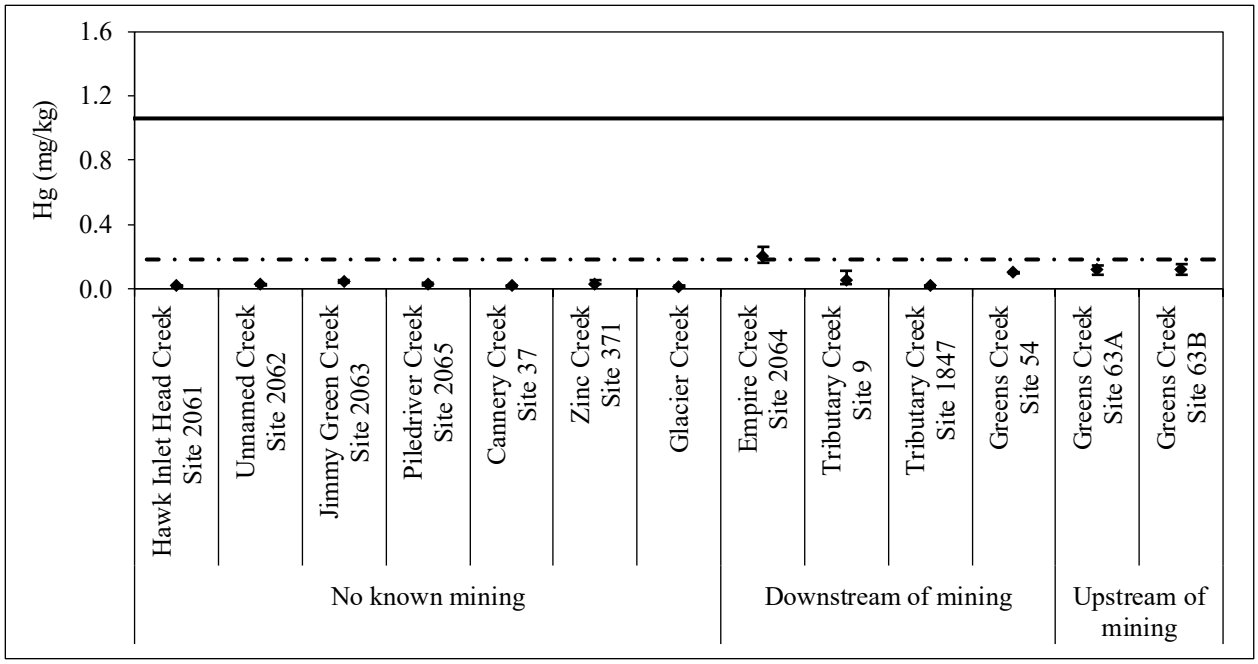

Figure 34.–Sediment mercury concentrations.

Note: Minimum, median (♦), and maximum concentrations presented. The dashed line represents the TEC and the solid line represents the PEC for freshwater sediments (Buchman 2008).

Note: Including the 2016–2018 Glacier Creek data (Legere and Kanouse 2018).

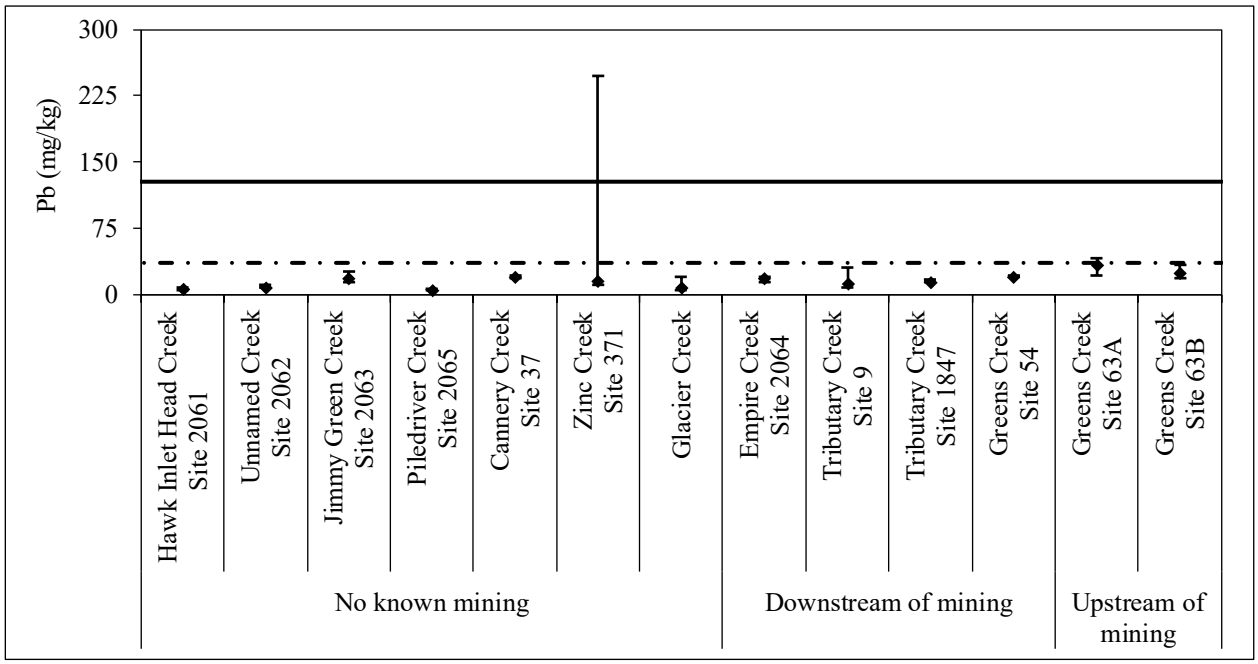

Figure 35.–Sediment lead concentrations.

Note: Minimum, median (♦), and maximum concentrations presented. The dashed line represents the TEC and the solid line represents the PEC for freshwater sediments (Buchman 2008).

Note: Including the 2016–2018 Glacier Creek data (Legere and Kanouse 2018).

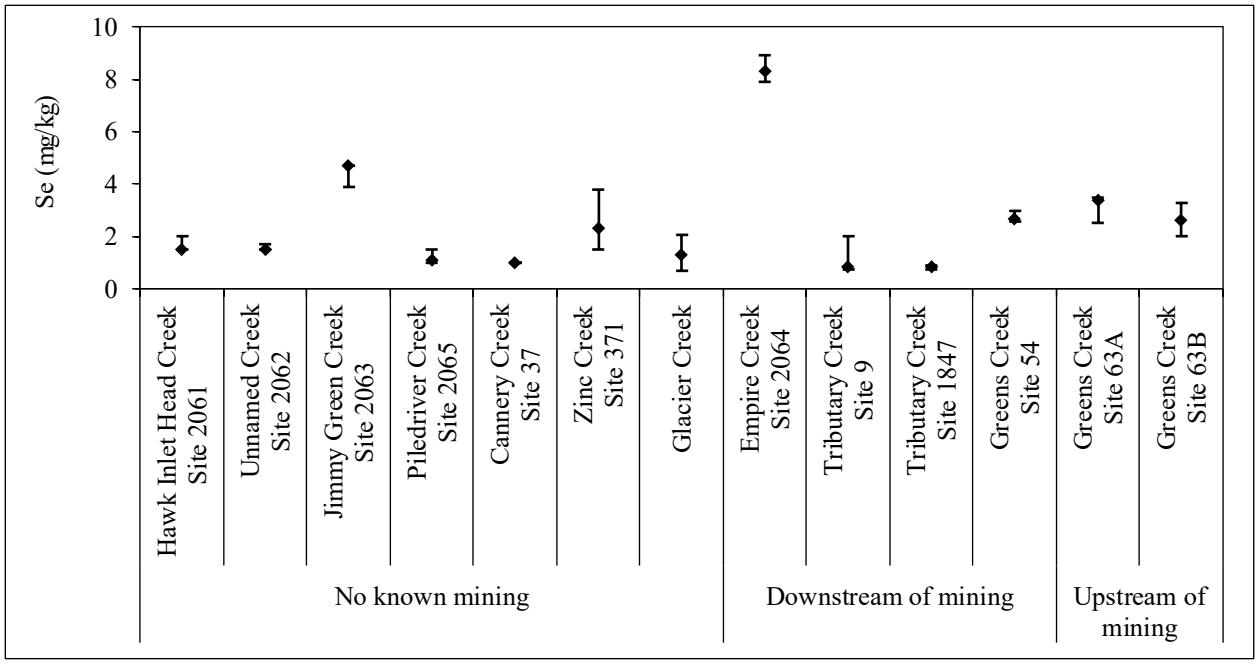

Figure 36.–Sediment selenium concentrations.

Note: Minimum, median (♦), and maximum concentrations presented. The TEC and PEC for Se in freshwater sediments are not published in Buchman (2008).

Note: Including the 2016–2018 Glacier Creek data (Legere and Kanouse 2018).

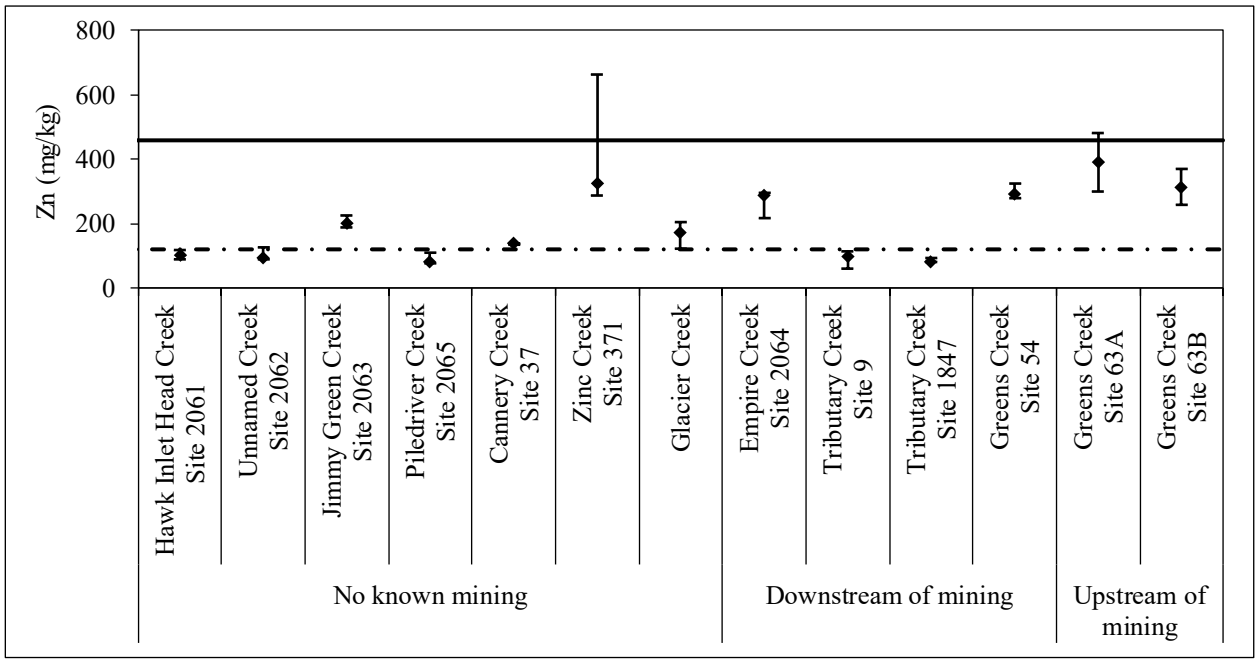

Figure 37.–Sediment zinc concentrations.

Note: Minimum, median (♦), and maximum concentrations presented. The dashed line represents the TEC and the solid line represents the PEC for freshwater sediments (Buchman 2008).

Note: Including the 2016–2018 Glacier Creek data (Legere and Kanouse 2018).

In Table 5, we compare the freshwater sediment element concentrations data to the 1984–2015 Hawk Inlet sediment element concentrations data summarized in DEC (2017), finding the range of median Cd, Cu, Hg, Pb, and Zn concentrations generally similar among the freshwater and marine data sets, except at the ore concentrate loading dock where median Cu, Hg, Pb, and Zn concentrations were elevated, and at Empire Creek where the median Hg concentration also was elevated. Excluding the ore concentrate loading dock data, we found greater median Cd, Cu, Hg, Pb, and Zn concentrations in the freshwater sediments than in the marine sediments.

At the head of Hawk Inlet, the Jimmy Green Creek sediment median Cd, Cu, Pb, and Zn concentrations were greater than the Site S-3 marine sediment medians, and the Hawk Inlet Head Creek and Unnamed Creek sediment median Cd, Cu, Pb, and Zn concentrations were generally similar to the Site S-3 marine sediment medians; Hg concentrations were low or undetectable in the Jimmy Green Creek, Unnamed Creek, and Hawk Inlet Head Creek sediment samples.

Table 5.–Fresh water and marine sediment median element concentration comparisons.

		Median concentration (mg/kg dry weight)				
	Data Years	Cd	Cu	Hg	Pb	Zn
2018 Fresh Water Sample Data						
Hawk Inlet Head Creek Site 2061	2018	0.70	35.1	0.021	7.2	103
Unnamed Creek Site 2062	2018	0.53	48.2	0.030	8.3	93
Jimmy Green Creek Site 2063	2018	2.13	53.4	0.044	19.7	201
Piledriver Creek Site 2065	2018	0.21	26.4	0.029	5.2	81
Cannery Creek Site 37	2018	0.85	16.5	0.024	20.5	140
Zinc Creek Site 371	2018	2.13	31.1	0.030	15.9	325
Empire Creek Site 2064	2018	2.39	54.5	0.204	19.4	288
Tributary Creek Site 9	2013, 2018	0.41	20.8	0.045	12.5	83
Tributary Creek Site 1847	2018	0.36	14.6	0.023	14.7	83
Greens Creek Site 54	2013, 2018	2.05	49.7	0.103	21.6	287
Greens Creek Site 63A	2018	2.86	46.7	0.126	34.7	393
Greens Creek Site 63B	2018	2.18	42.5	0.125	25.1	314
Greens Creek Site 48	2013	1.84	60.8	0.048	12.8	232
Marine Data Comparisons						
Hawk Inlet Outfall 002 Site S-1	1984–2015	0.15	14.9	0.03	6.6	94.2
Hawk Inlet Mouth Site S-2	1984–2015	0.13	9.5	0.02	2.0	41.0
Hawk Inlet Head Site S-3	1984–2015	0.67	35	0.07	13.2	121
Hawk Inlet Cannery Site S-4	1986–2015	0.30	20.7	0.03	23.6	65.4
Hawk Inlet Dock Site S-5N	1989–2015	2.00	105	0.20	288	471
Hawk Inlet Dock Site S-5S	1994–2015	2.89	80.7	0.28	267	707

Note: The 2013 Tributary Creek Site 9 and Greens Creek sites 54 and 48 data are in Kanouse and Brewster (2014) and n=1 for each element, each site. The Hawk Inlet data is summarized in DEC (2017) and sample sizes range n=89 to n=115 for each element, each site.

RESIDENT FISH ELEMENT CONCENTRATIONS

Figures 38–43 present the 2018 whole body juvenile Dolly Varden char element concentrations data. We found similar median Cu, Pb, and Zn concentrations in fish among sites undisturbed and near historic and active hard rock mining activities. Median Cd concentrations were greater among the Greens Creek fish samples, above and below active mining operations, and median Hg concentration was greatest among the Tributary Creek fish samples.

In Table 6, we compare the 2018 whole body Dolly Varden char median Cd, Cu, Hg, Pb, Se, and Zn concentrations for each site with the 2014 Empire Creek data,[jj,kk] 2001–2017 Tributary Creek Site 9 and Greens Creek sites 54 and 48 data (Zutz 2018a), and 2016–2018 Glacier Creek data (Legere and Kanouse 2018), finding greater median concentrations in the 2018 samples for:

- Cd and Se at Greens Creek sites 54 and 63A;
- Cu at Empire Creek and Greens Creek sites 54 and 63A;
- Hg at Tributary Creek; and
- Zn at Zinc Creek and Greens Creek sites 54 and 63A.

The median Pb concentration observed in Tributary Creek fish 2001–2017 was greater than the median concentrations observed in 2018 and the other data sets. We found greater median element concentrations among the 2018 Empire Creek fish samples than the 2014 fish samples, except median Pb concentrations were similar. Most element concentrations were within the ranges observed in whole body Dolly Varden char samples collected from reference and exploration sites elsewhere in Alaska (Legere and Timothy 2016).

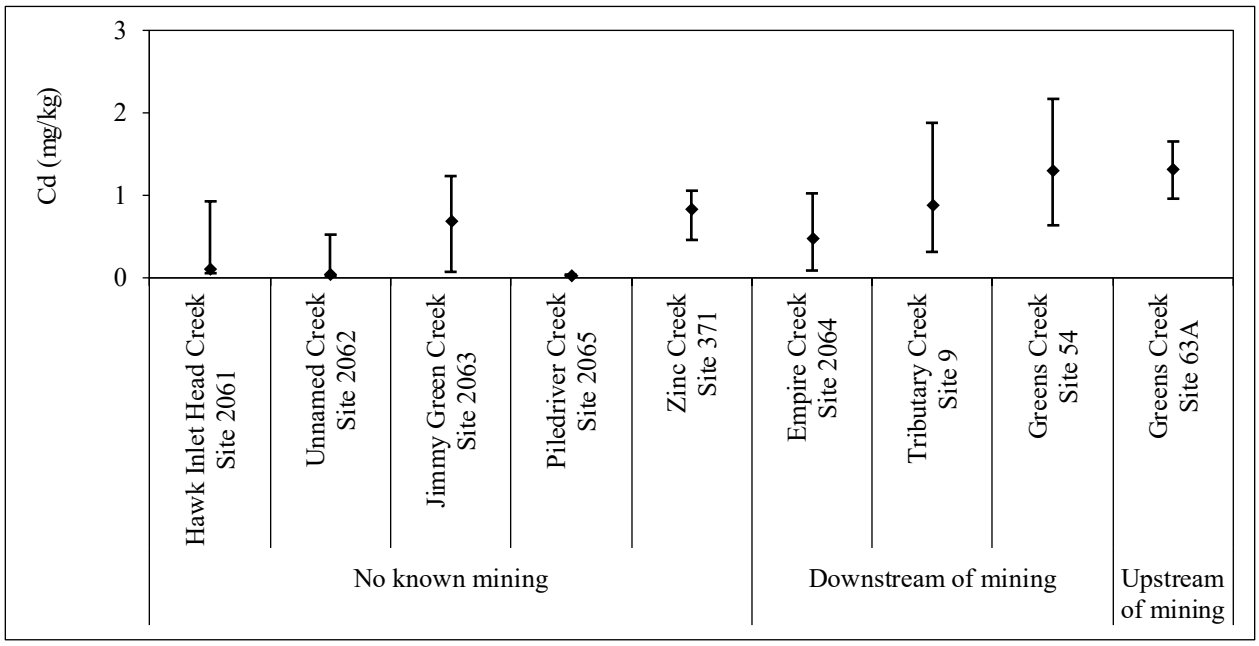

Figure 38.–2018 whole body Dolly Varden char cadmium concentrations.
Note: Minimum, median (♦), and maximum concentrations presented.

[jj] Gordon Willson-Naranjo and Benjamin Brewster, Habitat Biologists, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Division of Habitat. Memorandum: Empire Mine investigation Stream No. 112-65-10110; dated 7/24/2015. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Habitat Section, 802 3rd Street, Douglas, AK.

[kk] The DEC Environmental Health laboratory in Anchorage, AK analyzed the 2014 fish samples using different EPA methods than the ALS laboratory; method EPA 7473 for Hg, and method EPA 6020 for all other elements.

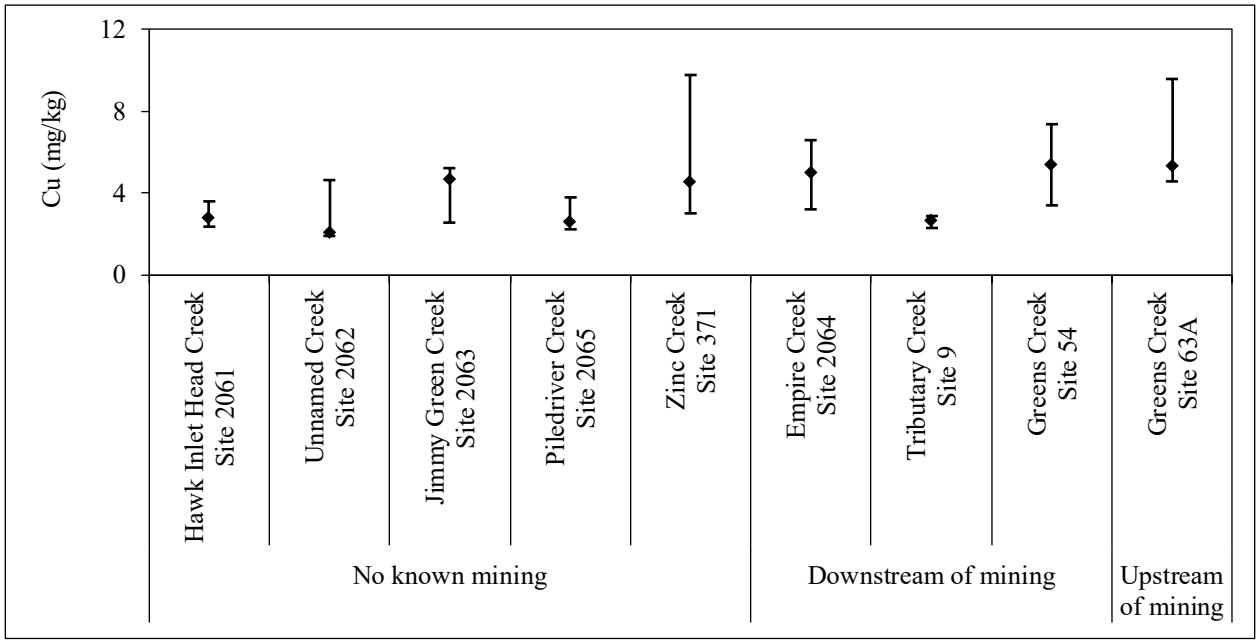

Figure 39.–2018 whole body Dolly Varden char copper concentrations.
Note: Minimum, median (♦), and maximum concentrations presented.

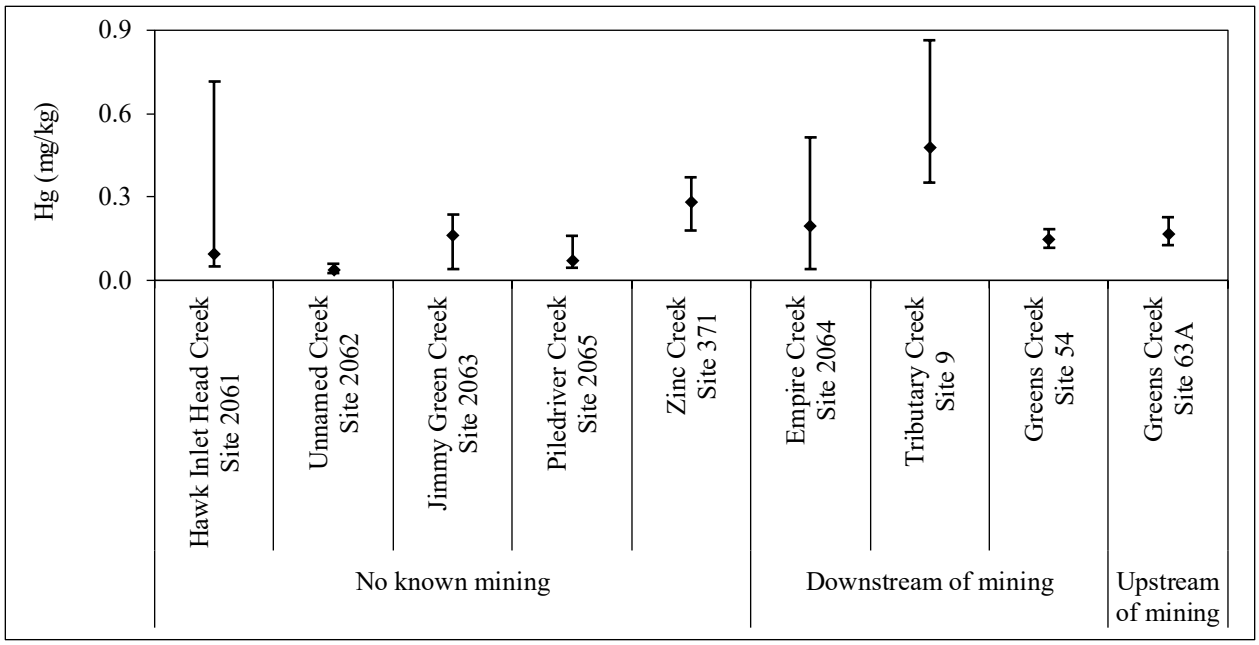

Figure 40.–2018 whole body Dolly Varden char mercury concentrations.
Note: Minimum, median (♦), and maximum concentrations presented.

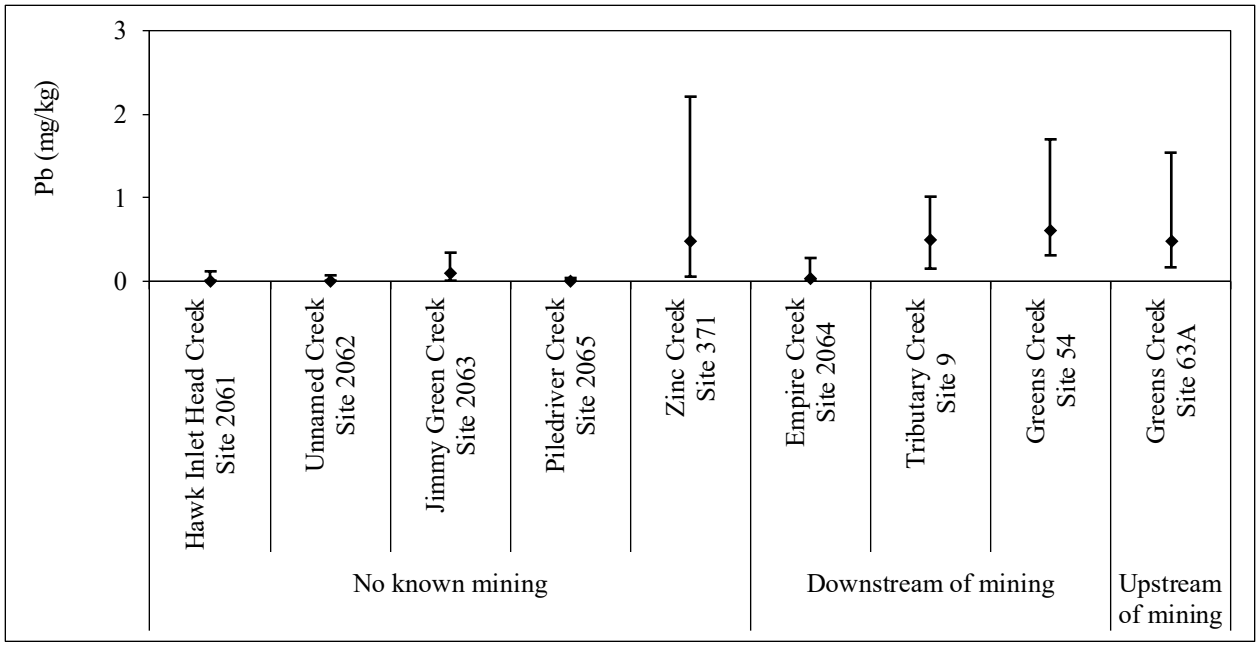

Figure 41.–2018 whole body Dolly Varden char lead concentrations.
Note: Minimum, median (♦), and maximum concentrations presented.

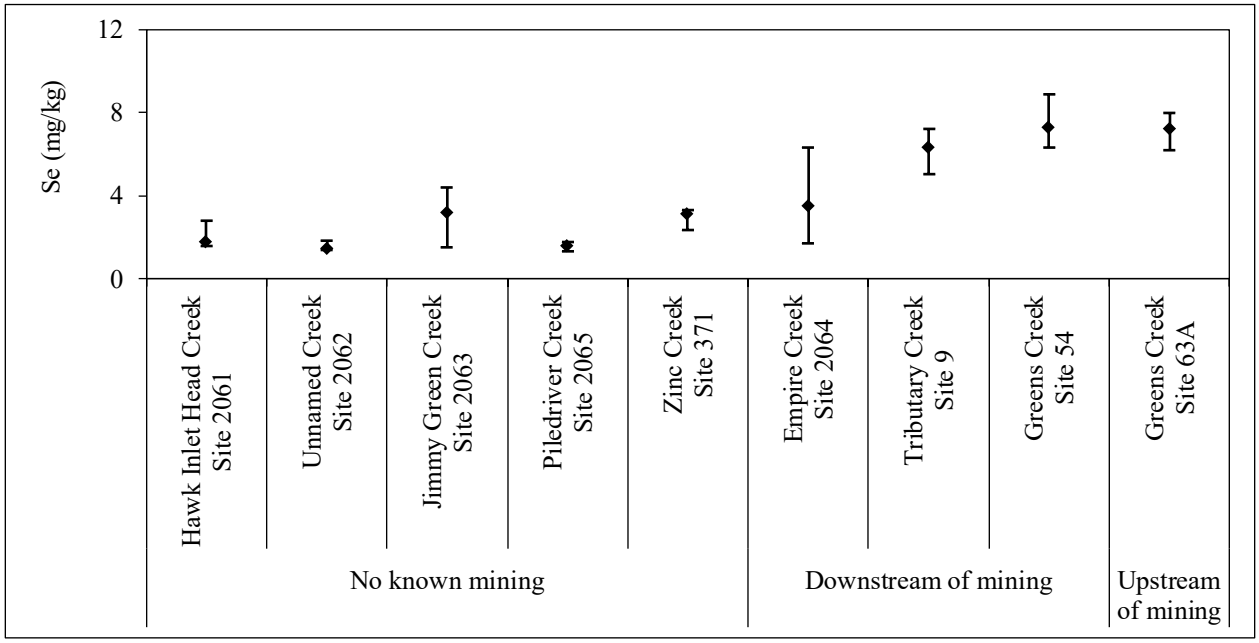

Figure 42.–2018 whole body Dolly Varden char selenium concentrations.
Note: Minimum, median (♦), and maximum concentrations presented.

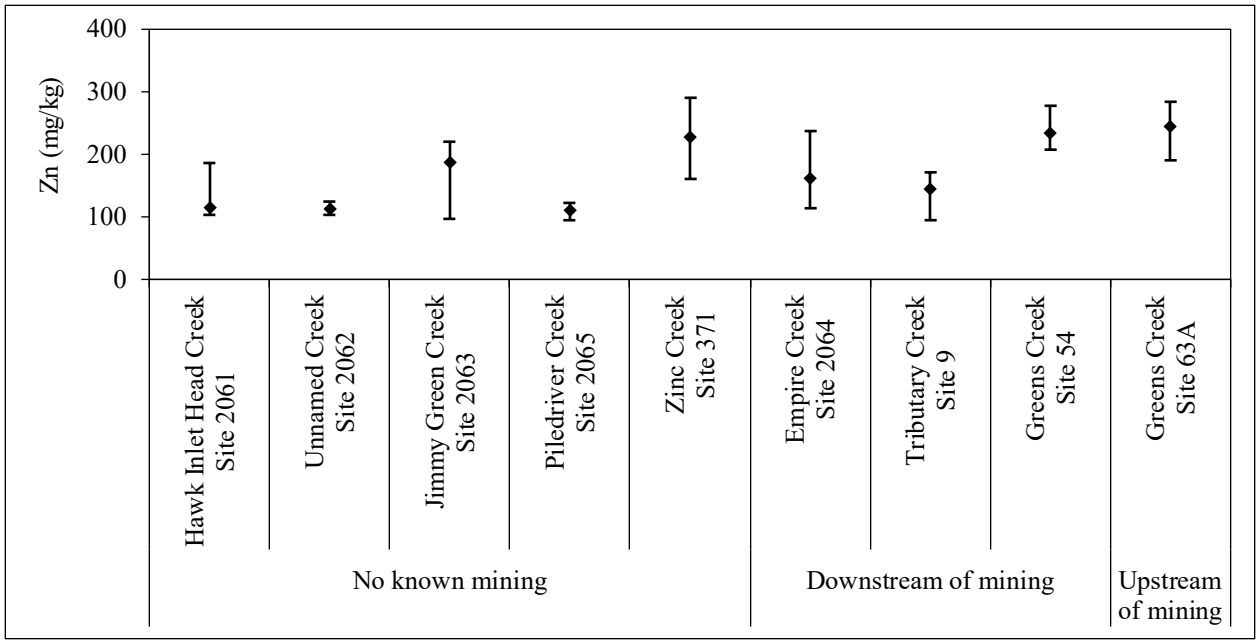

Figure 43.–2018 whole body Dolly Varden char zinc concentrations.
Note: Minimum, median (♦), and maximum concentrations presented.

Table 6.–Whole body Dolly Varden char median element concentration comparisons.

		Median concentration (mg/kg dry weight)					
	Data Years	Cd	Cu	Hg	Pb	Se	Zn
2018 Sample Data							
Hawk Inlet Head Creek Site 2061	2018	0.11	2.79	0.091	0.024	1.76	114
Unnamed Creek Site 2062	2018	0.04	2.09	0.037	0.020	1.49	111
Jimmy Green Creek Site 2063	2018	0.69	4.71	0.161	0.109	3.20	187
Piledriver Creek Site 2065	2018	0.02	2.60	0.069	0.020	1.60	110
Zinc Creek Site 371	2018	0.84	4.59	0.280	0.485	3.15	225
Empire Creek Site 2064	2018	0.47	5.02	0.193	0.044	3.53	160
Tributary Creek Site 9	2018	0.88	2.68	0.474	0.511	6.31	144
Greens Creek Site 54	2018	1.30	5.44	0.147	0.622	7.26	232
Greens Creek Site 63A	2018	1.32	5.38	0.163	0.488	7.19	244
Data Comparisons							
Empire Creek Site 2064	2014	0.13	0.70	0.070	0.050	1.90	54
Tributary Creek Site 9	2001–2017	0.92	3.80	0.301	0.860	6.13	134
Greens Creek Site 54	2001–2017	0.91	4.70	0.112	0.370	5.90	199
Greens Creek Site 48	2001–2017	0.98	4.70	0.142	0.205	5.60	194
Glacier Creek	2016–2018	0.51	4.13	0.045	0.102	6.33	144

Note: For the 2014 Empire Creek data n=10 (data source provided in footnote jj); the 2001–2017 Tributary and Greens Creek data are in Zutz (2018a) and n=109 for Cd, Pb, Se and Zn, n=103 for Cu, and n=54 for Hg; and the 2016–2018 Glacier Creek are in Legere and Kanouse (2018) and n=52.

REFERENCES CITED

Buchman, M. F. 2008. NOAA screening quick reference tables, National Oceanic and Atmospheric Administration, Office of Response and Restoration Division, Report 08-1, Seattle, WA.

DEC. 2017. Total maximum daily load for metals in the marine sediments of Hawk Inlet near Juneau, Alaska. Alaska Department of Environmental Conservation, Anchorage, AK.

Hecla. 2014. General plan of operations. Appendix 1: integrated monitoring plan.

Johnson, J. and B. Blossom. 2019. Catalog of waters important for the spawning, rearing, or migration of anadromous fishes – Southeastern Region. Effective June 1, 2019. Alaska Department of Fish and Game, Special Publication No. 19-04, Anchorage, AK.

Kanouse, K. M. and B. Brewster. 2014. Aquatic biomonitoring at Greens Creek Mine, 2013. Alaska Department of Fish and Game, Technical Report 14-05, Douglas, AK.

Kanouse, K. M. 2015. Aquatic biomonitoring at Greens Creek Mine, 2014. Alaska Department of Fish and Game, Technical Report 15-03, Douglas, AK.

Legere, N. M. and J. Timothy. 2016. Tulsequah Chief acid mine drainage and Dolly Varden char metals concentrations. Alaska Department of Fish and Game, Technical Report No. 16-06, Douglas, AK.

Legere, N. M. and K. M. Kanouse. 2018. Glacier Creek aquatic studies, 2018. Alaska Department of Fish and Game, Technical Report 18-09, Douglas, AK.

MacDonald, D. D., C. G. Ingersoll, and T. A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of Environmental Contamination Toxicology 39(1):20–31.

Paustian, S. 2010. Channel type user guide revision 2010. U.S. Forest Service, R-10-TP-26.

Portage, Inc. 2015. Empire Mine preliminary assessment/site inspection report. Prepared for the U.S. Forest Service, Idaho Falls, ID.

Tchounwou, P. B., C. G. Yedjou, A. K. Patlolla, D. J. Sutton. 2012. Heavy metal toxicity and the environment. Pages 133-164 [*In*] Experimentia Supplementum: Molecular, Clinical and Environmental Toxicology: Volume 3: Environmental Toxicology. Springer Basel.

Timothy, J. and K. M. Kanouse. 2014. Aquatic studies at Kensington Gold Mine, 2013. Alaska Department of Fish and Game, Technical Report No. 14-01, Douglas, AK.

USFS. 2003. Greens Creek tailings disposal final impact statement. U.S. Forest Service, R10-MB-482a.

USFS. 2013. Greens Creek Mine tailings disposal facility expansion final environmental impact statement and record of decision. U.S. Department of Agriculture, Forest Service, Alaska Region.

Zutz, J. 2018a. Aquatic biomonitoring at Greens Creek Mine, 2017. Alaska Department of Fish and Game, Technical Report No. 18-01, Douglas, AK.

Zutz, J. 2018b. Aquatic biomonitoring at Kensington Mine, 2017. Alaska Department of Fish and Game, Technical Report No. 18-02, Douglas, AK.

APPENDIX A: ANADROMOUS WATERS CATALOG NOMINATIONS

112-65-10150 CORRECTION

Water body name: Hawk Inlet Head Creek **Survey date:** 5/15/2018
Watershed: Fishery Creek-Frontal Chatham Strait **Species & Lifestage:** CHp, Pp
MTR: C042S065E **Quad:** Juneau A-3
Findings: We surveyed this stream using minnow traps, an electrofisher and a GPS. We found an anadromous fish barrier below the cataloged upper extent of anadromy (Table 1; Figure 1).
Recommendations: Correct Stream No. 112-65-10150 to reflect field verified stream course (Figure 2).
Nomination: 19-503

Table 1.–112-65-10150 survey data.

Waypoint	Latitude	Longitude	Notes	Sample Effort	Sample Results
623	58.1918	-134.7408	Top of tidal influence on Hawk Inlet Head Creek.		
624	58.1938	-134.7416	9 m tall barrier falls. Tributary enters river right and is 15-20% gradient with marginal rearing habitat only.		
625	58.1935	-134.7419	1 CO EF. 4 minnow traps set, no fish caught.	EF/MT	1 CO
626	58.1935	-134.7420	1 DV 88 mm.	EF	1 DV
627	58.1935	-134.7425	2 DV 111, 104 mm.	EF	2 DV
628	58.1937	-134.7419	HIHCS1 sediment sample taken at 1022 on river right. HIHCS2 sediment sample taken at 1030 on river left side.		
629	58.1933	-134.7418	3 DV 109, 129, 137 mm. HIHC3 sediment sample taken here at 1040 on river left.	EF	3 DV

Figure 1.–Anadromous fish barrier on Hawk Inlet Head Creek.

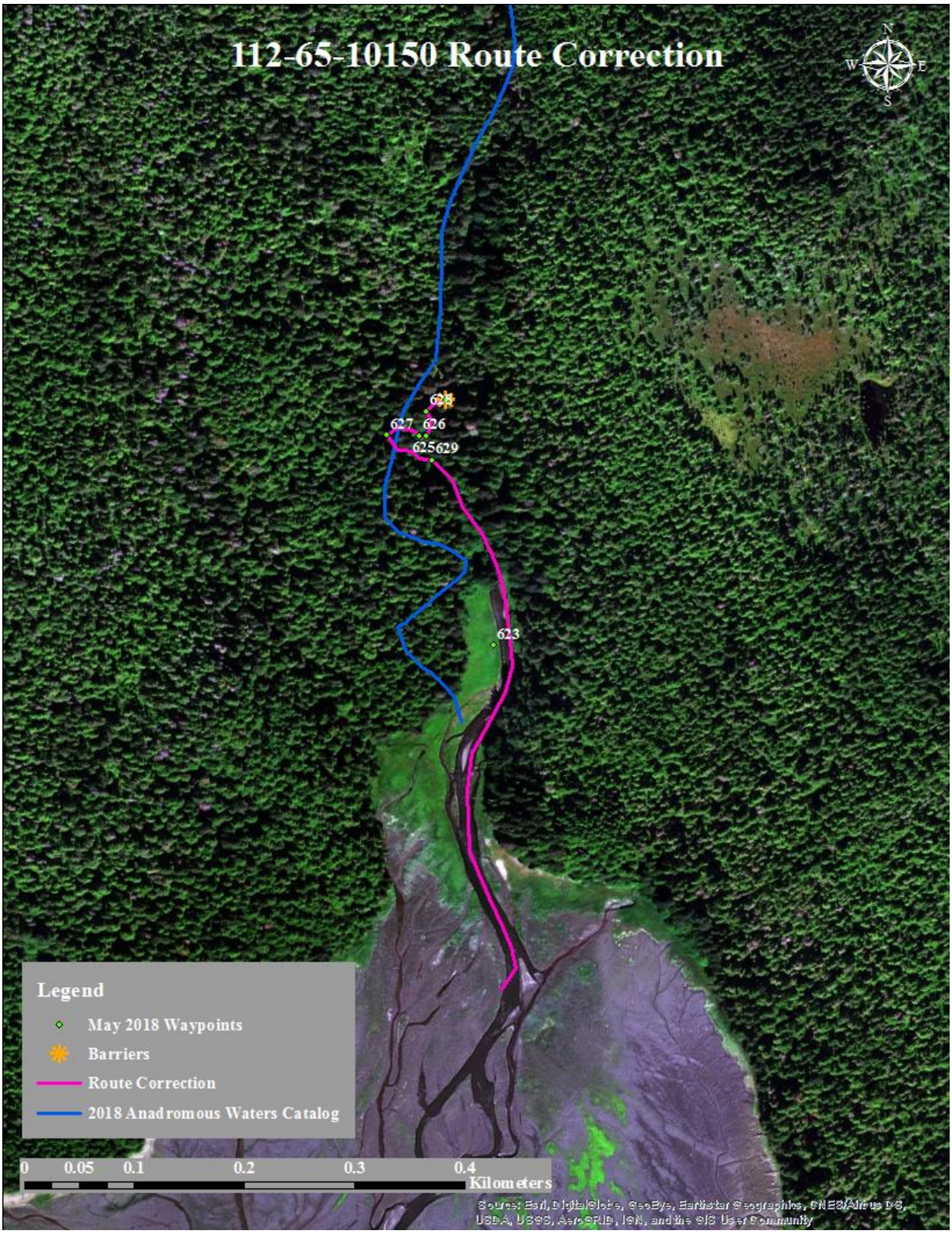

Figure 2.–112-65-10150 route correction map.

112-65-10140 **CORRECTION**

Water body name: **Survey date:** 5/15/2018
Watershed: Fishery Creek-Frontal Chatham Strait **Species & Lifestage:** CHs, Ps
MTR: C042S065E **Quad:** Juneau A-3
Findings: We surveyed this stream using minnow traps, an electrofisher and a GPS. We captured rearing coho salmon, pink salmon fry, Dolly Varden char, and cutthroat trout (Table 1; Figure 1).
Recommendations: Correct Stream No. 112-65-10140 to reflect field verified path. Add rearing coho salmon to the Anadromous Waters Catalog (Figure 2).
Nomination: 19-506

Table 1.–112-65-10140 survey data.

Waypoint	Latitude	Longitude	Notes	Sample Effort	Sample Results
630	58.1877	-134.7504	Top of tidal influence on Unnamed Creek. This Creek is 7.5-10.5 m wide at the mouth with spawning gravel present, then transitions to cobble within about 60 m and gradient is 3-5%, cobble and gravel substrate and two distinct channel braids.		
631	58.1886	-134.7514	Iron floc tributary.		
632	58.1890	-134.7521	200 mm CT captured here.	EF	CT
633	58.1895	-134.7529	4 minnow traps set, no fish caught. Two braids present here.	MT	No Fish
634	58.1900	-134.7531	2 DV 70, 65 mm left in a pool but not retained for sampling.	EF	2 DV
635	58.1900	-134.7537	2 DV 78, 90 mm.	EF	2 DV
636	58.1901	-134.7539	1 CO.	EF	1 CO
637	58.1903	-134.7543	2 CO, 3 DV 84, 134, 124 mm.	EF	2 CO, 3 DV
638	58.1912	-134.7545	2 CO, 2 P fry with visual on dozens of other fry.	EF	2 CO, 2 P
639	58.1909	-134.7539	1 DV 88 mm, combined with 78 mm sample, 1 P fry, 1 DV 118 mm.	EF	2 DV, 1 P
640	58.1894	-134.7529	UNC1 sediment sample taken at 1223.		
641	58.1892	-134.7519	UNC2 sediment sample taken here at 1233.		
642	58.1896	-134.7528	UNC3 sediment sample taken here at 1240.		
643	58.1890	-134.7521	1 DV 124 mm.	EF	1 DV

Figure 1.–Rearing coho salmon captured in Stream No. 112-65-10140.

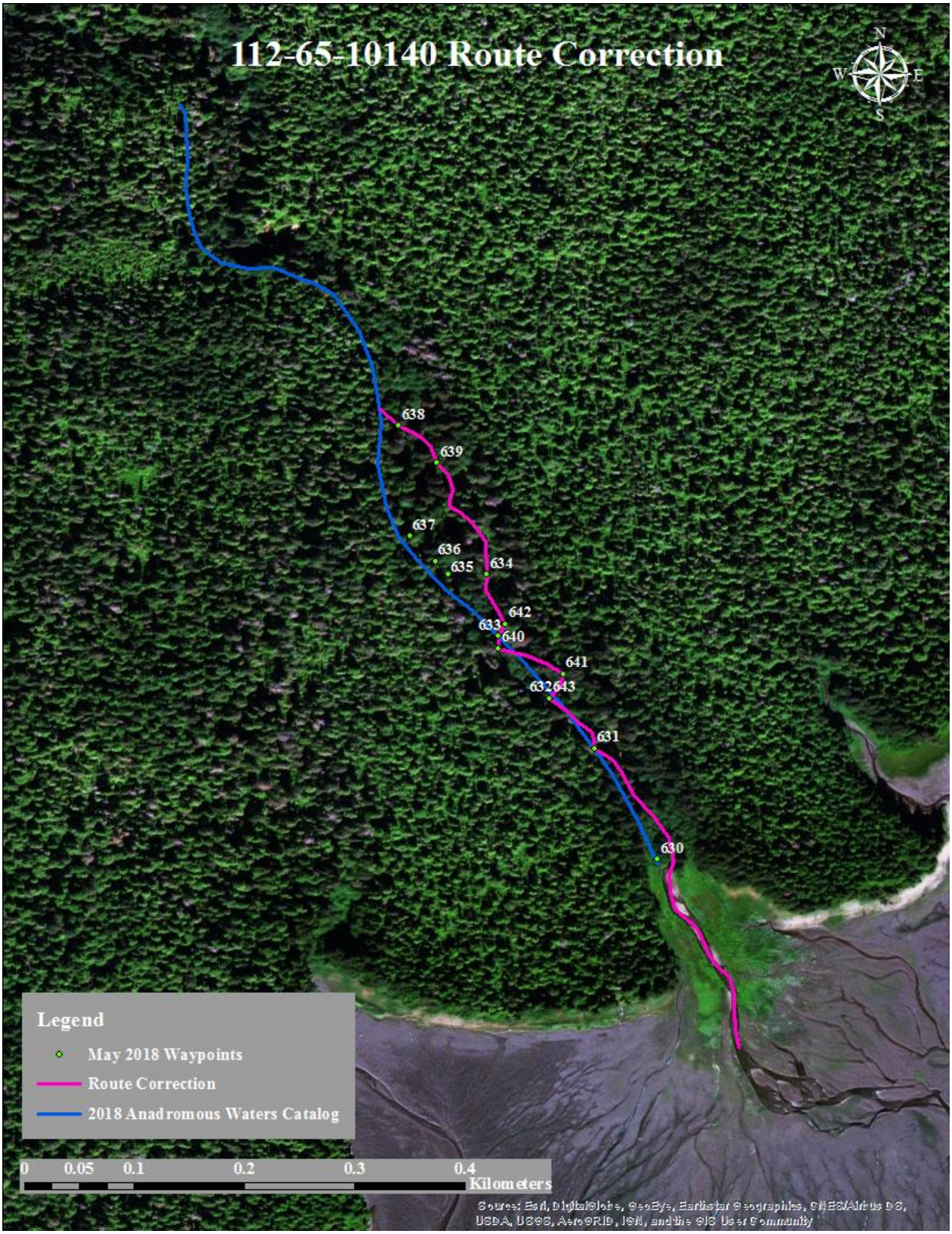

Figure 2.–112-65-10140 route correction map.

112-65-10120 **CORRECTION**

Water body name: Jimmy Green Creek **Survey date:** 5/15/2018
Watershed: Fishery Creek-Frontal Chatham Strait **Species & Lifestage:** CHp
MTR: C043S065E **Quad:** Juneau A-3
Findings: We surveyed this stream using an electrofisher and GPS, finding an anadromous fish barrier below upper extent of the current anadromous waters catalog. We captured Dolly Varden char in this creek (Table 1).
Recommendations: Correct Stream No. 112-65-10120 to reflect field verified upper extent of anadromous fish passage (Figure 1).
Nomination: 19-504

Table 1.–112-65-10120 survey data.

Waypoint	Latitude	Longitude	Notes	Sample Effort	Sample Results
645	58.1761	-134.7556	Top of tidal influence on Jimmy Green Creek. Debris jam 60 m upstream of this point has caused the channel to flood through the forest on either side, creating 3 channels probably within the last year. Debris jam is 2.5 m tall with minimal passage through developing side channels. Main channel is 0.5-1.2 m wide with some spawning gravel and rearing habitat.		
646	58.1768	-134.7590	4 minnow traps set here, no fish caught. Gradient is 15%, boulder dominated and very unstable. 1 DV 155 mm.	MT/EF	1 DV
647	58.1773	-134.7593	1 DV 113 mm.	EF	1 DV
648	58.1776	-134.7594	2 DV 88, 77 mm.	EF	2 DV
649	58.1778	-134.7600	1 DV 141 mm.	EF	1 DV
650	58.1781	-134.7600	2 DV 113, 92 mm. Boulders and >15% gradient.	EF	2 DV
651	58.1781	-134.7604	1 DV 131 mm. Base of transition to >25% step falls reach with 1-1.5 m cascades and increasing gradient upstream and likely end of fish habitat based on topo map.	EF	1 DV
652	58.1772	-134.7593	JGC1 sediment sample taken here at 1440 on river left.		
653	58.1764	-134.7583	JGC2 sediment sample taken in this area at 1453.		
654	58.1765	-134.7579	JGC3 sediment sample taken here at 1458.		

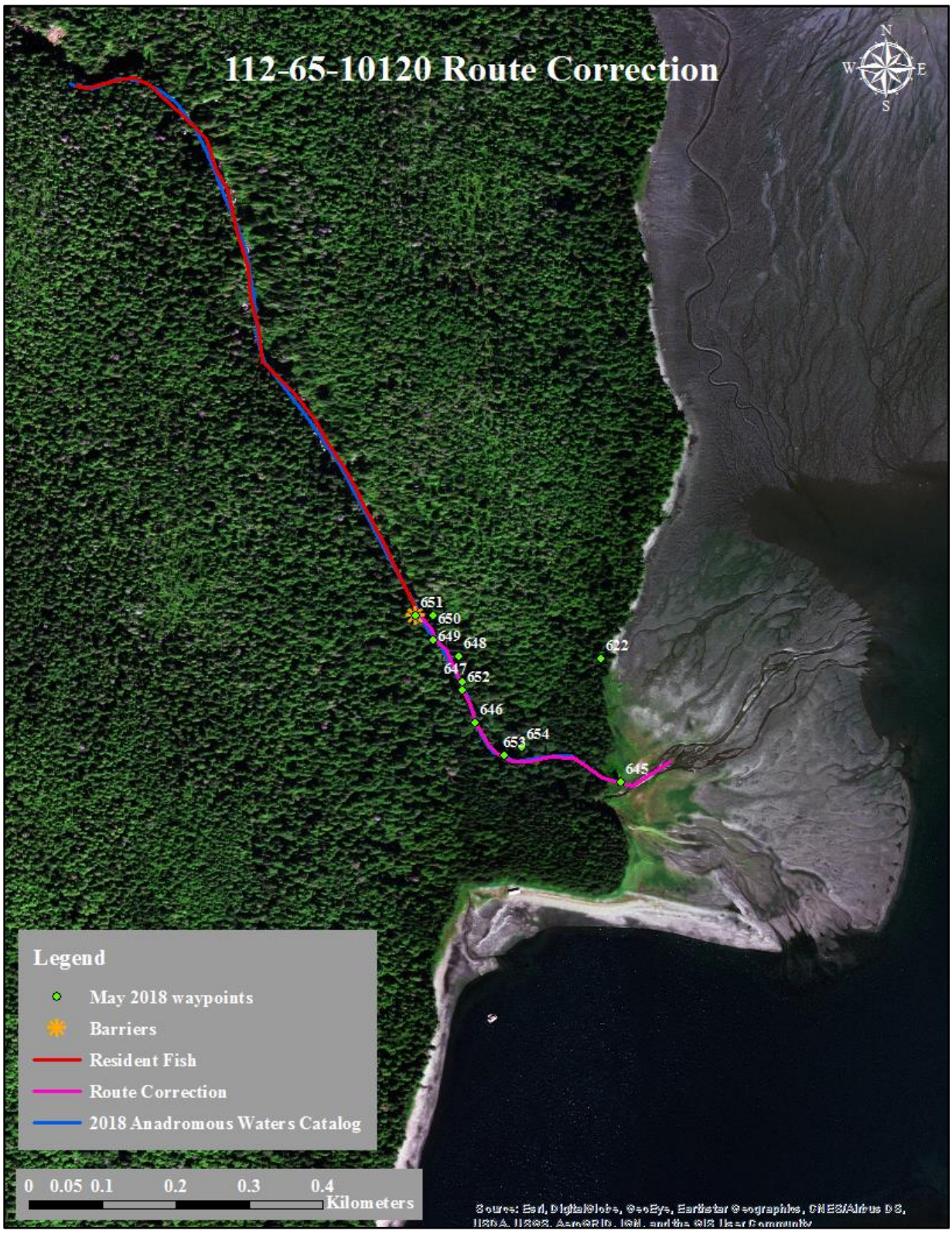

Figure 1.–112-65-10120 route correction map.

112-65-10110 **CORRECTION**

Water body name: Empire Creek **Survey date:** 5/16/2018
Watershed: Fishery Creek-Frontal Chatham Strait **Species & Lifestage:** CHs, Ps
MTR: C043S065E **Quad:** Juneau A-3
Findings: We surveyed this stream using an electrofisher, minnow traps, and a GPS. We captured Dolly Varden char, juvenile coho salmon, pink salmon fry, and a rainbow trout (Table 1; Figures 1-3).
Recommendations: Correct Stream No. 112-65-10110 to reflect field verified path. Add rearing coho to the anadromous waters catalog (Figure 4).
Nomination: 19-502

Table 1.–112-65-10110 survey data.

Waypoint	Latitude	Longitude	Notes	Sample Effort	Sample Results
655	58.1683	-134.7707	Top of tidal influence on Empire Creek. Stream is 2 m wide, 3-4% gradient, flat shaley cobble sized substrate with some gravel, intertidal spawning is higher quality.		
656	58.1689	-134.7710	Gradient increases to 5% then to >5% upstream of here. Flat cobble sized shale dominates but spawning and rearing habitat are present.		
657	58.1692	-134.7710	Base of 12% reach with debris jams and step falls, that would exclude most pink salmon.		
658	58.1692	-134.7713	4 minnow traps set, no fish caught. Two braids present here.	MT	No Fish
659	58.1698	-134.7714	2 DV 58, 134 mm. This reach is bouldery and 10% gradient.	EF	2 DV
660	58.1702	-134.7714	Bouldery debris jam reach 12-18% gradient and incised canyon. 1 DV 121 mm.	EF	1 DV
661	58.1702	-134.7714	1 DV 113 mm.	EF	1 DV
662	58.1692	-134.7712	220 mm RBT.	EF	1 RT
663	58.1690	-134.7710	3 DV 135, 137, 150 mm, 2 CO, 11 P fry. Upstream of some 0.5 m step falls, unfortunately close to intertidal though, due to lack of fish upstream. ECS3 sediment sample taken here at 1040.	EF	3 DV, 2 CO, 11 P

Table 1.–Continued.

Waypoint	Latitude	Longitude	Notes	Sample Effort	Sample Results
664	58.1688	-134.7709	ECS1 sediment sample taken in this area at 1030. broke the lid on this jar, but maintained cover until new lid installed.		
665	58.1685	-134.7711	ECS2 sediment sample taken here at 1045 about 3 m downstream of an iron seep on the opposite bank. May be some mixing with iron water.		

Figure 1.–Juvenile coho salmon captured in Empire Creek.

Figure 2.–Pink salmon fry captured in Empire Creek.

Figure 3.–Rainbow trout captured in Empire Creek.

Figure 4.–112-65-10110 route correction map.

112-65-10280 **CORRECTION**

Water body name: Piledriver Creek **Survey date:** 5/16/2018
Watershed: Fishery Creek-Frontal Chatham Strait **Species & Lifestage:** Pp
MTR: C044S065E **Quad:** Juneau A-3
Findings: We surveyed this stream using and electrofisher, minnow traps and a GPS. We captured juvenile coho salmon, pink salmon fry, Dolly Varden char, and cutthroat trout (Table 1; Figures 1, 2).
Recommendations: Correct Stream No. 112-65-10280 to match field verified route, add rearing coho salmon to the anadromous waters catalog (Figure 3).
Nomination: 19-505

Table 1.–112-65-10280 survey data.

Waypoint	Latitude	Longitude	Notes	Sample Effort	Sample Results
666	58.0778	-134.7703	Open beach necks down to estuary behind guard timber on Pile Driver Creek. Pink salmon redds everywhere.		
667	58.0726	-134.7678	Top of tidal influence. Gradient <1% to here with pink fry in water and average creek width of 6 m. Nice spawning and rearing habitat upstream and woody debris abound.	VI	P
668	58.0710	-134.7665	2 DV 126, 124 mm, 3 CO, 12 P fry. Tributary enters river right, gear stashed and begin fishing here. 4 minnow traps set in the area after finding few fish, 1 CO captured. "Spru-lock" tree about 30 m downstream of confluence on river right. PCS1 sediment sample taken here from river right bank at 1325 and is predominantly clay. PCS2 sediment sample taken here on the river left bank at 1325 about 6 m downstream. Predominantly clay and silt.	EF/MT	2 DV, 3 CO, 12 P
669	58.0706	-134.7663	2 P fry, 1 CO.	EF	1 CO, 2 P

Table 1.–Continued.

Waypoint	Latitude	Longitude	Notes	Sample Effort	Sample Results
670	58.0702	-134.7671	4 CO, 1 DV 148 mm, 2 P fry. Channel 6-10.5 m wide <2% downstream of here with slight increase to 3% upstream. Great spawning and rearing habitat, clay evident in eroded banks.	EF	4 CO, 1 DV, 2 P
671	58.0698	-134.7669	2 CO, 2 DV 124, 121 mm.	EF	2 CO, 2 DV
672	58.0695	-134.7649	1 CO, 2 P fry.	EF	1 CO, 2 P
673	58.0692	-134.7648	2 P fry, 1 DV 111 mm, channel still 2-3% with spawning and rearing habitat.	EF	2 P, 1 DV
674	58.0689	-134.7651	1 CT 180 mm.	EF	1 CT
675	58.0685	-134.7648	1 DV 121 mm, 2 P fry, 2 CO.	EF	1 DV, 2 P, 2 CO
676	58.0705	-134.7666	PCS3 sediment sample taken here at 1330. This site is slightly sandier substrate than other which are clay dominated. This site in direct influence from an iron seep.		

Figure 1.–Juvenile coho salmon captured in Piledriver Creek.

Figure 2.–Cutthroat trout captured in Piledriver Creek.

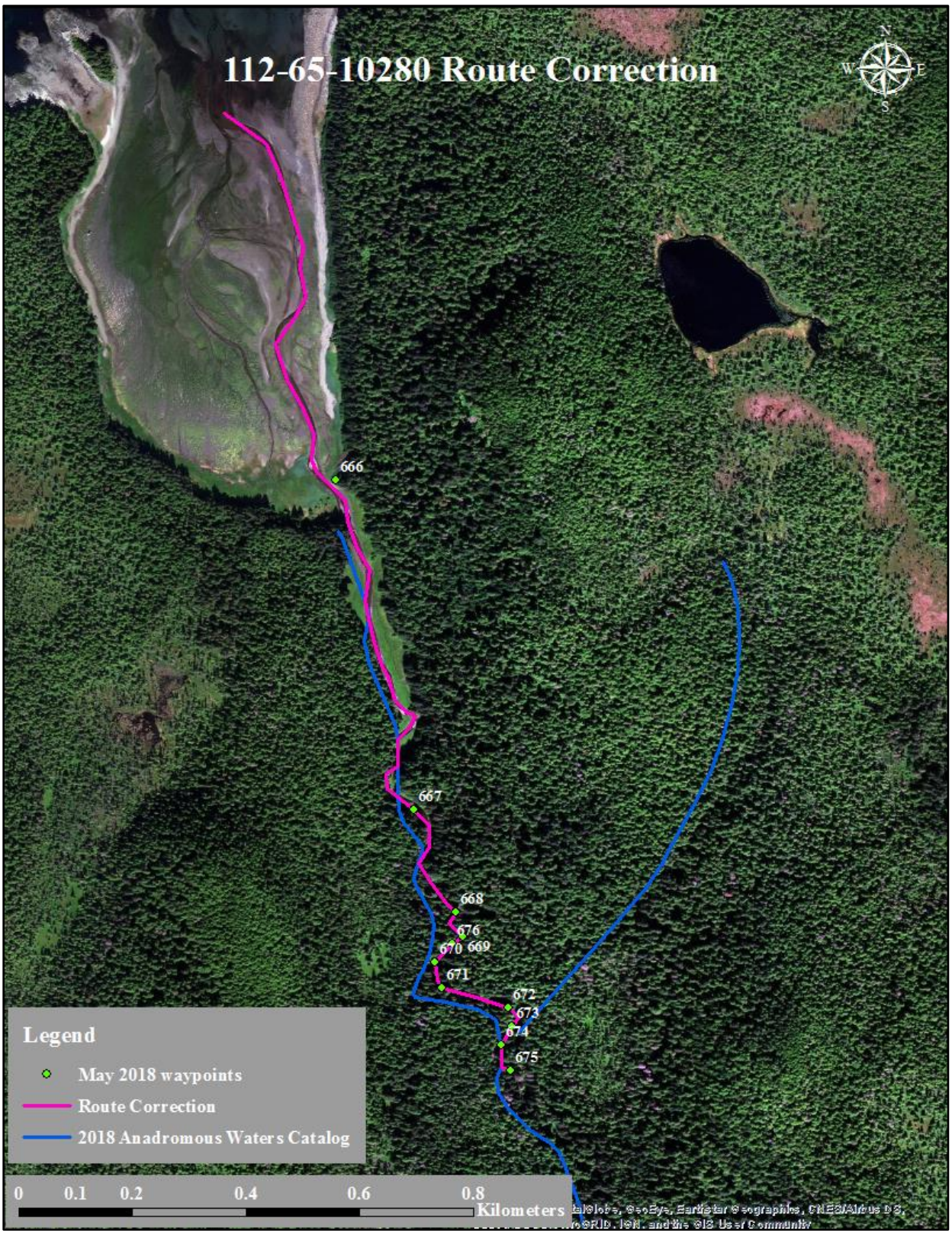

Figure 3.–112-65-10280 route correction map.

APPENDIX B: SEDIMENT DATA AND LABORATORY REPORTS

Appendix B.1–Sediment sample compositions.

Sample No.	Particle Size Data: % Clay	% Silt	% Sand	% Coarse material (> 2 mm)	% Total Solids	% Total Volatile Solids	Total Sulfide (mg/kg)	% Total Organic Carbon
Hawk Inlet Head Creek 2061								
2018HIHC-S1	0.1	1.6	90.7	3.6	79.2	2.80	<2.4	0.785
2018HIHC-S2	0.5	5.8	88.1	0.1	71.8	2.60	<2.6	0.790
2018HIHC-S3	1.0	7.3	84.9	6.1	64.3	4.70	<2.7	1.13
Unnamed Creek Site 2062								
2018UC-S1	0.8	8.8	93.4	0.3	59.7	4.00	<2.7	1.41
2018UC-S2	0.5	6.3	84.9	2.4	52.0	5.90	<3.3	1.27
2018UC-S3	0.5	5.2	88.8	2.7	59.9	3.90	<2.9	1.00
Jimmy Green Creek Site 2063								
2018JC-S1	0.3	3.0	85.2	5.2	69.3	3.80	<2.3	1.57
2018JC-S2	0.3	3.8	96.8	2.5	64.2	3.75	<3.1	1.55
2018JC-S3	0.5	6.7	93.9	0.1	60.3	4.30	<3.0	2.23
Empire Creek Site 2064								
2018EC-S1	0.2	1.9	83.1	6.1	69.4	5.40	<2.7	2.64
2018EC-S2	0.2	1.4	85.6	7.0	65.8	5.60	<2.1	2.95
2018EC-S3	0.0	2.3	87.9	9.7	63.2	4.90	<3.0	2.58
Piledriver Creek Site 2065								
2018PC-S1	3.7	7.0	77.1	9.6	62.2	3.30	<2.4	0.772
2018PC-S2	1.3	3.1	75.4	21.7	77.2	2.90	<2.1	0.608
2018PC-S3	0.6	2.3	86.0	4.9	78.4	3.30	<2.1	0.674
Cannery Creek Site 37								
2018CC-S1	0.4	1.5	63.6	41.3	69.6	4.00	<2.8	1.54
2018CC-S2	0.5	2.1	76.5	21.5	69.7	4.90	<2.6	2.42
2018CC-S3	0.3	1.3	57.7	40.3	74.7	3.90	<2.6	1.11
Zinc Creek Site 371								
2018ZC-S1	0.0	1.3	82.6	18.8	72.3	3.90	<2.7	0.915
2018ZC-S2	0.0	1.7	90.3	6.2	64.6	5.30	<2.8	1.10
2018ZC-S3	0.1	0.2	79.2	25.0	69.0	3.90	<2.8	0.745
Tributary Creek Site 9								
GCM Site #9 (2013 data)[a]	3.0	90.0	7.0	0.10	ND	ND	ND	ND
2018TC9-S1	2.4	6.1	61.3	31.9	74.8	3.30	<2.6	1.35
2018TC9-S2	2.1	21.3	72.8	2.1	34.7	4.75	<5.5	8.57
2018TC9-S3	0.6	3.9	83.1	26.4	73.3	3.80	<2.2	4.53
Tributary Creek Site 1847								
2018TC1847-S1	0.5	4.3	90.4	4.6	71.1	4.00	<2.7	0.596
2018TC1847-S2	0.4	3.5	89.8	5.9	70.1	3.90	<2.8	1.39
2018TC1847-S3	0.3	3.1	93.1	4.0	72.4	3.40	<2.8	1.00
Greens Creek Site 54								
GCM Site #54 (2013 data)[a]	5.0	94.0	1.0	0.06	ND	ND	ND	ND
2018GC54-S1	0.4	1.8	97.6	0.2	67.8	3.00	<2.2	0.528
2018GC54-S2	0.5	1.4	96.5	0.8	68.9	3.10	<2.4	0.481
2018GC54-S3	0.4	1.3	94.5	4.4	68.8	3.00	<2.3	0.548
Greens Creek Site 63A[b]								
2018GC48-S1	0.9	4.1	96.0	0.3	67.1	2.45	<2.4	0.807
2018GC48-S2	0.6	1.1	97.4	0.4	70.0	2.90	<2.3	0.486
2018GC48-S3	1.0	6.1	90.2	0.1	61.0	2.80	<3.0	1.21
Greens Creek Site 63B								
GCM Site #48 (2013 data)[a,c]	3.0	92.0	5.0	<0.05	ND	ND	ND	ND
GC63B-S1	0.2	1.6	92.6	6.0	71.0	2.90	<2.2	0.504
GC63B-S2	0.2	1.1	99.3	5.1	71.5	2.90	<2.2	0.445
GC63B-S3	0.1	0.9	81.4	8.1	77.7	2.70	<2.0	0.548

[a] Reported in Kanouse and Brewster (2014).

[b] The Greens Creek Site 63A sample codes were mislabeled as Greens Creek Site 48.

[c] Sample collected at former reference site Greens Creek Site 48.

Appendix B.2–Sediment sample element concentrations.

	Concentration (mg/kg dry weight)					
	Cd	Cu	Pb	Hg	Se	Zn
Hawk Inlet Head Creek 2061						
2018HIHC-S1	0.699	35.1	7.15	0.021	1.5	103
2018HIHC-S2	0.591	35.1	6.15	<0.020	1.5	91.9
2018HIHC-S3	0.791	46.1	8.67	<0.024	2.0	117
Unnamed Creek Site 2062						
2018UC-S1	0.522	48.2	8.25	<0.027	<1.5	89.3
2018UC-S2	0.869	56.9	11.4	0.030	<1.7	129
2018UC-S3	0.533	44.6	8.03	0.035	<1.5	92.7
Jimmy Green Creek Site 2063						
2018JC-S1	1.98	53.4	26.3	0.036	4.7	191
2018JC-S2	2.13	47.5	15.2	0.054	3.9	201
2018JC-S3	2.26	61.4	19.7	0.044	4.7	227
Empire Creek Site 2064						
2018EC-S1	3.20	54.7	21.1	0.263	8.9	296
2018EC-S2	1.38	47.2	14.0	0.162	7.9	218
2018EC-S3	2.39	54.5	19.4	0.204	8.3	288
Piledriver Creek Site 2065						
2018PC-S1	0.283	43.7	7.45	<0.029	<1.5	110
2018PC-S2	0.194	24.1	5.09	<0.024	<1.0	77.6
2018PC-S3	0.205	26.4	5.18	0.036	<1.1	80.5
Cannery Creek Site 37						
2018CC-S1	0.758	16.5	19.7	0.026	<1.0	141
2018CC-S2	0.981	16.3	20.5	0.024	<1.0	140
2018CC-S3	0.852	23.3	22.1	<0.021	<1.0	136
Zinc Creek Site 371						
2018ZC-S1	2.13	31.1	11.5	0.030	1.5	325
2018ZC-S2	6.08	62.3	248	0.054	2.3	663
2018ZC-S3	1.53	26.2	15.9	0.030	3.8	286
Tributary Creek Site 9						
GCM Site #9 (2013 data)[a]	0.390	15.5	11.8	<0.0357	0.309	68.9
2018TC9-S1	0.437	51.6	13.2	0.030	<0.84	97.7
2018TC9-S2	0.701	26.0	31.7	0.112	<2.0	113
2018TC9-S3	0.253	14.7	8.90	0.054	<0.77	59.6
Tributary Creek Site 1847						
2018TC1847-S1	0.410	14.6	17.3	0.024	<0.84	94.8
2018TC1847-S2	0.343	17.5	14.7	0.023	<0.89	83.1
2018TC1847-S3	0.358	12.7	14.6	<0.020	<0.76	79.7
Greens Creek Site 54						
GCM Site #54 (2013 data)[a]	3.63	51.7	29.8	0.0784	4.44	232
2018GC54-S1	2.01	48.5	20.7	0.098	3.0	294
2018GC54-S2	2.09	50.9	22.5	0.108	2.66	326
2018GC54-S3	1.79	47.1	20.6	0.107	2.59	280
Greens Creek Site 63A[b]						
2018GC48-S1	2.86	46.7	34.7	0.126	3.4	393
2018GC48-S2	1.82	43.1	21.4	0.091	2.5	302
2018GC48-S3	3.16	59.4	42.2	0.148	3.5	482
Greens Creek Site 63B						
GCM Site #48 (2013 data)[a,c]	1.84	60.8	12.8	0.0476	2.59	232
GC63B-S1	1.97	38.9	33.4	0.089	2.0	261
GC63B-S2	2.38	46.4	25.1	0.125	3.3	369
GC63B-S3	2.18	42.5	18.9	0.156	2.6	314

[a] Reported in Kanouse and Brewster (2014).

[b] The Greens Creek Site 63A sample codes were mislabeled as Greens Creek Site 48.

[c] Sample collected at former reference site Greens Creek Site 48.

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

June 13, 2018

Analytical Report for Service Request No: K1804793

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

RE: Greens Creek Mine Project

Dear Kate,

Enclosed are the results of the sample(s) submitted to our laboratory May 21, 2018
For your reference, these analyses have been assigned our service request number **K1804793.**

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 3356. You may also contact me via email at Kurt.Clarkson@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kurt Clarkson
Sr. 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

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

Inorganic Data Qualifiers

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

Metals Data Qualifiers

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

Organic Data Qualifiers

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

Additional Petroleum Hydrocarbon Specific Qualifiers

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

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

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	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	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	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)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
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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Client: Alaska Department of Fish and Game
Project: Greens Creek Mine Project
Sample Matrix: Soil

Service Request: K1804793
Date Received: 05/21/2018

CASE NARRATIVE

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

Sample Receipt:

Nine soil samples were received for analysis at ALS Environmental on 05/21/2018. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

Metals:

Method 200.8, 06/01/2018: The matrix spike recovery of Copper for the Batch QC sample was outside control criteria. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. No further corrective action was appropriate.

General Chemistry:

160.4M TVS- Due to an analyst error, the samples were analyzed past hold. The error has been documented under Non-Conformance report KL1404.

Approved by _____ Date 06/18/2018

Chain of Custody

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ALS Environmental

CHAIN OF CUSTODY
89306

001

SR# K1804793

COC Set 1 of 1

COC#

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Project Name: Greens Creek Mine Project	Project Number:
Project Manager: Kate Kanouse	
Company: ADF&G	
Address: 802 3rd St, Douglas, AK 99824	
Phone #: (907) 465-4290	email: Kate.Kanouse@alaska.gov
Sampler Signature:	Sampler Printed Name: Greg Albrecht

CLIENT SAMPLE ID	LABID	SAMPLING Date	SAMPLING Time	Matrix	NUMBER OF CONTAINERS	7D: 160.4 Modified / TVS	14D: PSEP TOC / PSEP TOC T	28D: 7471B / Hg	180D: 200.8 / Metals T	180D: ASTM D422M / Partsize	999D: 160.3 Modified / TS	PSEP Sulfide	2	3	4	5	Remarks
1. 2018JCS1		5/15	1440	soil	2	✓	✓	✓	✓	✓	✓	✓					
2. 2018JCS2		5/15	1453	soil	2	✓	✓	✓	✓	✓	✓	✓					
3. 2018JCS3		5/15	1458	soil	2	✓	✓	✓	✓	✓	✓	✓					
4. 2018HIHCS1		5/15	1022	soil	2	✓	✓	✓	✓	✓	✓	✓					
5. 2018HIHCS2		5/15	1030	soil	2	✓	✓	✓	✓	✓	✓	✓					
6. 2018HIHCS3		5/15	1040	soil	2	✓	✓	✓	✓	✓	✓	✓					
7. 2018UCS1		5/15	1223	soil	2	✓	✓	✓	✓	✓	✓	✓					
8. 2018UCS2		5/15	1233	soil	2	✓	✓	✓	✓	✓	✓	✓					
9. 2018UCS3		5/15	1240	soil	2	✓	✓	✓	✓	✓	✓	✓					
10. X X X																	

Report Requirements

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

Invoice Information

P.O.#

Bill To: Hecla Greens Creek Mining Company

Turnaround Requirements

- ___ 24 hr. ___ 48 hr.
- ___ 5 Day
- ✓ Standard

Requested Report Date

Circle which metals are to be analyzed

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

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

Special Instructions/Comments:

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

Relinquished By:	Received By:	Relinquished By:	Received By:	Relinquished By:	Received By:
Signature:	Signature:	Signature	Signature	Signature	Signature
Printed Name: Greg Albrecht	Printed Name: ALS	Printed Name	Printed Name	Printed Name	Printed Name
Firm: ADF&G	Firm: 5/21/18 0945	Firm	Firm	Firm	Firm
Date/Time: 5/16/18 1612	Date/Time	Date/Time	Date/Time	Date/Time	Date/Time

PC KC

Cooler Receipt and Preservation Form

Client Alaska Dept. of Fish + Game Service Request K1804793

Received: 5/21/18 Opened: 5/21/18 By: KM Unloaded: 5/21/18 By: PK

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 custody seals on coolers? NA (Y) N If yes, how many and where? 1 Front
   If present, were custody seals intact? (Y) N If present, were they signed and dated? (Y) N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID NA	Tracking Number NA	Filed
16.5	16.4	16.9	16.8	-0.1	391	89306	777254126533	

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

Sample ID on Bottle	Sample ID on COC	Identified by:

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

Notes, Discrepancies, & Resolutions: Rec'd 1 4oz jar sample 2018 HIHCS1 cracked. Total Solids tech transferred Sample to appropriate Clean jar.

Total Solids

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Soil	**Date Received:**	05/21/18
Analysis Method:	160.3 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	As Received

Solids, Total

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
2018JCS1	K1804793-001	**69.3**	-	-	1	05/25/18 16:30	
2018JCS2	K1804793-002	**63.8**	-	-	1	05/25/18 16:30	
2018JCS3	K1804793-003	**60.3**	-	-	1	05/25/18 16:30	
2018HIHCS1	K1804793-004	**79.2**	-	-	1	05/25/18 16:30	
2018HIHCS2	K1804793-005	**71.8**	-	-	1	05/25/18 16:30	
2018HIHCS3	K1804793-006	**64.3**	-	-	1	05/25/18 16:30	
2018UCS1	K1804793-007	**59.7**	-	-	1	05/25/18 16:30	
2018UCS2	K1804793-008	**52.0**	-	-	1	05/25/18 16:30	
2018UCS3	K1804793-009	**59.9**	-	-	1	05/25/18 16:30	
Method Blank	K1804793-MB	ND	U	-	-	1	05/25/18 16:30	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project	Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Soil	**Date Received:**	05/21/18
		Date Analyzed:	05/25/18

Replicate Sample Summary
Inorganic Parameters

Sample Name:	2018JCS2	**Units:**	Percent
Lab Code:	K1804793-002	**Basis:**	As Received

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample K1804793-002DUP Result	Average	RPD	RPD Limit
Solids, Total	160.3 Modified	-	-	63.8	64.5	64.2	1	20

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

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

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

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Soil	**Date Received:**	05/21/18
Analysis Method:	160.4 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	Dry, per Method

Solids, Total Volatile

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
2018JCS1	K1804793-001	**3.80**	0.10	-	1	05/25/18 16:30	*
2018JCS2	K1804793-002	**3.80**	0.10	-	1	05/25/18 16:30	*
2018JCS3	K1804793-003	**4.30**	0.10	-	1	05/25/18 16:30	*
2018HIHCS1	K1804793-004	**2.80**	0.10	-	1	05/25/18 16:30	*
2018HIHCS2	K1804793-005	**2.60**	0.10	-	1	05/25/18 16:30	*
2018HIHCS3	K1804793-006	**4.70**	0.10	-	1	05/25/18 16:30	*
2018UCS1	K1804793-007	**4.00**	0.10	-	1	05/25/18 16:30	*
2018UCS2	K1804793-008	**5.90**	0.10	-	1	05/25/18 16:30	*
2018UCS3	K1804793-009	**3.90**	0.10	-	1	05/25/18 16:30	*
Method Blank	K1804793-MB	ND U	0.10	-	1	05/25/18 16:30	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project	Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Soil	**Date Received:**	05/21/18
		Date Analyzed:	05/25/18

Replicate Sample Summary

General Chemistry Parameters

Sample Name:	2018JCS2	**Units:**	Percent
Lab Code:	K1804793-002	**Basis:**	Dry, per Method

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample K1804793-002DUP Result	Average	RPD	RPD Limit
Solids, Total Volatile	160.4 Modified	0.10	-	3.80	3.70	3.75	3	20

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

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

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

General Chemistry

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	5/15/2018
Sample Matrix:	Soil	**Date Received:**	5/21/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018JCS1
Lab Code: K1804793-001

Sand Fraction:	Dry Weight (Grams)	38.2752
Sand Fraction:	Weight Recovered (Grams)	38.1194
Sand Fraction:	Percent Recovery	99.59

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.3502	0.81
Gravel, Fine	-2 Ø to -1 Ø	1.9119	4.42
Sand, Very Coarse	-1 to 0 Ø	5.7198	13.23
Sand, Coarse	0 to 1 Ø	8.6217	19.93
Sand, Medium	1 to 2 Ø	8.0526	18.62
Sand, Fine	2 to 3 Ø	10.1066	23.37
Sand, Very Fine	3 to 4 Ø	2.1250	4.91
75.0 µm	4 Ø	2.2350	5.17
31.3 µm	5 Ø	0.7400	1.71
15.6 µm	6 Ø	0.4000	0.92
7.8 µm	7 Ø	0.1350	0.31
3.9 µm	8 Ø	0.0250	0.06
1.95 µm	9 Ø	0.0800	0.18
0.98 µm	> 10 Ø	0.0700	0.16
		40.5728	93.81

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	5/15/2018
Sample Matrix:	Soil	**Date Received:**	5/21/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018JCS2
Lab Code: K1804793-002

Sand Fraction:	Dry Weight (Grams)	38.5200
Sand Fraction:	Weight Recovered (Grams)	38.4095
Sand Fraction:	Percent Recovery	99.71

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0029	0.01
Gravel, Fine	-2 Ø to -1 Ø	0.9880	2.46
Sand, Very Coarse	-1 to 0 Ø	4.2526	10.60
Sand, Coarse	0 to 1 Ø	7.6556	19.08
Sand, Medium	1 to 2 Ø	9.4762	23.62
Sand, Fine	2 to 3 Ø	11.8729	29.59
Sand, Very Fine	3 to 4 Ø	2.6426	6.59
75.0 µm	4 Ø	2.9300	7.30
31.3 µm	5 Ø	0.8550	2.13
15.6 µm	6 Ø	0.4750	1.18
7.8 µm	7 Ø	0.1700	0.42
3.9 µm	8 Ø	0.0400	0.10
1.95 µm	9 Ø	0.0750	0.19
0.98 µm	> 10 Ø	0.0550	0.14
		41.4908	103.41

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	5/15/2018
Sample Matrix:	Soil	**Date Received:**	5/21/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018JCS3
Lab Code: K1804793-003

Sand Fraction:	Dry Weight (Grams)	31.7660
Sand Fraction:	Weight Recovered (Grams)	31.6703
Sand Fraction:	Percent Recovery	99.70

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0000	0.00
Gravel, Fine	-2 Ø to -1 Ø	0.0416	0.11
Sand, Very Coarse	-1 to 0 Ø	0.8098	2.22
Sand, Coarse	0 to 1 Ø	3.8615	10.60
Sand, Medium	1 to 2 Ø	6.9766	19.15
Sand, Fine	2 to 3 Ø	13.9214	38.22
Sand, Very Fine	3 to 4 Ø	3.7732	10.36
75.0 µm	4 Ø	4.8600	13.34
31.3 µm	5 Ø	1.3850	3.80
15.6 µm	6 Ø	0.7400	2.03
7.8 µm	7 Ø	0.1900	0.52
3.9 µm	8 Ø	0.1350	0.37
1.95 µm	9 Ø	0.1050	0.29
0.98 µm	> 10 Ø	0.0850	0.23
		36.8841	101.25

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	5/15/2018
Sample Matrix:	Soil	**Date Received:**	5/21/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018HIHCS1
Lab Code: K1804793-004

Sand Fraction: Dry Weight (Grams)	41.5918
Sand Fraction: Weight Recovered (Grams)	41.5239
Sand Fraction: Percent Recovery	99.84

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.1015	0.23
Gravel, Fine	-2 Ø to -1 Ø	1.5087	3.38
Sand, Very Coarse	-1 to 0 Ø	3.5606	7.99
Sand, Coarse	0 to 1 Ø	10.2434	22.98
Sand, Medium	1 to 2 Ø	15.1097	33.90
Sand, Fine	2 to 3 Ø	9.0859	20.38
Sand, Very Fine	3 to 4 Ø	1.3125	2.94
75.0 µm	4 Ø	1.1250	2.52
31.3 µm	5 Ø	0.3400	0.76
15.6 µm	6 Ø	0.2150	0.48
7.8 µm	7 Ø	0.0750	0.17
3.9 µm	8 Ø	0.0800	0.18
1.95 µm	9 Ø	0.0200	0.04
0.98 µm	> 10 Ø	0.0050	0.01
		42.7823	95.97

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	5/15/2018
Sample Matrix:	Soil	**Date Received:**	5/21/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018HIHCS2
Lab Code: K1804793-005

Sand Fraction:	Dry Weight (Grams)	47.5410
Sand Fraction:	Weight Recovered (Grams)	47.3930
Sand Fraction:	Percent Recovery	99.69

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0000	0.00
Gravel, Fine	-2 Ø to -1 Ø	0.0488	0.08
Sand, Very Coarse	-1 to 0 Ø	0.6113	1.05
Sand, Coarse	0 to 1 Ø	5.4795	9.43
Sand, Medium	1 to 2 Ø	12.9639	22.30
Sand, Fine	2 to 3 Ø	20.0792	34.54
Sand, Very Fine	3 to 4 Ø	5.5057	9.47
75.0 µm	4 Ø	6.5600	11.28
31.3 µm	5 Ø	1.9850	3.41
15.6 µm	6 Ø	0.8050	1.38
7.8 µm	7 Ø	0.4450	0.77
3.9 µm	8 Ø	0.1250	0.22
1.95 µm	9 Ø	0.1550	0.27
0.98 µm	> 10 Ø	0.1350	0.23
		54.8984	94.43

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	5/15/2018
Sample Matrix:	Soil	**Date Received:**	5/21/2018
		Date Analyzed:	6/4/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018HIHCS3
Lab Code: K1804793-006

Sand Fraction:	Dry Weight (Grams)	56.9243
Sand Fraction:	Weight Recovered (Grams)	56.6712
Sand Fraction:	Percent Recovery	99.56

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	1.4181	2.19
Gravel, Fine	-2 Ø to -1 Ø	2.5155	3.89
Sand, Very Coarse	-1 to 0 Ø	5.1936	8.03
Sand, Coarse	0 to 1 Ø	12.0737	18.68
Sand, Medium	1 to 2 Ø	10.6123	16.42
Sand, Fine	2 to 3 Ø	18.0088	27.86
Sand, Very Fine	3 to 4 Ø	4.1702	6.45
75.0 µm	4 Ø	4.8000	7.43
31.3 µm	5 Ø	2.4050	3.72
15.6 µm	6 Ø	0.8650	1.34
7.8 µm	7 Ø	0.9200	1.42
3.9 µm	8 Ø	0.5550	0.86
1.95 µm	9 Ø	0.3500	0.54
0.98 µm	> 10 Ø	0.2950	0.46
		64.1822	99.29

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	5/15/2018
Sample Matrix:	Soil	**Date Received:**	5/21/2018
		Date Analyzed:	6/4/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018HIHCS3
Lab Code: K1804793-006DUP

Sand Fraction: Dry Weight (Grams)	57.5014
Sand Fraction: Weight Recovered (Grams)	57.3892
Sand Fraction: Percent Recovery	99.80

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.1517	0.24
Gravel, Fine	-2 Ø to -1 Ø	1.9736	3.06
Sand, Very Coarse	-1 to 0 Ø	4.3824	6.80
Sand, Coarse	0 to 1 Ø	11.3314	17.58
Sand, Medium	1 to 2 Ø	13.2627	20.57
Sand, Fine	2 to 3 Ø	20.2616	31.43
Sand, Very Fine	3 to 4 Ø	3.9568	6.14
75.0 µm	4 Ø	3.7800	5.86
31.3 µm	5 Ø	2.0300	3.15
15.6 µm	6 Ø	0.7050	1.09
7.8 µm	7 Ø	0.8050	1.25
3.9 µm	8 Ø	0.4800	0.74
1.95 µm	9 Ø	0.2700	0.42
0.98 µm	> 10 Ø	0.2400	0.37
		63.6302	98.69

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	5/15/2018
Sample Matrix:	Soil	**Date Received:**	5/21/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018UCS1
Lab Code: K1804793-007

Sand Fraction:	Dry Weight (Grams)	31.1473
Sand Fraction:	Weight Recovered (Grams)	31.0300
Sand Fraction:	Percent Recovery	99.62

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0000	0.00
Gravel, Fine	-2 Ø to -1 Ø	0.0962	0.26
Sand, Very Coarse	-1 to 0 Ø	0.2357	0.64
Sand, Coarse	0 to 1 Ø	1.0704	2.92
Sand, Medium	1 to 2 Ø	4.4492	12.13
Sand, Fine	2 to 3 Ø	16.1495	44.04
Sand, Very Fine	3 to 4 Ø	5.3601	14.62
75.0 µm	4 Ø	7.0000	19.09
31.3 µm	5 Ø	1.8450	5.03
15.6 µm	6 Ø	0.7150	1.95
7.8 µm	7 Ø	0.3650	1.00
3.9 µm	8 Ø	0.2850	0.78
1.95 µm	9 Ø	0.1950	0.53
0.98 µm	> 10 Ø	0.1150	0.31
		37.8811	103.30

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	5/15/2018
Sample Matrix:	Soil	**Date Received:**	5/21/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018UCS2
Lab Code: K1804793-008

Sand Fraction:	Dry Weight (Grams)	29.6697
Sand Fraction:	Weight Recovered (Grams)	29.6146
Sand Fraction:	Percent Recovery	99.81

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0000	0.00
Gravel, Fine	-2 Ø to -1 Ø	0.8557	2.36
Sand, Very Coarse	-1 to 0 Ø	2.4263	6.68
Sand, Coarse	0 to 1 Ø	4.1465	11.41
Sand, Medium	1 to 2 Ø	6.4367	17.72
Sand, Fine	2 to 3 Ø	10.5254	28.97
Sand, Very Fine	3 to 4 Ø	3.2191	8.86
75.0 µm	4 Ø	4.0950	11.27
31.3 µm	5 Ø	1.3550	3.73
15.6 µm	6 Ø	0.5500	1.51
7.8 µm	7 Ø	0.2750	0.76
3.9 µm	8 Ø	0.0900	0.25
1.95 µm	9 Ø	0.0900	0.25
0.98 µm	> 10 Ø	0.1050	0.29
		34.1697	94.04

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	5/15/2018
Sample Matrix:	Soil	**Date Received:**	5/21/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018UCS3
Lab Code: K1804793-009

Sand Fraction:	Dry Weight (Grams)	34.0176
Sand Fraction:	Weight Recovered (Grams)	33.9165
Sand Fraction:	Percent Recovery	99.70

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0000	0.00
Gravel, Fine	-2 Ø to -1 Ø	1.0650	2.72
Sand, Very Coarse	-1 to 0 Ø	3.0011	7.68
Sand, Coarse	0 to 1 Ø	6.7551	17.28
Sand, Medium	1 to 2 Ø	7.6971	19.69
Sand, Fine	2 to 3 Ø	10.8704	27.80
Sand, Very Fine	3 to 4 Ø	2.7517	7.04
75.0 µm	4 Ø	3.6350	9.30
31.3 µm	5 Ø	1.2100	3.09
15.6 µm	6 Ø	0.4900	1.25
7.8 µm	7 Ø	0.2500	0.64
3.9 µm	8 Ø	0.0700	0.18
1.95 µm	9 Ø	0.0850	0.22
0.98 µm	> 10 Ø	0.1250	0.32
		38.0054	97.21

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	5/15/2018
Sample Matrix:	Soil	**Date Received:**	5/21/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018UCS3
Lab Code: K1804793-009DUP

Sand Fraction:	Dry Weight (Grams)	38.1613
Sand Fraction:	Weight Recovered (Grams)	38.0857
Sand Fraction:	Percent Recovery	99.80

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.1607	0.37
Gravel, Fine	-2 Ø to -1 Ø	1.4265	3.30
Sand, Very Coarse	-1 to 0 Ø	2.8690	6.63
Sand, Coarse	0 to 1 Ø	7.2520	16.75
Sand, Medium	1 to 2 Ø	9.6072	22.19
Sand, Fine	2 to 3 Ø	12.1370	28.04
Sand, Very Fine	3 to 4 Ø	3.0573	7.06
75.0 µm	4 Ø	3.9600	9.15
31.3 µm	5 Ø	1.2600	2.91
15.6 µm	6 Ø	0.5300	1.22
7.8 µm	7 Ø	0.2150	0.50
3.9 µm	8 Ø	0.1900	0.44
1.95 µm	9 Ø	0.0200	0.05
0.98 µm	> 10 Ø	0.0850	0.20
		42.7697	98.80

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Soil	**Date Received:**	05/21/18
Analysis Method:	PSEP Sulfide	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry

Sulfide, Total

Sample Name	Lab Code	Result		MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
2018JCS1	K1804793-001	ND	U	2.3	0.7	1	05/22/18 17:56	5/22/18	
2018JCS2	K1804793-002	ND	U	3.1	0.99	1	05/22/18 17:56	5/22/18	
2018JCS3	K1804793-003	ND	U	3.0	0.96	1	05/22/18 17:56	5/22/18	
2018HIHCS1	K1804793-004	ND	U	2.4	0.8	1	05/22/18 17:56	5/22/18	
2018HIHCS2	K1804793-005	ND	U	2.6	0.8	1	05/22/18 17:56	5/22/18	
2018HIHCS3	K1804793-006	ND	U	2.7	0.9	1	05/22/18 17:56	5/22/18	
2018UCS1	K1804793-007	**1.0**	**J**	2.7	0.9	1	05/22/18 17:56	5/22/18	
2018UCS2	K1804793-008	ND	U	3.3	1.1	1	05/22/18 17:56	5/22/18	
2018UCS3	K1804793-009	ND	U	2.9	0.9	1	05/22/18 17:56	5/22/18	
Method Blank	K1804793-MB	ND	U	1.0	0.3	1	05/22/18 17:56	5/22/18	

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project	Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Soil	**Date Received:**	05/21/18
		Date Analyzed:	05/22/18

Triplicate Sample Summary
General Chemistry Parameters

Sample Name:	2018JCS1	**Units:**	mg/Kg
Lab Code:	K1804793-001	**Basis:**	Dry
Analysis Method:	PSEP Sulfide		
Prep Method:	Method		

Analyte Name	MRL	MDL	Sample Result	Duplicate K1804793-001DUP Result	Triplicate K1804793-001TRP Result	Average	RSD	RSD Limit
Sulfide, Total	2.3	0.7	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.

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Soil	**Date Received:**	05/21/18
		Date Analyzed:	05/22/18
		Date Extracted:	05/22/18

Duplicate Matrix Spike Summary
Sulfide, Total

Sample Name:	2018JCS1	**Units:**	mg/Kg
Lab Code:	K1804793-001	**Basis:**	Dry
Analysis Method:	PSEP Sulfide		
Prep Method:	Method		

		Matrix Spike			Duplicate Matrix Spike					
		K1804793-001MS			K1804793-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Sulfide, Total	ND U	820	900	91	780	930	84	28-175	5	20

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Analyzed:**	05/22/18
Sample Matrix:	Soil	**Date Extracted:**	05/22/18

Lab Control Sample Summary
Sulfide, Total

Analysis Method:	PSEP Sulfide	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry
		Analysis Lot:	592097

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1804793-LCS	397	410	97	39-166

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Soil	**Date Received:**	05/21/18
Analysis Method:	PSEP TOC	**Units:**	Percent
Prep Method:	ALS SOP	**Basis:**	Dry, per Method

Carbon, Total Organic (TOC)

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
2018JCS1	K1804793-001	**1.56**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018JCS2	K1804793-002	**1.55**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018JCS3	K1804793-003	**2.23**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018HIHCS1	K1804793-004	**0.785**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018HIHCS2	K1804793-005	**0.790**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018HIHCS3	K1804793-006	**1.13**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018UCS1	K1804793-007	**1.41**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018UCS2	K1804793-008	**1.27**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018UCS3	K1804793-009	**1.00**	0.050	0.020	1	05/29/18 14:15	5/29/18	
Method Blank	K1804793-MB	ND U	0.050	0.020	1	05/29/18 14:15	5/29/18	

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project	Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Soil	**Date Received:**	05/21/18
		Date Analyzed:	05/29/18

Triplicate Sample Summary
General Chemistry Parameters

Sample Name:	2018JCS1	**Units:**	Percent
Lab Code:	K1804793-001	**Basis:**	Dry, per Method
Analysis Method:	PSEP TOC		
Prep Method:	ALS SOP		

Analyte Name	MRL	MDL	Sample Result	Duplicate K1804793-001DUP Result	Triplicate K1804793-001TRP Result	Average	RSD	RSD Limit
Carbon, Total Organic (TOC)	0.050	0.020	1.56	1.58	1.57	1.57	<1	27

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Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Soil	**Date Received:**	05/21/18
		Date Analyzed:	05/29/18
		Date Extracted:	05/29/18

Duplicate Matrix Spike Summary
Carbon, Total Organic (TOC)

Sample Name:	2018JCS1	**Units:**	Percent
Lab Code:	K1804793-001	**Basis:**	Dry, per Method
Analysis Method:	PSEP TOC		
Prep Method:	ALS SOP		

		Matrix Spike			Duplicate Matrix Spike					
		K1804793-001MS			K1804793-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Carbon, Total Organic (TOC)	1.56	4.81	3.27	99	4.72	3.17	100	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.

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 Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Analyzed:**	05/29/18
Sample Matrix:	Soil	**Date Extracted:**	05/29/18

Lab Control Sample Summary
Carbon, Total Organic (TOC)

Analysis Method:	PSEP TOC	**Units:**	Percent
Prep Method:	ALS SOP	**Basis:**	Dry, per Method
		Analysis Lot:	592766

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1804793-LCS	0.568	0.603	94	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:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18 14:40
Sample Matrix:	Soil	**Date Received:**	05/21/18 09:45
Sample Name:	2018JCS1	**Basis:**	Dry
Lab Code:	K1804793-001		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.98**	mg/Kg	0.025	0.009	5	06/01/18 10:28	05/31/18	
Copper	200.8	**53.4**	mg/Kg	0.13	0.05	5	06/01/18 10:28	05/31/18	
Lead	200.8	**26.3**	mg/Kg	0.064	0.025	5	06/01/18 10:28	05/31/18	
Mercury	7471B	**0.036**	mg/Kg	0.025	0.003	1	06/11/18 12:30	06/11/18	
Selenium	200.8	**4.7**	mg/Kg	1.3	0.09	5	06/01/18 10:28	05/31/18	
Zinc	200.8	**191**	mg/Kg	0.64	0.25	5	06/01/18 10:28	05/31/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18 14:53
Sample Matrix:	Soil	**Date Received:**	05/21/18 09:45
Sample Name:	2018JCS2	**Basis:**	Dry
Lab Code:	K1804793-002		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**2.13**	mg/Kg	0.028	0.010	5	06/01/18 10:30	05/31/18	
Copper	200.8	**47.5**	mg/Kg	0.14	0.06	5	06/01/18 10:30	05/31/18	
Lead	200.8	**15.2**	mg/Kg	0.071	0.028	5	06/01/18 10:30	05/31/18	
Mercury	7471B	**0.054**	mg/Kg	0.024	0.002	1	06/11/18 12:31	06/11/18	
Selenium	200.8	**3.9**	mg/Kg	1.4	0.10	5	06/01/18 10:30	05/31/18	
Zinc	200.8	**201**	mg/Kg	0.71	0.28	5	06/01/18 10:30	05/31/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18 14:58
Sample Matrix:	Soil	**Date Received:**	05/21/18 09:45
Sample Name:	2018JCS3	**Basis:**	Dry
Lab Code:	K1804793-003		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**2.26**	mg/Kg	0.024	0.008	5	06/01/18 10:32	05/31/18	
Copper	200.8	**61.4**	mg/Kg	0.12	0.05	5	06/01/18 10:32	05/31/18	
Lead	200.8	**19.7**	mg/Kg	0.059	0.024	5	06/01/18 10:32	05/31/18	
Mercury	7471B	**0.044**	mg/Kg	0.027	0.003	1	06/11/18 12:33	06/11/18	
Selenium	200.8	**4.7**	mg/Kg	1.2	0.08	5	06/01/18 10:32	05/31/18	
Zinc	200.8	**227**	mg/Kg	0.59	0.24	5	06/01/18 10:32	05/31/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18 10:22
Sample Matrix:	Soil	**Date Received:**	05/21/18 09:45
Sample Name:	2018HIHCS1	**Basis:**	Dry
Lab Code:	K1804793-004		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.699**	mg/Kg	0.022	0.008	5	06/01/18 10:34	05/31/18	
Copper	200.8	**35.1**	mg/Kg	0.11	0.04	5	06/01/18 10:34	05/31/18	
Lead	200.8	**7.15**	mg/Kg	0.056	0.022	5	06/01/18 10:34	05/31/18	
Mercury	7471B	**0.021**	mg/Kg	0.019	0.002	1	06/11/18 12:35	06/11/18	
Selenium	200.8	**1.5**	mg/Kg	1.1	0.08	5	06/01/18 10:34	05/31/18	
Zinc	200.8	**103**	mg/Kg	0.56	0.22	5	06/01/18 10:34	05/31/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18 10:30
Sample Matrix:	Soil	**Date Received:**	05/21/18 09:45
Sample Name:	2018HIHCS2	**Basis:**	Dry
Lab Code:	K1804793-005		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.591**	mg/Kg	0.024	0.008	5	06/01/18 10:36	05/31/18	
Copper	200.8	**35.1**	mg/Kg	0.12	0.05	5	06/01/18 10:36	05/31/18	
Lead	200.8	**6.15**	mg/Kg	0.059	0.024	5	06/01/18 10:36	05/31/18	
Mercury	7471B	**0.016**	mg/Kg	0.020	0.002	1	06/11/18 12:36	06/11/18	J
Selenium	200.8	**1.5**	mg/Kg	1.2	0.08	5	06/01/18 10:36	05/31/18	
Zinc	200.8	**91.9**	mg/Kg	0.59	0.24	5	06/01/18 10:36	05/31/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18 10:40
Sample Matrix:	Soil	**Date Received:**	05/21/18 09:45
Sample Name:	2018HIHCS3	**Basis:**	Dry
Lab Code:	K1804793-006		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.791**	mg/Kg	0.026	0.009	5	06/01/18 10:38	05/31/18	
Copper	200.8	**46.1**	mg/Kg	0.13	0.05	5	06/01/18 10:38	05/31/18	
Lead	200.8	**8.67**	mg/Kg	0.064	0.026	5	06/01/18 10:38	05/31/18	
Mercury	7471B	**0.022**	mg/Kg	0.024	0.002	1	06/11/18 12:38	06/11/18	**J**
Selenium	200.8	**2.0**	mg/Kg	1.3	0.09	5	06/01/18 10:38	05/31/18	
Zinc	200.8	**117**	mg/Kg	0.64	0.26	5	06/01/18 10:38	05/31/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18 12:23
Sample Matrix:	Soil	**Date Received:**	05/21/18 09:45
Sample Name:	2018UCS1	**Basis:**	Dry
Lab Code:	K1804793-007		

Total Metals

Analyte Name	Analysis Method	Result		Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.522**		mg/Kg	0.030	0.010	5	06/01/18 10:44	05/31/18	
Copper	200.8	**48.2**		mg/Kg	0.15	0.06	5	06/01/18 10:44	05/31/18	
Lead	200.8	**8.25**		mg/Kg	0.074	0.030	5	06/01/18 10:44	05/31/18	
Mercury	7471B	**0.022**	**J**	mg/Kg	0.027	0.003	1	06/11/18 12:43	06/11/18	
Selenium	200.8	**1.1**	**J**	mg/Kg	1.5	0.1	5	06/01/18 10:44	05/31/18	
Zinc	200.8	**89.3**		mg/Kg	0.74	0.30	5	06/01/18 10:44	05/31/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18 12:33
Sample Matrix:	Soil	**Date Received:**	05/21/18 09:45
Sample Name:	2018UCS2	**Basis:**	Dry
Lab Code:	K1804793-008		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.869**	mg/Kg	0.033	0.012	5	06/01/18 10:46	05/31/18	
Copper	200.8	**56.9**	mg/Kg	0.17	0.07	5	06/01/18 10:46	05/31/18	
Lead	200.8	**11.4**	mg/Kg	0.083	0.033	5	06/01/18 10:46	05/31/18	
Mercury	7471B	**0.030**	mg/Kg	0.025	0.002	1	06/11/18 12:44	06/11/18	
Selenium	200.8	**1.7**	mg/Kg	1.7	0.1	5	06/01/18 10:46	05/31/18	**J**
Zinc	200.8	**129**	mg/Kg	0.83	0.33	5	06/01/18 10:46	05/31/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18 12:40
Sample Matrix:	Soil	**Date Received:**	05/21/18 09:45
Sample Name:	2018UCS3	**Basis:**	Dry
Lab Code:	K1804793-009		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.539**	mg/Kg	0.030	0.010	5	06/01/18 10:48	05/31/18	
Copper	200.8	**47.4**	mg/Kg	0.15	0.06	5	06/01/18 10:48	05/31/18	
Lead	200.8	**8.02**	mg/Kg	0.074	0.030	5	06/01/18 10:48	05/31/18	
Mercury	7471B	**0.035**	mg/Kg	0.029	0.003	1	06/11/18 12:46	06/11/18	
Selenium	200.8	**1.1**	mg/Kg	1.5	0.1	5	06/01/18 10:48	05/31/18	**J**
Zinc	200.8	**88.9**	mg/Kg	0.74	0.30	5	06/01/18 10:48	05/31/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1807093-05		

Total Metals

Analyte Name	Analysis Method	Result		Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	ND	U	mg/Kg	0.020	0.007	5	06/01/18 09:58	05/31/18	
Copper	200.8	ND	U	mg/Kg	0.10	0.04	5	06/01/18 09:58	05/31/18	
Lead	200.8	ND	U	mg/Kg	0.05	0.020	5	06/01/18 09:58	05/31/18	
Selenium	200.8	ND	U	mg/Kg	1.0	0.07	5	06/01/18 09:58	05/31/18	
Zinc	200.8	**0.33**	**J**	mg/Kg	0.5	0.20	5	06/01/18 09:58	05/31/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1807091-03		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Mercury	7471B	ND U	mg/Kg	0.02	0.002	1	06/11/18 12:04	06/11/18	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project	Greens Creek Mine Project	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
		Date Analyzed:	06/01/18

Replicate Sample Summary

Total Metals

Sample Name:	Batch QC	**Units:**	mg/Kg
Lab Code:	K1804762-009	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample KQ1807093-01 Result	Average	RPD	RPD Limit
Cadmium	200.8	0.024	0.008	2.39	2.39	2.39	<1	30
Copper	200.8	0.12	0.05	48.0	60.9	54.5	24	30
Lead	200.8	0.059	0.024	21.7	17.1	19.4	24	30
Selenium	200.8	1.2	0.08	7.6	9.0	8.3	16	30
Zinc	200.8	0.59	0.24	270	305	288	12	30

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

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

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

Printed 6/12/2018 3:50:24 PM Superset Reference:

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project	Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Soil	**Date Received:**	05/21/18
		Date Analyzed:	06/01/18

Replicate Sample Summary

Total Metals

Sample Name:	2018UCS3	**Units:**	mg/Kg
Lab Code:	K1804793-009	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample KQ1807093-03 Result	Average	RPD	RPD Limit
Cadmium	200.8	0.030	0.011	0.539	0.527	0.533	3	30
Copper	200.8	0.15	0.06	47.4	41.7	44.6	13	30
Lead	200.8	0.076	0.030	8.02	8.04	8.03	<1	30
Selenium	200.8	1.5	0.1	1.1 J	1.0 J	1.1	13	30
Zinc	200.8	0.76	0.30	88.9	96.5	92.7	8	30

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

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

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

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project	Greens Creek Mine Project	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
		Date Analyzed:	06/11/18

Replicate Sample Summary

Total Metals

Sample Name:	Batch QC	**Units:**	mg/Kg
Lab Code:	K1804762-009	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample KQ1807091-01 Result	Average	RPD	RPD Limit
Mercury	7471B	0.027	0.003	0.206	0.202	0.204	2	20

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

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

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

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	N/A
Sample Matrix:	Soil	**Date Received:**	N/A
		Date Analyzed:	06/1/18
		Date Extracted:	05/31/18

Matrix Spike Summary
Total Metals

Sample Name:	Batch QC	**Units:**	mg/Kg
Lab Code:	K1804762-009	**Basis:**	Dry
Analysis Method:	200.8		
Prep Method:	EPA 3050B		

Matrix Spike
KQ1807093-02

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	2.39	16.8	13.1	110	70-130
Copper	48.0	144	65.8	147 N	70-130
Lead	21.7	150	131	97	70-130
Selenium	7.6	149	131	107	70-130
Zinc	270	408	131	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.

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

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Soil	**Date Received:**	05/21/18
		Date Analyzed:	06/1/18
		Date Extracted:	05/31/18

Matrix Spike Summary
Total Metals

Sample Name:	2018UCS3	**Units:**	mg/Kg
Lab Code:	K1804793-009	**Basis:**	Dry
Analysis Method:	200.8		
Prep Method:	EPA 3050B		

Matrix Spike
KQ1807093-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	0.539	16.6	15.4	104	70-130
Copper	47.4	123	76.8	98	70-130
Lead	8.02	159	154	98	70-130
Selenium	1.1 J	166	154	107	70-130
Zinc	88.9	242	154	100	70-130

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

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

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

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dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804793
Project:	Greens Creek Mine Project	**Date Collected:**	N/A
Sample Matrix:	Soil	**Date Received:**	N/A
		Date Analyzed:	06/11/18
		Date Extracted:	06/11/18

Matrix Spike Summary
Total Metals

Sample Name:	Batch QC	**Units:**	mg/Kg
Lab Code:	K1804762-009	**Basis:**	Dry
Analysis Method:	7471B		
Prep Method:	Method		

Matrix Spike
KQ1807091-02

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Mercury	0.206	0.996	0.663	119	80-120

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.

Printed 6/12/2018 3:50:25 PM Superset Reference:

Client: Alaska Department of Fish and Game
Project: Greens Creek Mine Project
Sample Matrix: Soil

Service Request: K1804793
Date Analyzed: 06/01/18

Lab Control Sample Summary
Total Metals

Units:mg/Kg
Basis: Dry

Lab Control Sample
KQ1807093-06

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	200.8	217	211	103	70-117
Copper	200.8	172	166	104	71-119
Lead	200.8	116	111	104	71-129
Selenium	200.8	212	191	111	64-122
Zinc	200.8	186	199	94	67-125

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Alaska Department of Fish and Game
Project: Greens Creek Mine Project
Sample Matrix: Soil

Service Request: K1804793
Date Analyzed: 06/11/18

Lab Control Sample Summary
Total Metals

Units:mg/Kg
Basis: Dry

Lab Control Sample
KQ1807091-04

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Mercury	7471B	12.2	11.5	106	60-139

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

June 14, 2018 **Analytical Report for Service Request No:** K1804762

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

RE: 2018 Greens Creek Mine Project Request - ADF&G

Dear Kate,

Enclosed are the results of the sample(s) submitted to our laboratory May 18, 2018
For your reference, these analyses have been assigned our service request number **K1804762.**

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 3356. You may also contact me via email at Kurt.Clarkson@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kurt Clarkson
Sr. 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

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

Inorganic Data Qualifiers

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

Metals Data Qualifiers

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

Organic Data Qualifiers

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

Additional Petroleum Hydrocarbon Specific Qualifiers

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

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

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	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	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	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)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	NA

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

Case Narrative

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

ALS Environmental

Client: Alaska Department of Fish and Game
Project: 2018 Greens Creek Mine Project Request - ADF&G
Sample Matrix: Soil

Service Request: K1804762
Date Received: 05/18/2018

CASE NARRATIVE

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

Sample Receipt:

Nine soil samples were received for analysis at ALS Environmental on 05/18/2018. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

Metals:

Method 200.8, 06/01/2018: The matrix spike recovery of Copper for sample 2018ECS3 was outside control criteria. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. No further corrective action was appropriate.

General Chemistry:

No significant anomalies were noted with this analysis.

Approved by _____ Date 06/14/2018

Chain of Custody

ALS Environmental—Kelso Laboratory
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Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

ALS Environmental

CHAIN OF CUSTODY
89306

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SR# K1804762

COC Set 1 of 1

COC#

1317 South 13th Ave, Kelso, WA 98626 Phone (360) 577-7222 / 800-695-7222 / FAX (360) 636-1068
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Project Name: Greens Creek Mine Project	Project Number:
Project Manager: Kate Kanouse	
Company: Hecla / AK. Dept. of Fish & Game	
Address: 802 3rd St, Douglas, AK 99824	
Phone #: (907) 465-4290	email: Kate.kanouse@alaska.gov
Sampler Signature:	Sampler Printed Name: Greg Albrecht

CLIENT SAMPLE ID	LABID	SAMPLING Date	SAMPLING Time	Matrix	NUMBER OF CONTAINERS	7D 160.4 Modified / TVS	14D PSEP TOC / PSEP TOC T	28D 7471B / Hg	180D 200.8 / Metals T	ASTM D422M / Partsize	999D 160.3 Modified / TS	PSEP Sulfide	2	3	4	5	Remarks
1. 2018ECS1		5/16	1523	Soil	2	✓	✓	✓	✓	✓	✓	✓					
2. 2018ECS2		5/16	1520	Soil	2	✓	✓	✓	✓	✓	✓	✓					
3. 2018ECS3		5/16	1516	Soil	2	✓	✓	✓	✓	✓	✓	✓					
4. 2018PCS1		5/16	1325	Soil	2	✓	✓	✓	✓	✓	✓	✓					
5. 2018PCS2		5/16	1325	Soil	2	✓	✓	✓	✓	✓	✓	✓					
6. 2018PCS3		5/16	1330	Soil	2	✓	✓	✓	✓	✓	✓	✓					
7. 2018ECS1		5/16	1030	Soil	2	✓	✓	✓	✓	✓	✓	✓					
8. 2018ECS2		5/16	1045	Soil	2	✓	✓	✓	✓	✓	✓	✓					
9. 2018ECS3		5/16	1040	Soil	2	✓	✓	✓	✓	✓	✓	✓					
10. XXX																	

Report Requirements

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

Invoice Information

P.O.#

Bill To: Hecla Greens Creek Mining Company

Turnaround Requirements

___ 24 hr. ___ 48 hr.
___ 5 Day
✓ Standard

Requested Report Date

Circle which metals are to be analyzed

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

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

Special Instructions/Comments:

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

Relinquished By:	Received By:	Relinquished By:	Received By:	Relinquished By:	Received By:
Signature:	Signature:	Signature	Signature	Signature	Signature
Printed Name: Greg Albrecht	Printed Name:	Printed Name	Printed Name	Printed Name	Printed Name
Firm: ADF&G	Firm: 5/18/18 0930	Firm	Firm	Firm	Firm
Date/Time: 5/16/18 1610	Date/Time	Date/Time	Date/Time	Date/Time	Date/Time

PC KC

Cooler Receipt and Preservation Form

Client Hecla Service Request *K18* 04762

Received: 5/18/18 Opened: 5/18/18 By: Unloaded: 5/18/18 By:

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 custody seals on coolers? NA Y (N) If yes, how many and where? _____
   If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID (NA)	Tracking Number NA	Filed
1.0	1.0	5.4	5.4	0	384		7725412 7140	

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

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time
* 2018ZCS2	1-4oz 1-16oz			X						
* 2018PCS1	1-16oz			X						

Notes, Discrepancies, & Resolutions:

* Transferred to new jars

Total Solids

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18
Sample Matrix:	Soil	**Date Received:**	05/18/18
Analysis Method:	160.3 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	As Received

Solids, Total

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
2018ZCS1	K1804762-001	**71.7**	-	-	1	05/25/18 16:30	
2018ZCS2	K1804762-002	**64.6**	-	-	1	05/25/18 16:30	
2018ZCS3	K1804762-003	**69.0**	-	-	1	05/25/18 16:30	
2018PCS1	K1804762-004	**62.2**	-	-	1	05/25/18 16:30	
2018PCS2	K1804762-005	**77.2**	-	-	1	05/25/18 16:30	
2018PCS3	K1804762-006	**78.4**	-	-	1	05/25/18 16:30	
2018ECS1	K1804762-007	**69.4**	-	-	1	05/25/18 16:30	
2018ECS2	K1804762-008	**65.8**	-	-	1	05/25/18 16:30	
2018ECS3	K1804762-009	**63.2**	-	-	1	05/25/18 16:30	
Method Blank	K1804762-MB	ND	U	-	-	1	05/25/18 16:30	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18
Sample Matrix:	Soil	**Date Received:**	05/18/18
		Date Analyzed:	05/25/18

Replicate Sample Summary
Inorganic Parameters

Sample Name:	2018ZCS1	**Units:**	Percent
Lab Code:	K1804762-001	**Basis:**	As Received

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample K1804762-001DUP Result	Average	RPD	RPD Limit
Solids, Total	160.3 Modified	-	-	71.7	72.9	72.3	2	20

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

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

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18
Sample Matrix:	Soil	**Date Received:**	05/18/18
Analysis Method:	160.4 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	Dry, per Method

Solids, Total Volatile

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
2018ZCS1	K1804762-001	**3.80**	0.10	-	1	05/25/18 16:30	*
2018ZCS2	K1804762-002	**5.30**	0.10	-	1	05/25/18 16:30	*
2018ZCS3	K1804762-003	**3.90**	0.10	-	1	05/25/18 16:30	*
2018PCS1	K1804762-004	**3.30**	0.10	-	1	05/25/18 16:30	*
2018PCS2	K1804762-005	**2.90**	0.10	-	1	05/25/18 16:30	*
2018PCS3	K1804762-006	**3.30**	0.10	-	1	05/25/18 16:30	*
2018ECS1	K1804762-007	**5.40**	0.10	-	1	05/25/18 16:30	*
2018ECS2	K1804762-008	**5.60**	0.10	-	1	05/25/18 16:30	*
2018ECS3	K1804762-009	**4.90**	0.10	-	1	05/25/18 16:30	*
Method Blank	K1804762-MB1	ND U	0.10	-	1	05/25/18 16:30	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18
Sample Matrix:	Soil	**Date Received:**	05/18/18
		Date Analyzed:	05/25/18

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	2018ZCS1	**Units:**	Percent
Lab Code:	K1804762-001	**Basis:**	Dry, per Method

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample K1804762-001DUP Result	Average	RPD	RPD Limit
Solids, Total Volatile	160.4 Modified	0.10	-	3.80	4.00	3.90	5	20

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General Chemistry

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF	**Date Collected:**	5/16/2018
Sample Matrix:	Soil	**Date Received:**	5/18/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018ZCS1
Lab Code: K1804762-001

Sand Fraction:	Dry Weight (Grams)	59.2011
Sand Fraction:	Weight Recovered (Grams)	59.1594
Sand Fraction:	Percent Recovery	99.93

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.6103	1.04
Gravel, Fine	-2 Ø to -1 Ø	10.4037	17.75
Sand, Very Coarse	-1 to 0 Ø	26.1896	44.68
Sand, Coarse	0 to 1 Ø	14.8591	25.35
Sand, Medium	1 to 2 Ø	4.4243	7.55
Sand, Fine	2 to 3 Ø	2.0971	3.58
Sand, Very Fine	3 to 4 Ø	0.3650	0.62
75.0 µm	4 Ø	0.4850	0.83
31.3 µm	5 Ø	0.3600	0.61
15.6 µm	6 Ø	0.1550	0.26
7.8 µm	7 Ø	0.1200	0.20
3.9 µm	8 Ø	0.1100	0.19
1.95 µm	9 Ø	0.0150	0.03
0.98 µm	> 10 Ø	0.0000	0.00
		60.1941	102.70

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF	**Date Collected:**	5/16/2018
Sample Matrix:	Soil	**Date Received:**	5/18/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018ZCS2
Lab Code: K1804762-002

Sand Fraction:	Dry Weight (Grams)	57.3906
Sand Fraction:	Weight Recovered (Grams)	57.2614
Sand Fraction:	Percent Recovery	99.77

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0000	0.00
Gravel, Fine	-2 Ø to -1 Ø	3.7091	6.23
Sand, Very Coarse	-1 to 0 Ø	19.8975	33.40
Sand, Coarse	0 to 1 Ø	22.3433	37.51
Sand, Medium	1 to 2 Ø	8.0894	13.58
Sand, Fine	2 to 3 Ø	2.5598	4.30
Sand, Very Fine	3 to 4 Ø	0.4286	0.72
75.0 µm	4 Ø	0.4750	0.80
31.3 µm	5 Ø	0.4450	0.75
15.6 µm	6 Ø	0.3100	0.52
7.8 µm	7 Ø	0.1350	0.23
3.9 µm	8 Ø	0.1050	0.18
1.95 µm	9 Ø	0.0150	0.03
0.98 µm	> 10 Ø	0.0000	0.00
		58.5127	98.23

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF	**Date Collected:**	5/16/2018
Sample Matrix:	Soil	**Date Received:**	5/18/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018ZCS3
Lab Code: K1804762-003

Sand Fraction:	Dry Weight (Grams)	56.9416
Sand Fraction:	Weight Recovered (Grams)	56.9361
Sand Fraction:	Percent Recovery	99.99

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	5.8452	10.68
Gravel, Fine	-2 Ø to -1 Ø	7.8446	14.33
Sand, Very Coarse	-1 to 0 Ø	19.3084	35.28
Sand, Coarse	0 to 1 Ø	18.0094	32.91
Sand, Medium	1 to 2 Ø	4.5480	8.31
Sand, Fine	2 to 3 Ø	1.2345	2.26
Sand, Very Fine	3 to 4 Ø	0.1131	0.21
75.0 µm	4 Ø	0.1450	0.26
31.3 µm	5 Ø	0.0500	0.09
15.6 µm	6 Ø	0.0250	0.05
7.8 µm	7 Ø	0.0150	0.03
3.9 µm	8 Ø	0.0300	0.05
1.95 µm	9 Ø	0.0550	0.10
0.98 µm	> 10 Ø	0.0150	0.03
		57.2382	104.58

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF	**Date Collected:**	5/16/2018
Sample Matrix:	Soil	**Date Received:**	5/18/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018PCS1
Lab Code: K1804762-004

Sand Fraction:	Dry Weight (Grams)	32.3366
Sand Fraction:	Weight Recovered (Grams)	32.2463
Sand Fraction:	Percent Recovery	99.72

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.5540	1.44
Gravel, Fine	-2 Ø to -1 Ø	3.1245	8.12
Sand, Very Coarse	-1 to 0 Ø	10.1618	26.41
Sand, Coarse	0 to 1 Ø	8.6104	22.38
Sand, Medium	1 to 2 Ø	5.4644	14.20
Sand, Fine	2 to 3 Ø	3.1764	8.26
Sand, Very Fine	3 to 4 Ø	0.7688	2.00
75.0 µm	4 Ø	1.4950	3.89
31.3 µm	5 Ø	0.8250	2.14
15.6 µm	6 Ø	0.8500	2.21
7.8 µm	7 Ø	0.4900	1.27
3.9 µm	8 Ø	0.5450	1.42
1.95 µm	9 Ø	0.4550	1.18
0.98 µm	> 10 Ø	0.9550	2.48
		37.4753	97.40

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF	**Date Collected:**	5/16/2018
Sample Matrix:	Soil	**Date Received:**	5/18/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018PCS2
Lab Code: K1804762-005

Sand Fraction:	Dry Weight (Grams)	45.5353
Sand Fraction:	Weight Recovered (Grams)	45.4518
Sand Fraction:	Percent Recovery	99.82

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	2.4042	5.02
Gravel, Fine	-2 Ø to -1 Ø	7.9718	16.64
Sand, Very Coarse	-1 to 0 Ø	15.2956	31.92
Sand, Coarse	0 to 1 Ø	12.3321	25.74
Sand, Medium	1 to 2 Ø	4.3260	9.03
Sand, Fine	2 to 3 Ø	2.2864	4.77
Sand, Very Fine	3 to 4 Ø	0.5640	1.18
75.0 µm	4 Ø	1.3100	2.73
31.3 µm	5 Ø	0.6450	1.35
15.6 µm	6 Ø	0.3400	0.71
7.8 µm	7 Ø	0.2450	0.51
3.9 µm	8 Ø	0.2650	0.55
1.95 µm	9 Ø	0.1850	0.39
0.98 µm	> 10 Ø	0.4450	0.93
		48.6151	101.47

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF	**Date Collected:**	5/16/2018
Sample Matrix:	Soil	**Date Received:**	5/18/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018PCS3
Lab Code: K1804762-006

Sand Fraction:	Dry Weight (Grams)	47.9433
Sand Fraction:	Weight Recovered (Grams)	47.9128
Sand Fraction:	Percent Recovery	99.94

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.2647	0.50
Gravel, Fine	-2 Ø to -1 Ø	2.3401	4.38
Sand, Very Coarse	-1 to 0 Ø	11.0863	20.77
Sand, Coarse	0 to 1 Ø	19.5636	36.65
Sand, Medium	1 to 2 Ø	9.1739	17.18
Sand, Fine	2 to 3 Ø	4.7550	8.91
Sand, Very Fine	3 to 4 Ø	0.5564	1.04
75.0 µm	4 Ø	0.7850	1.47
31.3 µm	5 Ø	0.5150	0.96
15.6 µm	6 Ø	0.3700	0.69
7.8 µm	7 Ø	0.2250	0.42
3.9 µm	8 Ø	0.1250	0.23
1.95 µm	9 Ø	0.1100	0.21
0.98 µm	> 10 Ø	0.1950	0.37
		50.0650	93.78

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF	**Date Collected:**	5/16/2018
Sample Matrix:	Soil	**Date Received:**	5/18/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018ECS1
Lab Code: K1804762-007

Sand Fraction:	Dry Weight (Grams)	42.3738
Sand Fraction:	Weight Recovered (Grams)	42.4255
Sand Fraction:	Percent Recovery	100.12

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.5804	1.21
Gravel, Fine	-2 Ø to -1 Ø	2.3478	4.89
Sand, Very Coarse	-1 to 0 Ø	6.9674	14.50
Sand, Coarse	0 to 1 Ø	11.3050	23.52
Sand, Medium	1 to 2 Ø	10.8868	22.65
Sand, Fine	2 to 3 Ø	8.8196	18.35
Sand, Very Fine	3 to 4 Ø	0.9946	2.07
75.0 µm	4 Ø	0.9550	1.99
31.3 µm	5 Ø	0.4850	1.01
15.6 µm	6 Ø	0.2650	0.55
7.8 µm	7 Ø	0.0550	0.11
3.9 µm	8 Ø	0.0850	0.18
1.95 µm	9 Ø	0.0950	0.20
0.98 µm	> 10 Ø	0.0100	0.02
		43.8516	91.25

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF	**Date Collected:**	5/16/2018
Sample Matrix:	Soil	**Date Received:**	5/18/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018ECS2
Lab Code: K1804762-008

Sand Fraction:	Dry Weight (Grams)	42.8225
Sand Fraction:	Weight Recovered (Grams)	42.7801
Sand Fraction:	Percent Recovery	99.90

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	1.2992	2.79
Gravel, Fine	-2 Ø to -1 Ø	1.9487	4.19
Sand, Very Coarse	-1 to 0 Ø	9.1848	19.76
Sand, Coarse	0 to 1 Ø	12.5655	27.03
Sand, Medium	1 to 2 Ø	10.1269	21.78
Sand, Fine	2 to 3 Ø	6.5626	14.12
Sand, Very Fine	3 to 4 Ø	0.7443	1.60
75.0 µm	4 Ø	0.6250	1.34
31.3 µm	5 Ø	0.4600	0.99
15.6 µm	6 Ø	0.0850	0.18
7.8 µm	7 Ø	0.0650	0.14
3.9 µm	8 Ø	0.0450	0.10
1.95 µm	9 Ø	0.0250	0.05
0.98 µm	> 10 Ø	0.0600	0.13
		43.7970	94.20

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF	**Date Collected:**	5/16/2018
Sample Matrix:	Soil	**Date Received:**	5/18/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018ECS3
Lab Code: K1804762-009

Sand Fraction:	Dry Weight (Grams)	39.0380
Sand Fraction:	Weight Recovered (Grams)	39.0323
Sand Fraction:	Percent Recovery	99.99

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.6419	1.58
Gravel, Fine	-2 Ø to -1 Ø	3.2734	8.07
Sand, Very Coarse	-1 to 0 Ø	6.6196	16.33
Sand, Coarse	0 to 1 Ø	10.9001	26.89
Sand, Medium	1 to 2 Ø	8.6817	21.41
Sand, Fine	2 to 3 Ø	7.2983	18.00
Sand, Very Fine	3 to 4 Ø	1.0353	2.55
75.0 µm	4 Ø	1.1050	2.73
31.3 µm	5 Ø	0.5300	1.31
15.6 µm	6 Ø	0.1750	0.43
7.8 µm	7 Ø	0.1500	0.37
3.9 µm	8 Ø	0.0550	0.14
1.95 µm	9 Ø	0.0100	0.02
0.98 µm	> 10 Ø	0.0100	0.02
		40.4853	99.86

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF	**Date Collected:**	5/16/2018
Sample Matrix:	Soil	**Date Received:**	5/18/2018
		Date Analyzed:	5/29/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018ECS3
Lab Code: K1804762-009DUP

Sand Fraction:	Dry Weight (Grams)	41.3032
Sand Fraction:	Weight Recovered (Grams)	41.3010
Sand Fraction:	Percent Recovery	99.99

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	1.6547	3.96
Gravel, Fine	-2 Ø to -1 Ø	4.6384	11.10
Sand, Very Coarse	-1 to 0 Ø	7.6001	18.19
Sand, Coarse	0 to 1 Ø	11.2608	26.96
Sand, Medium	1 to 2 Ø	8.5138	20.38
Sand, Fine	2 to 3 Ø	6.1799	14.79
Sand, Very Fine	3 to 4 Ø	1.0022	2.40
75.0 µm	4 Ø	1.0950	2.62
31.3 µm	5 Ø	0.4700	1.13
15.6 µm	6 Ø	0.1950	0.47
7.8 µm	7 Ø	0.0500	0.12
3.9 µm	8 Ø	0.1600	0.38
1.95 µm	9 Ø	0.0200	0.05
0.98 µm	> 10 Ø	0.0350	0.08
		42.8749	102.63

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18
Sample Matrix:	Soil	**Date Received:**	05/18/18
Analysis Method:	PSEP Sulfide	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry

Sulfide, Total

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
2018ZCS1	K1804762-001	ND U	2.7	0.9	1	05/22/18 17:56	5/22/18	
2018ZCS2	K1804762-002	ND U	2.8	0.9	1	05/22/18 17:56	5/22/18	
2018ZCS3	K1804762-003	ND U	2.8	0.9	1	05/22/18 17:56	5/22/18	
2018PCS1	K1804762-004	ND U	2.4	0.8	1	05/22/18 17:56	5/22/18	
2018PCS2	K1804762-005	**1.0 J**	2.1	0.7	1	05/22/18 17:56	5/22/18	
2018PCS3	K1804762-006	ND U	2.1	0.7	1	05/23/18 18:24	5/23/18	
2018ECS1	K1804762-007	ND U	2.7	0.9	1	05/23/18 18:24	5/23/18	
2018ECS2	K1804762-008	**0.8 J**	2.1	0.7	1	05/23/18 18:24	5/23/18	
2018ECS3	K1804762-009	ND U	3.0	0.97	1	05/23/18 18:24	5/23/18	
Method Blank	K1804762-MB1	ND U	1.0	0.3	1	05/22/18 17:56	5/22/18	
Method Blank	K1804762-MB2	ND U	1.0	0.3	1	05/23/18 18:24	5/23/18	

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18
Sample Matrix:	Soil	**Date Received:**	05/18/18
		Date Analyzed:	05/23/18

Triplicate Sample Summary
General Chemistry Parameters

Sample Name:	2018PCS3	**Units:**	mg/Kg
Lab Code:	K1804762-006	**Basis:**	Dry
Analysis Method:	PSEP Sulfide		
Prep Method:	Method		

Analyte Name	MRL	MDL	Sample Result	Duplicate K1804762-006DUP Result	Triplicate K1804762-006TRP Result	Average	RSD	RSD Limit
Sulfide, Total	1.9	0.6	ND	ND	ND	NC	NC	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.

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18
Sample Matrix:	Soil	**Date Received:**	05/18/18
		Date Analyzed:	05/23/18
		Date Extracted:	05/23/18

Duplicate Matrix Spike Summary
Sulfide, Total

Sample Name:	2018PCS3	**Units:**	mg/Kg
Lab Code:	K1804762-006	**Basis:**	Dry
Analysis Method:	PSEP Sulfide		
Prep Method:	Method		

		Matrix Spike K1804762-006MS			Duplicate Matrix Spike K1804762-006DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Sulfide, Total	ND U	670	720	93	670	710	94	28-175	1	20

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

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

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

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Analyzed:**	05/22/18
Sample Matrix:	Soil	**Date Extracted:**	05/22/18

Lab Control Sample Summary
Sulfide, Total

Analysis Method:	PSEP Sulfide	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry
		Analysis Lot:	592097

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1804762-LCS1	397	410	97	39-166

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Analyzed:**	05/23/18
Sample Matrix:	Soil	**Date Extracted:**	05/23/18

Lab Control Sample Summary
Sulfide, Total

Analysis Method:	PSEP Sulfide	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry
		Analysis Lot:	592192

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1804762-LCS2	421	390	108	39-166

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18
Sample Matrix:	Soil	**Date Received:**	05/18/18
Analysis Method:	PSEP TOC	**Units:**	Percent
Prep Method:	ALS SOP	**Basis:**	Dry, per Method

Carbon, Total Organic (TOC)

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
2018ZCS1	K1804762-001	**0.915**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018ZCS2	K1804762-002	**1.10**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018ZCS3	K1804762-003	**0.745**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018PCS1	K1804762-004	**0.722**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018PCS2	K1804762-005	**0.608**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018PCS3	K1804762-006	**0.674**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018ECS1	K1804762-007	**2.64**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018ECS2	K1804762-008	**2.95**	0.050	0.020	1	05/29/18 14:15	5/29/18	
2018ECS3	K1804762-009	**2.58**	0.050	0.020	1	05/29/18 14:15	5/29/18	
Method Blank	K1804762-MB1	ND U	0.050	0.020	1	05/29/18 14:15	5/29/18	

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Analyzed:**	05/29/18
Sample Matrix:	Soil	**Date Extracted:**	05/29/18

Lab Control Sample Summary
Carbon, Total Organic (TOC)

Analysis Method:	PSEP TOC	**Units:**	Percent
Prep Method:	ALS SOP	**Basis:**	Dry, per Method
		Analysis Lot:	592766

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1804762-LCS1	0.568	0.603	94	74-118

Metals

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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:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18 15:23
Sample Matrix:	Soil	**Date Received:**	05/18/18 09:30
Sample Name:	2018ZCS1	**Basis:**	Dry
Lab Code:	K1804762-001		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**2.13**	mg/Kg	0.027	0.010	5	06/01/18 10:02	05/31/18	
Copper	200.8	**31.1**	mg/Kg	0.14	0.05	5	06/01/18 10:02	05/31/18	
Lead	200.8	**11.5**	mg/Kg	0.069	0.027	5	06/01/18 10:02	05/31/18	
Mercury	7471B	**0.030**	mg/Kg	0.026	0.003	1	06/11/18 12:07	06/11/18	
Selenium	200.8	**1.5**	mg/Kg	1.4	0.10	5	06/01/18 10:02	05/31/18	
Zinc	200.8	**325**	mg/Kg	0.69	0.27	5	06/01/18 10:02	05/31/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18 15:20
Sample Matrix:	Soil	**Date Received:**	05/18/18 09:30
Sample Name:	2018ZCS2	**Basis:**	Dry
Lab Code:	K1804762-002		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**6.08**	mg/Kg	0.030	0.011	5	06/01/18 10:04	05/31/18	
Copper	200.8	**62.3**	mg/Kg	0.15	0.06	5	06/01/18 10:04	05/31/18	
Lead	200.8	**248**	mg/Kg	0.076	0.030	5	06/01/18 10:04	05/31/18	
Mercury	7471B	**0.054**	mg/Kg	0.031	0.003	1	06/11/18 12:09	06/11/18	
Selenium	200.8	**2.3**	mg/Kg	1.5	0.1	5	06/01/18 10:04	05/31/18	
Zinc	200.8	**663**	mg/Kg	0.76	0.30	5	06/01/18 10:04	05/31/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18 15:16
Sample Matrix:	Soil	**Date Received:**	05/18/18 09:30
Sample Name:	2018ZCS3	**Basis:**	Dry
Lab Code:	K1804762-003		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.53**	mg/Kg	0.027	0.010	5	06/01/18 10:06	05/31/18	
Copper	200.8	**26.2**	mg/Kg	0.14	0.05	5	06/01/18 10:06	05/31/18	
Lead	200.8	**15.9**	mg/Kg	0.068	0.027	5	06/01/18 10:06	05/31/18	
Mercury	7471B	**0.030**	mg/Kg	0.028	0.003	1	06/11/18 12:10	06/11/18	
Selenium	200.8	**3.8**	mg/Kg	1.4	0.10	5	06/01/18 10:06	05/31/18	
Zinc	200.8	**286**	mg/Kg	0.68	0.27	5	06/01/18 10:06	05/31/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18 13:25
Sample Matrix:	Soil	**Date Received:**	05/18/18 09:30
Sample Name:	2018PCS1	**Basis:**	Dry
Lab Code:	K1804762-004		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.283**	mg/Kg	0.031	0.011	5	06/01/18 10:08	05/31/18	
Copper	200.8	**43.7**	mg/Kg	0.15	0.06	5	06/01/18 10:08	05/31/18	
Lead	200.8	**7.45**	mg/Kg	0.076	0.031	5	06/01/18 10:08	05/31/18	
Mercury	7471B	**0.018 J**	mg/Kg	0.029	0.003	1	06/11/18 12:12	06/11/18	
Selenium	200.8	**0.5 J**	mg/Kg	1.5	0.1	5	06/01/18 10:08	05/31/18	
Zinc	200.8	**110**	mg/Kg	0.76	0.31	5	06/01/18 10:08	05/31/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18 13:25
Sample Matrix:	Soil	**Date Received:**	05/18/18 09:30
Sample Name:	2018PCS2	**Basis:**	Dry
Lab Code:	K1804762-005		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.194**	mg/Kg	0.021	0.007	5	06/01/18 10:10	05/31/18	
Copper	200.8	**24.1**	mg/Kg	0.10	0.04	5	06/01/18 10:10	05/31/18	
Lead	200.8	**5.09**	mg/Kg	0.052	0.021	5	06/01/18 10:10	05/31/18	
Mercury	7471B	**0.016 J**	mg/Kg	0.024	0.002	1	06/11/18 12:14	06/11/18	
Selenium	200.8	**0.4 J**	mg/Kg	1.0	0.07	5	06/01/18 10:10	05/31/18	
Zinc	200.8	**77.6**	mg/Kg	0.52	0.21	5	06/01/18 10:10	05/31/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18 13:30
Sample Matrix:	Soil	**Date Received:**	05/18/18 09:30
Sample Name:	2018PCS3	**Basis:**	Dry
Lab Code:	K1804762-006		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.205**	mg/Kg	0.022	0.008	5	06/01/18 10:12	05/31/18	
Copper	200.8	**26.4**	mg/Kg	0.11	0.04	5	06/01/18 10:12	05/31/18	
Lead	200.8	**5.18**	mg/Kg	0.055	0.022	5	06/01/18 10:12	05/31/18	
Mercury	7471B	**0.036**	mg/Kg	0.023	0.002	1	06/11/18 12:15	06/11/18	
Selenium	200.8	**0.3 J**	mg/Kg	1.1	0.08	5	06/01/18 10:12	05/31/18	
Zinc	200.8	**80.5**	mg/Kg	0.55	0.22	5	06/01/18 10:12	05/31/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18 10:30
Sample Matrix:	Soil	**Date Received:**	05/18/18 09:30
Sample Name:	2018ECS1	**Basis:**	Dry
Lab Code:	K1804762-007		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**3.20**	mg/Kg	0.024	0.009	5	06/01/18 10:14	05/31/18	
Copper	200.8	**54.7**	mg/Kg	0.12	0.05	5	06/01/18 10:14	05/31/18	
Lead	200.8	**21.1**	mg/Kg	0.061	0.024	5	06/01/18 10:14	05/31/18	
Mercury	7471B	**0.263**	mg/Kg	0.027	0.003	1	06/11/18 12:17	06/11/18	
Selenium	200.8	**8.9**	mg/Kg	1.2	0.09	5	06/01/18 10:14	05/31/18	
Zinc	200.8	**296**	mg/Kg	0.61	0.24	5	06/01/18 10:14	05/31/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18 10:45
Sample Matrix:	Soil	**Date Received:**	05/18/18 09:30
Sample Name:	2018ECS2	**Basis:**	Dry
Lab Code:	K1804762-008		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.38**	mg/Kg	0.028	0.010	5	06/01/18 10:16	05/31/18	
Copper	200.8	**47.2**	mg/Kg	0.14	0.06	5	06/01/18 10:16	05/31/18	
Lead	200.8	**14.0**	mg/Kg	0.069	0.028	5	06/01/18 10:16	05/31/18	
Mercury	7471B	**0.162**	mg/Kg	0.028	0.003	1	06/11/18 12:18	06/11/18	
Selenium	200.8	**7.9**	mg/Kg	1.4	0.10	5	06/01/18 10:16	05/31/18	
Zinc	200.8	**218**	mg/Kg	0.69	0.28	5	06/01/18 10:16	05/31/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18 10:40
Sample Matrix:	Soil	**Date Received:**	05/18/18 09:30
Sample Name:	2018ECS3	**Basis:**	Dry
Lab Code:	K1804762-009		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**2.39**	mg/Kg	0.023	0.008	5	06/01/18 10:22	05/31/18	
Copper	200.8	**48.0**	mg/Kg	0.11	0.05	5	06/01/18 10:22	05/31/18	
Lead	200.8	**21.7**	mg/Kg	0.057	0.023	5	06/01/18 10:22	05/31/18	
Mercury	7471B	**0.206**	mg/Kg	0.025	0.002	1	06/11/18 12:23	06/11/18	
Selenium	200.8	**7.6**	mg/Kg	1.1	0.08	5	06/01/18 10:22	05/31/18	
Zinc	200.8	**270**	mg/Kg	0.57	0.23	5	06/01/18 10:22	05/31/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1807093-05		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	ND U	mg/Kg	0.020	0.007	5	06/01/18 09:58	05/31/18	
Copper	200.8	ND U	mg/Kg	0.10	0.04	5	06/01/18 09:58	05/31/18	
Lead	200.8	ND U	mg/Kg	0.05	0.020	5	06/01/18 09:58	05/31/18	
Selenium	200.8	ND U	mg/Kg	1.0	0.07	5	06/01/18 09:58	05/31/18	
Zinc	200.8	**0.33 J**	mg/Kg	0.5	0.20	5	06/01/18 09:58	05/31/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1807091-03		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Mercury	7471B	ND U	mg/Kg	0.02	0.002	1	06/11/18 12:04	06/11/18	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18
Sample Matrix:	Soil	**Date Received:**	05/18/18
		Date Analyzed:	06/01/18

Replicate Sample Summary

Total Metals

Sample Name:	2018ECS3	**Units:**	mg/Kg
Lab Code:	K1804762-009	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample KQ1807093-01 Result	Average	RPD	RPD Limit
Cadmium	200.8	0.024	0.008	2.39	2.39	2.39	<1	30
Copper	200.8	0.12	0.05	48.0	60.9	54.5	24	30
Lead	200.8	0.059	0.024	21.7	17.1	19.4	24	30
Selenium	200.8	1.2	0.08	7.6	9.0	8.3	16	30
Zinc	200.8	0.59	0.24	270	305	288	12	30

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

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

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

Printed 6/13/2018 3:45:16 PM Superset Reference:

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18
Sample Matrix:	Soil	**Date Received:**	05/18/18
		Date Analyzed:	06/11/18

Replicate Sample Summary

Total Metals

Sample Name:	2018ECS3	**Units:**	mg/Kg
Lab Code:	K1804762-009	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample KQ1807091-01 Result	Average	RPD	RPD Limit
Mercury	7471B	0.027	0.003	0.206	0.202	0.204	2	20

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

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

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

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18
Sample Matrix:	Soil	**Date Received:**	05/18/18
		Date Analyzed:	06/1/18
		Date Extracted:	05/31/18

Matrix Spike Summary
Total Metals

Sample Name:	2018ECS3	**Units:**	mg/Kg
Lab Code:	K1804762-009	**Basis:**	Dry
Analysis Method:	200.8		
Prep Method:	EPA 3050B		

Matrix Spike
KQ1807093-02

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	2.39	16.8	13.1	110	70-130
Copper	48.0	144	65.8	147 N	70-130
Lead	21.7	150	131	97	70-130
Selenium	7.6	149	131	107	70-130
Zinc	270	408	131	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.

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 Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	05/16/18
Sample Matrix:	Soil	**Date Received:**	05/18/18
		Date Analyzed:	06/11/18
		Date Extracted:	06/11/18

Matrix Spike Summary
Total Metals

Sample Name:	2018ECS3	**Units:**	mg/Kg
Lab Code:	K1804762-009	**Basis:**	Dry
Analysis Method:	7471B		
Prep Method:	Method		

Matrix Spike
KQ1807091-02

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Mercury	0.206	0.996	0.663	119	80-120

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

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

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

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QA/QC Report

Client: Alaska Department of Fish and Game
Project: 2018 Greens Creek Mine Project Request - ADF&G
Sample Matrix: Soil

Service Request: K1804762
Date Analyzed: 06/01/18

Lab Control Sample Summary
Total Metals

Units:mg/Kg
Basis: Dry

Lab Control Sample
KQ1807093-06

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	200.8	217	211	103	70-117
Copper	200.8	172	166	104	71-119
Lead	200.8	116	111	104	71-129
Selenium	200.8	212	191	111	64-122
Zinc	200.8	186	199	94	67-125

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1804762
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Analyzed:**	06/11/18
Sample Matrix:	Soil		

Lab Control Sample Summary
Total Metals

Units:mg/Kg
Basis: Dry

Lab Control Sample
KQ1807091-04

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Mercury	7471B	12.2	11.5	106	60-139

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

August 30, 2018 **Analytical Report for Service Request No:** K1806728

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

RE: Greens Creek Mine Project

Dear Kate,

Enclosed are the results of the sample(s) submitted to our laboratory July 18, 2018
For your reference, these analyses have been assigned our service request number **K1806728.**

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 3356. You may also contact me via email at Kurt.Clarkson@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kurt Clarkson
Sr. 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

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

Inorganic Data Qualifiers

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

Metals Data Qualifiers

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

Organic Data Qualifiers

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

Additional Petroleum Hydrocarbon Specific Qualifiers

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

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

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	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	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	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)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	NA

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

Case Narrative

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

ALS Environmental

Client: Alaska Department of Fish and Game
Project: Greens Creek Mine Project
Sample Matrix: Soil

Service Request: K1806728
Date Received: 07/18/2018

CASE NARRATIVE

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

Sample Receipt:

Fifteen soil samples were received for analysis at ALS Environmental on 07/18/2018. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

Metals:

No significant anomalies were noted with this analysis.

General Chemistry:

Method PSEP Sulfide, 07/19/2018:The Relative Percent Difference (RPD) for Total Sulfide in the replicate matrix spike analyses of sample 2018CC-S1 was outside control criteria. The associated QA/QC results (e.g. control sample, matrix spikes, method blank, calibration standards, etc.) indicate the analysis was in control. No further corrective action was appropriate.

Method PSEP Sulfide, 08/29/2018:Samples 2018GC48-S1, 2018GC48-S2, 2018GC48-S3, 2018GC54-S1, 2018GC54-S2 and 2018GC54-S3 for Total Sulfide were received past holding time. The analysis was performed as soon as possible after receipt by the laboratory. The data was flagged to indicate the holding time violation.
Method PSEP Sulfide, 08/29/2018:The Relative Standard Difference (RSD) criterion for the replicate analysis of Total Sulfide in sample 2018GC48-S1 was not applicable because the analyte concentration was not significantly greater than the Method Reporting Limit (MRL). Analytical values derived from measurements close to the detection limit are not subject to the same accuracy and precision criteria as results derived from measurements higher on the calibration range for the method.

Approved by _____ Date 08/30/2018

Chain of Custody

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

ALS Environmental

CHAIN OF CUSTODY

SR# K1806728

1317 South 13th Ave., Kelso, WA 98626 | +1 360 577 7222 | +1 800 695 7222 | +1 360 636 1068 (fax)

PAGE 1 OF 2 COC# ____

PROJECT NAME: Greens Creek Mine Project
PROJECT NUMBER:
PROJECT MANAGER: Kate Kanouse
COMPANY NAME: ADF+G Division of Habitat
ADDRESS: 802 3rd St.
CITY/STATE/ZIP: Douglas, AK ~~99801~~ 99824
E-MAIL ADDRESS: kate.kanouse@alaska.gov
PHONE #: 907-465-4290 FAX #:
SAMPLER'S SIGNATURE: [signature]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS		Semivolatile Organics by GC/MS 625☐ 8270☐ 8270LL☐ SIM PAH☐	Volatile Organics 624☐ 8260☐ 8021☐ BTEX☐	Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐	Oil & Grease/TRPH 1664 HEM☐ 1664 SGT☐	PCBs Aroclors☐ Congeners☐	Pesticides/Herbicides 608☐ 8081☐ 8141☐ 8151☐	Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐	Metals, Total or Dissolved (See List below) 200.8	Cyanide☐ Hex-Chrom☐	(circle) pH, Cond., Cl, SO4, PO4, F, NO2, NO3, BOD, TSS, TDS, Turb.	(circle) NH3-N, COD, TKN, TOC, DOC, NO2+NO3, T-Phos	TOX 9020☐ AOX 1650☐ 506☐	Alkalinity☐ CO3☐ HCO3☐	~~Dioxins/Furans 1613☐ 8290☐~~ ASTM D4222M	Dissolved Gases RSK 175☐ Methane☐ Ethane☐ Ethene☐ CO2☐	160.4 Mod TVS	PSEP TOC	PSEP Sulfide	160.3 Mod TS	REMARKS
2018GC48-S1	7/11/18	1010		soil	2									✓						✓		✓	✓	✓	✓	
2018GC48-S2	7/11/18	1010		soil	2									✓						✓		✓	✓	✓	✓	
2018GC48-S3	7/11/18	1010		soil	2									✓						✓		✓	✓	✓	✓	
2018GC54-S1	7/10/18	1115		soil	2									✓						✓		✓	✓	✓	✓	
2018GC54-S2	7/10/18	1115		soil	2									✓						✓		✓	✓	✓	✓	
2018GC54-S3	7/10/18	1115		soil	2									✓						✓		✓	✓	✓	✓	
2018CC-S1	7/12/18	1520		soil	2									✓						✓		✓	✓	✓	✓	
2018CC-S2	7/12/18	1520		soil	2									✓						✓		✓	✓	✓	✓	
2018CC-S3	7/12/18	1520		soil	2									✓						✓		✓	✓	✓	✓	

REPORT REQUIREMENTS

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

INVOICE INFORMATION

P.O. # ____
Bill To: Hecla
cwallace@hecla-mining.com

TURNAROUND REQUIREMENTS

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

____ Requested Report Date

Circle which metals are to be analyzed:

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

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

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

SPECIAL INSTRUCTIONS/COMMENTS:

for Hg use 7471B

samples shipped in 2 coolers w/ copies of COCs in both

Container Supply Number 79921

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

RELINQUISHED BY:		RECEIVED BY:		RELINQUISHED BY:		RECEIVED BY:	
[signature]	7/17/18 1000	[signature]	7-18-18 0950				
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
Kate Kanouse	ADF&G	David Hudson	ALSK				
Printed Name	Firm	Printed Name	Firm	Printed Name	Firm	Printed Name	Firm

CHAIN OF CUSTODY

SR# K1806728

ALS Environmental
1317 South 13th Ave., Kelso, WA 98626 | +1 360 577 7222 | +1 800 695 7222 | +1 360 636 1068 (fax)

PAGE 2 OF 2 COC#

PROJECT NAME: Greens Creek Mine Project
PROJECT NUMBER:
PROJECT MANAGER: Kate Kanouse
COMPANY NAME: ADF&G Division of Habitat
ADDRESS: 802 3rd St
CITY/STATE/ZIP: Douglas, AK 99824
E-MAIL ADDRESS: kate.kanouse@alaska.gov
PHONE #: 907-465-4290 FAX #:
SAMPLER'S SIGNATURE:

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Metals, Total or Dissolved (See List below)	Cyanide ☐	Hex-Chrom ☐	(circle) pH, Cond., Cl, SO4, PO4, F, NO2, NO3, BOD, TSS, TDS, Turb.	(circle) NH3-N, COD, TKN, TOC, DOC, NO2+NO3, T-Phos	TOX 9020 ☐	AOX 1650 ☐ 506 ☐	Alkalinity ☐ CO_3 ☐ HCO_3 ☐	Dissolved Gases CO_2 ☐ RSK 175 ☐ Methane ☐ Ethane ☐ Ethene ☐	1600.4 Mod TVS	PSEP TOC	PSEP Sulfide	1600.3 Mod TS	REMARKS
2018TC9-S1	7/12/18	1410		soil	2	✓								✓	✓	✓	✓		
2018TC9-S2	7/12/18	1410		soil	2	✓								✓	✓	✓	✓		
2018TC9-S3	7/12/18	1410		soil	2	✓								✓	✓	✓	✓		
2018TC1847-S1	7/12/18	1100		soil	2	✓								✓	✓	✓	✓		
2018TC1847-S2	7/12/18	1100		soil	2	✓								✓	✓	✓	✓		
2018TC1847-S3	7/12/18	1100		soil	2	✓								✓	✓	✓	✓		

REPORT REQUIREMENTS

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

INVOICE INFORMATION

P.O. #
Bill To: Hecla
cwallace@hecla-mining.com

TURNAROUND REQUIREMENTS

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

Requested Report Date

Circle which metals are to be analyzed:

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

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

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

SPECIAL INSTRUCTIONS/COMMENTS:

For Hg use 7471B
Samples shipped in 2 coolers w/ copies of COCs in both

Container Supply Number

79921

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

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Kate Kanouse 7/17/18 1000	7.18.18 0950		
Signature / Date/Time	Signature / Date/Time	Signature / Date/Time	Signature / Date/Time
Printed Name / Firm: ADF&G	Printed Name / Firm: ALSK	Printed Name / Firm	Printed Name / Firm

PC KC

Cooler Receipt and Preservation Form

Client Alaska Dept Of Fish & Game Division of Habitat Service Request **K18** 06728

Received: 7-18-18 Opened: 7-18-18 By: [illegible] Unloaded: 7-18-18 By: [illegible]

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 custody seals on coolers? NA (Y) N If yes, how many and where? 1 TOP FRONT
   If present, were custody seals intact? (Y) N If present, were they signed and dated? (Y) N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID (NA)	Tracking Number NA	Filec
0.5	0.5	5.6	5.6	0.0	374		7818 9460 4252	
-0.1	-0.1	4.8	4.8	0.0	356		7818 9463 8963	

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

Sample ID on Bottle	Sample ID on COC	Identified by:

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

Notes, Discrepancies, & Resolutions: _____

Total Solids

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

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/10/18 - 07/12/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
Analysis Method:	160.3 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	As Received

Solids, Total

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
2018GC48-S1	K1806728-001	**67.1**	-	-	1	07/25/18 15:39	
2018GC48-S2	K1806728-002	**70.0**	-	-	1	07/25/18 15:39	
2018GC48-S3	K1806728-003	**61.0**	-	-	1	07/25/18 15:39	
2018GC54-S1	K1806728-004	**67.8**	-	-	1	07/25/18 15:39	
2018GC54-S2	K1806728-005	**68.6**	-	-	1	07/25/18 15:39	
2018GC54-S3	K1806728-006	**68.8**	-	-	1	07/25/18 15:39	
2018CC-S1	K1806728-007	**69.6**	-	-	1	07/25/18 15:39	
2018CC-S2	K1806728-008	**69.7**	-	-	1	07/25/18 15:39	
2018CC-S3	K1806728-009	**74.7**	-	-	1	07/25/18 15:39	
2018TC9-S1	K1806728-010	**74.8**	-	-	1	07/25/18 15:39	
2018TC9-S2	K1806728-011	**34.7**	-	-	1	07/25/18 15:39	
2018TC9-S3	K1806728-012	**73.3**	-	-	1	07/25/18 15:39	
2018TC1847-S1	K1806728-013	**71.1**	-	-	1	07/25/18 15:39	
2018TC1847-S2	K1806728-014	**70.1**	-	-	1	07/25/18 15:39	
2018TC1847-S3	K1806728-015	**72.4**	-	-	1	07/25/18 16:21	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project	Greens Creek Mine Project	**Date Collected:**	07/10/18 - 07/12/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
Analysis Method:	160.3 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	As Received

Replicate Sample Summary

Inorganic Parameters

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
2018GC54-S2	K1806728-005DUP	-	68.6	69.1	68.9	<1	20	07/25/18
2018TC1847-S3	K1806728-015DUP	-	72.4	72.4	72.4	<1	20	07/25/18
Batch QC	K1806931-001DUP	-	80.6	80.3	80.5	<1	20	07/25/18

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

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

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

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/10/18 - 07/12/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
Analysis Method:	160.4 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	Dry, per Method

Solids, Total Volatile

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
2018GC48-S1	K1806728-001	**2.40**	0.10	-	1	07/19/18 18:04	
2018GC48-S2	K1806728-002	**2.90**	0.10	-	1	07/19/18 18:04	
2018GC48-S3	K1806728-003	**2.80**	0.10	-	1	07/19/18 18:04	
2018GC54-S1	K1806728-004	**3.00**	0.10	-	1	07/19/18 18:04	
2018GC54-S2	K1806728-005	**3.10**	0.10	-	1	07/19/18 18:04	
2018GC54-S3	K1806728-006	**3.00**	0.10	-	1	07/19/18 18:04	
2018CC-S1	K1806728-007	**4.00**	0.10	-	1	07/19/18 18:04	
2018CC-S2	K1806728-008	**4.90**	0.10	-	1	07/19/18 18:04	
2018CC-S3	K1806728-009	**3.90**	0.10	-	1	07/19/18 18:04	
2018TC9-S1	K1806728-010	**3.30**	0.10	-	1	07/19/18 18:04	
2018TC9-S2	K1806728-011	**4.90**	0.10	-	1	07/19/18 18:04	
2018TC9-S3	K1806728-012	**3.80**	0.10	-	1	07/19/18 18:04	
2018TC1847-S1	K1806728-013	**4.00**	0.10	-	1	07/19/18 18:04	
2018TC1847-S2	K1806728-014	**3.90**	0.10	-	1	07/19/18 18:04	
2018TC1847-S3	K1806728-015	**3.40**	0.10	-	1	07/19/18 18:04	
Method Blank	K1806728-MB	ND U	0.10	-	1	07/19/18 18:04	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project	Greens Creek Mine Project	**Date Collected:**	07/11/18 - 07/12/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
Analysis Method:	160.4 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	Dry, per Method

Replicate Sample Summary
Solids, Total Volatile

Sample Name:	Lab Code:	MRL	MDL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
2018GC48-S1	K1806728-001DUP	0.10	-	2.40	2.50	2.45	4	20	07/19/18
2018TC9-S2	K1806728-011DUP	0.10	-	4.90	4.60	4.75	6	20	07/19/18

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

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

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/11/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018GC48-S1
Lab Code: K1806728-001

Sand Fraction: Dry Weight (Grams)	22.8169
Sand Fraction: Weight Recovered (Grams)	22.8308
Sand Fraction: Percent Recovery	100.06

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0000	0.00
Gravel, Fine	-2 Ø to -1 Ø	0.0745	0.31
Sand, Very Coarse	-1 to 0 Ø	2.2637	9.42
Sand, Coarse	0 to 1 Ø	12.6713	52.74
Sand, Medium	1 to 2 Ø	5.2208	21.73
Sand, Fine	2 to 3 Ø	2.3941	9.97
Sand, Very Fine	3 to 4 Ø	0.0149	0.06
75.0 µm	4 Ø	0.5000	2.08
31.3 µm	5 Ø	0.2700	1.12
15.6 µm	6 Ø	0.2850	1.19
7.8 µm	7 Ø	0.2850	1.19
3.9 µm	8 Ø	0.1400	0.58
1.95 µm	9 Ø	0.0950	0.40
0.98 µm	> 10 Ø	0.1100	0.46
		24.3243	101.25

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/11/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018GC48-S2
Lab Code: K1806728-002

Sand Fraction:	Dry Weight (Grams)	23.8933
Sand Fraction:	Weight Recovered (Grams)	23.8636
Sand Fraction:	Percent Recovery	99.88

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0000	0.00
Gravel, Fine	-2 Ø to -1 Ø	0.0902	0.37
Sand, Very Coarse	-1 to 0 Ø	2.4658	10.05
Sand, Coarse	0 to 1 Ø	8.9786	36.60
Sand, Medium	1 to 2 Ø	7.5729	30.87
Sand, Fine	2 to 3 Ø	4.2467	17.31
Sand, Very Fine	3 to 4 Ø	0.3993	1.63
75.0 µm	4 Ø	0.2400	0.98
31.3 µm	5 Ø	0.1550	0.63
15.6 µm	6 Ø	0.0950	0.39
7.8 µm	7 Ø	0.0100	0.04
3.9 µm	8 Ø	0.0000	0.00
1.95 µm	9 Ø	0.0200	0.08
0.98 µm	> 10 Ø	0.1150	0.47
		24.3885	99.43

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/11/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018GC48-S3
Lab Code: K1806728-003

Sand Fraction:	Dry Weight (Grams)	19.8757
Sand Fraction:	Weight Recovered (Grams)	19.7786
Sand Fraction:	Percent Recovery	99.51

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0000	0.00
Gravel, Fine	-2 Ø to -1 Ø	0.0254	0.11
Sand, Very Coarse	-1 to 0 Ø	0.1397	0.63
Sand, Coarse	0 to 1 Ø	1.2070	5.42
Sand, Medium	1 to 2 Ø	5.1307	23.03
Sand, Fine	2 to 3 Ø	11.9815	53.79
Sand, Very Fine	3 to 4 Ø	0.1651	0.74
75.0 µm	4 Ø	1.4750	6.62
31.3 µm	5 Ø	0.5850	2.63
15.6 µm	6 Ø	0.3900	1.75
7.8 µm	7 Ø	0.1900	0.85
3.9 µm	8 Ø	0.1950	0.88
1.95 µm	9 Ø	0.1200	0.54
0.98 µm	> 10 Ø	0.1100	0.49
		21.7144	97.48

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/10/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018GC54-S1
Lab Code: K1806728-004

Sand Fraction: Dry Weight (Grams)	28.3941
Sand Fraction: Weight Recovered (Grams)	28.3502
Sand Fraction: Percent Recovery	99.85

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0000	0.00
Gravel, Fine	-2 Ø to -1 Ø	0.0584	0.20
Sand, Very Coarse	-1 to 0 Ø	2.2224	7.59
Sand, Coarse	0 to 1 Ø	8.9573	30.57
Sand, Medium	1 to 2 Ø	9.6554	32.95
Sand, Fine	2 to 3 Ø	6.7923	23.18
Sand, Very Fine	3 to 4 Ø	0.5643	1.93
75.0 µm	4 Ø	0.3900	1.33
31.3 µm	5 Ø	0.2050	0.70
15.6 µm	6 Ø	0.1200	0.41
7.8 µm	7 Ø	0.1650	0.56
3.9 µm	8 Ø	0.0250	0.09
1.95 µm	9 Ø	0.0250	0.09
0.98 µm	> 10 Ø	0.0900	0.31
		29.2701	99.90

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/10/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018GC54-S2
Lab Code: K1806728-005

Sand Fraction:	Dry Weight (Grams)	30.2158
Sand Fraction:	Weight Recovered (Grams)	30.1441
Sand Fraction:	Percent Recovery	99.76

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0000	0.00
Gravel, Fine	-2 Ø to -1 Ø	0.2345	0.75
Sand, Very Coarse	-1 to 0 Ø	2.7848	8.92
Sand, Coarse	0 to 1 Ø	7.7341	24.78
Sand, Medium	1 to 2 Ø	9.7927	31.38
Sand, Fine	2 to 3 Ø	9.4162	30.17
Sand, Very Fine	3 to 4 Ø	0.0105	0.03
75.0 µm	4 Ø	0.3650	1.17
31.3 µm	5 Ø	0.2300	0.74
15.6 µm	6 Ø	0.0850	0.27
7.8 µm	7 Ø	0.0250	0.08
3.9 µm	8 Ø	0.0800	0.26
1.95 µm	9 Ø	0.0350	0.11
0.98 µm	> 10 Ø	0.1150	0.37
		30.9078	99.04

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/10/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018GC54-S3
Lab Code: K1806728-006

Sand Fraction:	Dry Weight (Grams)	27.0978
Sand Fraction:	Weight Recovered (Grams)	27.1051
Sand Fraction:	Percent Recovery	100.03

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0000	0.00
Gravel, Fine	-2 Ø to -1 Ø	1.2098	4.36
Sand, Very Coarse	-1 to 0 Ø	3.4649	12.48
Sand, Coarse	0 to 1 Ø	5.2568	18.93
Sand, Medium	1 to 2 Ø	7.7674	27.97
Sand, Fine	2 to 3 Ø	8.2829	29.83
Sand, Very Fine	3 to 4 Ø	0.9179	3.31
75.0 µm	4 Ø	0.5400	1.94
31.3 µm	5 Ø	0.0950	0.34
15.6 µm	6 Ø	0.1300	0.47
7.8 µm	7 Ø	0.1300	0.47
3.9 µm	8 Ø	0.0050	0.02
1.95 µm	9 Ø	0.0000	0.00
0.98 µm	> 10 Ø	0.1000	0.36
		27.8997	100.48

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/12/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018CC-S1
Lab Code: K1806728-007

Sand Fraction:	Dry Weight (Grams)	31.5801
Sand Fraction:	Weight Recovered (Grams)	31.6133
Sand Fraction:	Percent Recovery	100.11

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	7.5491	24.88
Gravel, Fine	-2 Ø to -1 Ø	4.9725	16.39
Sand, Very Coarse	-1 to 0 Ø	8.9471	29.49
Sand, Coarse	0 to 1 Ø	5.9452	19.59
Sand, Medium	1 to 2 Ø	2.3870	7.87
Sand, Fine	2 to 3 Ø	1.7496	5.77
Sand, Very Fine	3 to 4 Ø	0.0021	0.01
75.0 µm	4 Ø	0.2650	0.87
31.3 µm	5 Ø	0.2200	0.73
15.6 µm	6 Ø	0.1250	0.41
7.8 µm	7 Ø	0.0700	0.23
3.9 µm	8 Ø	0.0500	0.16
1.95 µm	9 Ø	0.0050	0.02
0.98 µm	> 10 Ø	0.1050	0.35
		32.3926	106.76

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/12/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018CC-S2
Lab Code: K1806728-008

Sand Fraction:	Dry Weight (Grams)	29.7715
Sand Fraction:	Weight Recovered (Grams)	29.8104
Sand Fraction:	Percent Recovery	100.13

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.9527	3.10
Gravel, Fine	-2 Ø to -1 Ø	5.6463	18.40
Sand, Very Coarse	-1 to 0 Ø	11.2665	36.71
Sand, Coarse	0 to 1 Ø	7.8072	25.44
Sand, Medium	1 to 2 Ø	2.4623	8.02
Sand, Fine	2 to 3 Ø	1.3419	4.37
Sand, Very Fine	3 to 4 Ø	0.2476	0.81
75.0 µm	4 Ø	0.3450	1.12
31.3 µm	5 Ø	0.2450	0.80
15.6 µm	6 Ø	0.1850	0.60
7.8 µm	7 Ø	0.1400	0.46
3.9 µm	8 Ø	0.0700	0.23
1.95 µm	9 Ø	0.0600	0.20
0.98 µm	> 10 Ø	0.0850	0.28
		30.8545	100.53

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/12/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018CC-S3
Lab Code: K1806728-009

Sand Fraction: Dry Weight (Grams)	35.8911
Sand Fraction: Weight Recovered (Grams)	35.9128
Sand Fraction: Percent Recovery	100.06

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	8.3924	22.76
Gravel, Fine	-2 Ø to -1 Ø	6.4480	17.49
Sand, Very Coarse	-1 to 0 Ø	9.1151	24.72
Sand, Coarse	0 to 1 Ø	8.8642	24.04
Sand, Medium	1 to 2 Ø	2.1046	5.71
Sand, Fine	2 to 3 Ø	0.9417	2.55
Sand, Very Fine	3 to 4 Ø	0.0001	0.00
75.0 µm	4 Ø	0.2550	0.69
31.3 µm	5 Ø	0.2050	0.56
15.6 µm	6 Ø	0.1400	0.38
7.8 µm	7 Ø	0.0700	0.19
3.9 µm	8 Ø	0.0450	0.12
1.95 µm	9 Ø	0.0200	0.05
0.98 µm	> 10 Ø	0.0900	0.24
		36.6911	99.51

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/12/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018TC9-S1
Lab Code: K1806728-010

Sand Fraction: Dry Weight (Grams)	30.1319
Sand Fraction: Weight Recovered (Grams)	30.1000
Sand Fraction: Percent Recovery	99.89

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	3.1415	9.52
Gravel, Fine	-2 Ø to -1 Ø	7.3831	22.38
Sand, Very Coarse	-1 to 0 Ø	8.0213	24.32
Sand, Coarse	0 to 1 Ø	4.8237	14.62
Sand, Medium	1 to 2 Ø	2.6884	8.15
Sand, Fine	2 to 3 Ø	3.2759	9.93
Sand, Very Fine	3 to 4 Ø	0.5808	1.76
75.0 µm	4 Ø	0.8450	2.56
31.3 µm	5 Ø	0.6000	1.82
15.6 µm	6 Ø	0.5400	1.64
7.8 µm	7 Ø	0.4800	1.46
3.9 µm	8 Ø	0.3950	1.20
1.95 µm	9 Ø	0.2400	0.73
0.98 µm	> 10 Ø	0.5600	1.70
		33.5747	101.78

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/12/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018TC9-S2
Lab Code: K1806728-011

Sand Fraction: Dry Weight (Grams)	7.2346
Sand Fraction: Weight Recovered (Grams)	7.4965
Sand Fraction: Percent Recovery	103.62

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0000	0.00
Gravel, Fine	-2 Ø to -1 Ø	0.2218	2.05
Sand, Very Coarse	-1 to 0 Ø	0.3793	3.51
Sand, Coarse	0 to 1 Ø	0.5643	5.22
Sand, Medium	1 to 2 Ø	0.9287	8.58
Sand, Fine	2 to 3 Ø	4.6761	43.22
Sand, Very Fine	3 to 4 Ø	0.0153	0.14
75.0 µm	4 Ø	1.3150	12.15
31.3 µm	5 Ø	0.9950	9.20
15.6 µm	6 Ø	0.5900	5.45
7.8 µm	7 Ø	0.4900	4.53
3.9 µm	8 Ø	0.2300	2.13
1.95 µm	9 Ø	0.1100	1.02
0.98 µm	> 10 Ø	0.1150	1.06
		10.6305	98.25

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/12/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018TC9-S3
Lab Code: K1806728-012

Sand Fraction: Dry Weight (Grams)	37.1836
Sand Fraction: Weight Recovered (Grams)	37.4286
Sand Fraction: Percent Recovery	100.66

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	4.7117	13.60
Gravel, Fine	-2 Ø to -1 Ø	4.4301	12.78
Sand, Very Coarse	-1 to 0 Ø	7.4746	21.57
Sand, Coarse	0 to 1 Ø	6.3480	18.32
Sand, Medium	1 to 2 Ø	5.0367	14.53
Sand, Fine	2 to 3 Ø	4.3847	12.65
Sand, Very Fine	3 to 4 Ø	4.9216	14.20
75.0 µm	4 Ø	0.6350	1.83
31.3 µm	5 Ø	0.4500	1.30
15.6 µm	6 Ø	0.4350	1.26
7.8 µm	7 Ø	0.3000	0.87
3.9 µm	8 Ø	0.1550	0.45
1.95 µm	9 Ø	0.0600	0.17
0.98 µm	> 10 Ø	0.1500	0.43
		39.4924	113.95

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/12/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018TC1847-S1
Lab Code: K1806728-013

Sand Fraction: Dry Weight (Grams)	28.9076
Sand Fraction: Weight Recovered (Grams)	28.8670
Sand Fraction: Percent Recovery	99.86

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0115	0.04
Gravel, Fine	-2 Ø to -1 Ø	1.4187	4.60
Sand, Very Coarse	-1 to 0 Ø	7.2384	23.49
Sand, Coarse	0 to 1 Ø	8.7753	28.48
Sand, Medium	1 to 2 Ø	6.2386	20.25
Sand, Fine	2 to 3 Ø	5.0151	16.28
Sand, Very Fine	3 to 4 Ø	0.0016	0.01
75.0 µm	4 Ø	0.5900	1.91
31.3 µm	5 Ø	0.4550	1.48
15.6 µm	6 Ø	0.3750	1.22
7.8 µm	7 Ø	0.3100	1.01
3.9 µm	8 Ø	0.1700	0.55
1.95 µm	9 Ø	0.0400	0.13
0.98 µm	> 10 Ø	0.1100	0.36
		30.7492	99.80

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/12/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018TC1847-S2
Lab Code: K1806728-014

Sand Fraction: Dry Weight (Grams)	35.0795
Sand Fraction: Weight Recovered (Grams)	35.0870
Sand Fraction: Percent Recovery	100.02

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.4148	1.12
Gravel, Fine	-2 Ø to -1 Ø	1.7735	4.78
Sand, Very Coarse	-1 to 0 Ø	11.3368	30.55
Sand, Coarse	0 to 1 Ø	11.9687	32.26
Sand, Medium	1 to 2 Ø	4.9309	13.29
Sand, Fine	2 to 3 Ø	4.0478	10.91
Sand, Very Fine	3 to 4 Ø	0.5200	1.40
75.0 µm	4 Ø	0.5100	1.37
31.3 µm	5 Ø	0.5300	1.43
15.6 µm	6 Ø	0.3350	0.90
7.8 µm	7 Ø	0.2750	0.74
3.9 µm	8 Ø	0.1450	0.39
1.95 µm	9 Ø	0.0200	0.05
0.98 µm	> 10 Ø	0.1250	0.34
		36.9325	99.54

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/12/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018TC1847-S3
Lab Code: K1806728-015

Sand Fraction:	Dry Weight (Grams)	31.8056
Sand Fraction:	Weight Recovered (Grams)	31.7842
Sand Fraction:	Percent Recovery	99.93

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.0000	0.00
Gravel, Fine	-2 Ø to -1 Ø	1.3231	4.00
Sand, Very Coarse	-1 to 0 Ø	9.4726	28.66
Sand, Coarse	0 to 1 Ø	12.5706	38.03
Sand, Medium	1 to 2 Ø	5.1612	15.62
Sand, Fine	2 to 3 Ø	3.1598	9.56
Sand, Very Fine	3 to 4 Ø	0.0042	0.01
75.0 µm	4 Ø	0.3900	1.18
31.3 µm	5 Ø	0.3850	1.16
15.6 µm	6 Ø	0.2900	0.88
7.8 µm	7 Ø	0.2300	0.70
3.9 µm	8 Ø	0.1050	0.32
1.95 µm	9 Ø	0.0350	0.11
0.98 µm	> 10 Ø	0.0650	0.20
		33.1915	100.42

dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	7/12/2018
Sample Matrix:	Soil	**Date Received:**	7/18/2018
		Date Analyzed:	7/30/2018

Particle Size Determination
ASTM D422M

Sample Name: 2018TC1847-S3
Lab Code: K1806728-015DUP

Sand Fraction: Dry Weight (Grams)	33.0598
Sand Fraction: Weight Recovered (Grams)	33.0756
Sand Fraction: Percent Recovery	100.05

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.2519	0.74
Gravel, Fine	-2 Ø to -1 Ø	1.6084	4.70
Sand, Very Coarse	-1 to 0 Ø	10.0658	29.39
Sand, Coarse	0 to 1 Ø	12.8072	37.39
Sand, Medium	1 to 2 Ø	5.2966	15.46
Sand, Fine	2 to 3 Ø	2.6226	7.66
Sand, Very Fine	3 to 4 Ø	0.3322	0.97
75.0 µm	4 Ø	0.4650	1.36
31.3 µm	5 Ø	0.4250	1.24
15.6 µm	6 Ø	0.2500	0.73
7.8 µm	7 Ø	0.1700	0.50
3.9 µm	8 Ø	0.0800	0.23
1.95 µm	9 Ø	0.0100	0.03
0.98 µm	> 10 Ø	0.1350	0.39
		34.5197	100.78

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/10/18 - 07/12/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
Analysis Method:	PSEP Sulfide	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry

Sulfide, Total

Sample Name	Lab Code	Result		MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
2018GC48-S1	K1806728-001	**1.2**	**J**	2.4	0.8	1	08/29/18 18:28	8/29/18	*
2018GC48-S2	K1806728-002	**0.9**	**J**	2.3	0.7	1	08/29/18 18:28	8/29/18	*
2018GC48-S3	K1806728-003	**1.3**	**J**	3.0	0.9	1	08/29/18 18:28	8/29/18	*
2018GC54-S1	K1806728-004	**0.7**	**J**	2.2	0.7	1	08/29/18 18:28	8/29/18	*
2018GC54-S2	K1806728-005	**1.2**	**J**	2.4	0.8	1	08/29/18 18:28	8/29/18	*
2018GC54-S3	K1806728-006	**0.8**	**J**	2.3	0.7	1	08/29/18 18:28	8/29/18	*
2018CC-S1	K1806728-007	ND	U	2.8	0.9	1	07/19/18 18:30	7/19/18	
2018CC-S2	K1806728-008	ND	U	2.6	0.8	1	07/19/18 18:30	7/19/18	
2018CC-S3	K1806728-009	ND	U	2.6	0.8	1	07/19/18 18:30	7/19/18	
2018TC9-S1	K1806728-010	ND	U	2.6	0.8	1	07/19/18 18:30	7/19/18	
2018TC9-S2	K1806728-011	**2.1**	**J**	5.5	1.7	1	07/19/18 18:30	7/19/18	
2018TC9-S3	K1806728-012	**1.3**	**J**	2.2	0.7	1	07/19/18 18:30	7/19/18	
2018TC1847-S1	K1806728-013	ND	U	2.7	0.9	1	07/19/18 18:30	7/19/18	
2018TC1847-S2	K1806728-014	**1.0**	**J**	2.8	0.9	1	07/19/18 18:30	7/19/18	
2018TC1847-S3	K1806728-015	ND	U	2.8	0.9	1	07/19/18 18:30	7/19/18	
Method Blank	K1806728-MB1	ND	U	1.0	0.3	1	07/19/18 18:30	7/19/18	
Method Blank	K1806728-MB2	ND	U	1.0	0.3	1	08/29/18 18:28	8/29/18	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project	Greens Creek Mine Project	**Date Collected:**	07/11/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
		Date Analyzed:	08/29/18

Triplicate Sample Summary
General Chemistry Parameters

Sample Name:	2018GC48-S1	**Units:**	mg/Kg
Lab Code:	K1806728-001	**Basis:**	Dry
Analysis Method:	PSEP Sulfide		
Prep Method:	Method		

Analyte Name	MRL	MDL	Sample Result	Duplicate K1806728-001DUP Result	Triplicate K1806728-001TRP Result	Average	RSD	RSD Limit
Sulfide, Total	2.2	0.7	1.2	0.9	1.3	1.13	21 *	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 Game	**Service Request:**	K1806728
Project	Greens Creek Mine Project	**Date Collected:**	07/12/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
		Date Analyzed:	07/19/18

Triplicate Sample Summary
General Chemistry Parameters

Sample Name:	2018CC-S1	**Units:**	mg/Kg
Lab Code:	K1806728-007	**Basis:**	Dry
Analysis Method:	PSEP Sulfide		
Prep Method:	Method		

Analyte Name	MRL	MDL	Sample Result	Duplicate K1806728-007DUP Result	Triplicate K1806728-007TRP Result	Average	RSD	RSD Limit
Sulfide, Total	2.6	0.8	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.

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/11/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
		Date Analyzed:	08/29/18
		Date Extracted:	08/29/18

Duplicate Matrix Spike Summary
Sulfide, Total

Sample Name:	2018GC48-S1	**Units:**	mg/Kg
Lab Code:	K1806728-001	**Basis:**	Dry
Analysis Method:	PSEP Sulfide		
Prep Method:	Method		

		Matrix Spike			Duplicate Matrix Spike					
		K1806728-001MS			K1806728-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Sulfide, Total	1.2 J	1030	970	106	1100	930	118	28-175	6	20

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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 Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/12/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
		Date Analyzed:	07/19/18
		Date Extracted:	07/19/18

Duplicate Matrix Spike Summary
Sulfide, Total

Sample Name:	2018CC-S1	**Units:**	mg/Kg
Lab Code:	K1806728-007	**Basis:**	Dry
Analysis Method:	PSEP Sulfide		
Prep Method:	Method		

		Matrix Spike K1806728-007MS			**Duplicate Matrix Spike** K1806728-007DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Sulfide, Total	ND U	390 J	700	56	680	920	74	28-175	54*	20

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

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Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Analyzed:**	07/19/18
Sample Matrix:	Soil	**Date Extracted:**	07/19/18

Lab Control Sample Summary
Sulfide, Total

Analysis Method:	PSEP Sulfide	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry
		Analysis Lot:	599258

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1806728-LCS1	301	350	86	39-166

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Analyzed:**	08/29/18
Sample Matrix:	Soil	**Date Extracted:**	08/29/18

Lab Control Sample Summary
Sulfide, Total

Analysis Method:	PSEP Sulfide	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry
		Analysis Lot:	604655

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1806728-LCS2	473	400	120	39-166

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/10/18 - 07/12/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
Analysis Method:	PSEP TOC	**Units:**	Percent
Prep Method:	ALS SOP	**Basis:**	Dry, per Method

Carbon, Total Organic (TOC)

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
2018GC48-S1	K1806728-001	**0.806**	0.050	0.020	1	07/23/18 11:15	7/23/18	
2018GC48-S2	K1806728-002	**0.486**	0.050	0.020	1	07/23/18 11:15	7/23/18	
2018GC48-S3	K1806728-003	**1.21**	0.050	0.020	1	07/23/18 11:15	7/23/18	
2018GC54-S1	K1806728-004	**0.528**	0.050	0.020	1	07/23/18 11:15	7/23/18	
2018GC54-S2	K1806728-005	**0.481**	0.050	0.020	1	07/23/18 11:15	7/23/18	
2018GC54-S3	K1806728-006	**0.548**	0.050	0.020	1	07/23/18 11:15	7/23/18	
2018CC-S1	K1806728-007	**1.54**	0.050	0.020	1	07/23/18 11:15	7/23/18	
2018CC-S2	K1806728-008	**2.42**	0.050	0.020	1	07/23/18 11:15	7/23/18	
2018CC-S3	K1806728-009	**1.11**	0.050	0.020	1	07/23/18 11:15	7/23/18	
2018TC9-S1	K1806728-010	**1.35**	0.050	0.020	1	07/23/18 11:15	7/23/18	
2018TC9-S2	K1806728-011	**8.57**	0.050	0.020	1	07/23/18 11:15	7/23/18	
2018TC9-S3	K1806728-012	**4.53**	0.050	0.020	1	07/23/18 11:15	7/23/18	
2018TC1847-S1	K1806728-013	**0.596**	0.050	0.020	1	07/23/18 11:15	7/23/18	
2018TC1847-S2	K1806728-014	**1.39**	0.050	0.020	1	07/23/18 11:15	7/23/18	
2018TC1847-S3	K1806728-015	**1.00**	0.050	0.020	1	07/23/18 11:15	7/23/18	
Method Blank	K1806728-MB1	ND U	0.050	0.020	1	07/23/18 11:15	7/23/18	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project	Greens Creek Mine Project	**Date Collected:**	07/11/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
		Date Analyzed:	07/23/18

Triplicate Sample Summary
General Chemistry Parameters

Sample Name:	2018GC48-S1	**Units:**	Percent
Lab Code:	K1806728-001	**Basis:**	Dry, per Method
Analysis Method:	PSEP TOC		
Prep Method:	ALS SOP		

Analyte Name	MRL	MDL	Sample Result	Duplicate K1806728-001DUP Result	Triplicate K1806728-001TRP Result	Average	RSD	RSD Limit
Carbon, Total Organic (TOC)	0.050	0.020	0.806	0.808	0.807	0.807	<1	27

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SuperSet Reference:18-0000474175 rev 00

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/11/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
		Date Analyzed:	07/23/18
		Date Extracted:	07/23/18

Duplicate Matrix Spike Summary
Carbon, Total Organic (TOC)

Sample Name:	2018GC48-S1	**Units:**	Percent
Lab Code:	K1806728-001	**Basis:**	Dry, per Method
Analysis Method:	PSEP TOC		
Prep Method:	ALS SOP		

		Matrix Spike K1806728-001MS			Duplicate Matrix Spike K1806728-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Carbon, Total Organic (TOC)	0.806	4.25	3.41	101	4.27	3.49	99	69-123	2	27

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 Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Analyzed:**	07/23/18
Sample Matrix:	Soil	**Date Extracted:**	07/23/18

Lab Control Sample Summary
Carbon, Total Organic (TOC)

Analysis Method:	PSEP TOC	**Units:**	Percent
Prep Method:	ALS SOP	**Basis:**	Dry, per Method
		Analysis Lot:	599628

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1806728-LCS1	0.619	0.603	103	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

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/11/18 10:10
Sample Matrix:	Soil	**Date Received:**	07/18/18 09:50
Sample Name:	2018GC48-S1	**Basis:**	Dry
Lab Code:	K1806728-001		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**2.97**	mg/Kg	0.026	0.009	5	07/31/18 11:08	07/26/18	
Copper	200.8	**46.1**	mg/Kg	0.13	0.05	5	07/31/18 11:08	07/26/18	
Lead	200.8	**36.9**	mg/Kg	0.13	0.03	5	07/31/18 11:08	07/26/18	
Mercury	7471B	**0.130**	mg/Kg	0.026	0.003	1	07/31/18 07:56	07/30/18	
Selenium	200.8	**3.4**	mg/Kg	1.3	0.09	5	07/31/18 11:08	07/26/18	
Zinc	200.8	**397**	mg/Kg	0.65	0.26	5	07/31/18 11:08	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/11/18 10:10
Sample Matrix:	Soil	**Date Received:**	07/18/18 09:50
Sample Name:	2018GC48-S2	**Basis:**	Dry
Lab Code:	K1806728-002		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.82**	mg/Kg	0.023	0.008	5	07/31/18 11:17	07/26/18	
Copper	200.8	**43.1**	mg/Kg	0.12	0.05	5	07/31/18 11:17	07/26/18	
Lead	200.8	**21.4**	mg/Kg	0.12	0.02	5	07/31/18 11:17	07/26/18	
Mercury	7471B	**0.091**	mg/Kg	0.022	0.002	1	07/31/18 08:04	07/30/18	
Selenium	200.8	**2.5**	mg/Kg	1.2	0.08	5	07/31/18 11:17	07/26/18	
Zinc	200.8	**302**	mg/Kg	0.58	0.23	5	07/31/18 11:17	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/11/18 10:10
Sample Matrix:	Soil	**Date Received:**	07/18/18 09:50
Sample Name:	2018GC48-S3	**Basis:**	Dry
Lab Code:	K1806728-003		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**3.16**	mg/Kg	0.025	0.009	5	07/31/18 11:19	07/26/18	
Copper	200.8	**59.4**	mg/Kg	0.12	0.05	5	07/31/18 11:19	07/26/18	
Lead	200.8	**42.2**	mg/Kg	0.12	0.02	5	07/31/18 11:19	07/26/18	
Mercury	7471B	**0.148**	mg/Kg	0.022	0.002	1	07/31/18 08:05	07/30/18	
Selenium	200.8	**3.5**	mg/Kg	1.2	0.09	5	07/31/18 11:19	07/26/18	
Zinc	200.8	**482**	mg/Kg	0.61	0.25	5	07/31/18 11:19	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/10/18 11:15
Sample Matrix:	Soil	**Date Received:**	07/18/18 09:50
Sample Name:	2018GC54-S1	**Basis:**	Dry
Lab Code:	K1806728-004		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**2.01**	mg/Kg	0.025	0.009	5	07/31/18 11:22	07/26/18	
Copper	200.8	**48.5**	mg/Kg	0.12	0.05	5	07/31/18 11:22	07/26/18	
Lead	200.8	**20.7**	mg/Kg	0.12	0.02	5	07/31/18 11:22	07/26/18	
Mercury	7471B	**0.098**	mg/Kg	0.018	0.002	1	07/31/18 08:07	07/30/18	
Selenium	200.8	**3.0**	mg/Kg	1.2	0.09	5	07/31/18 11:22	07/26/18	
Zinc	200.8	**294**	mg/Kg	0.62	0.25	5	07/31/18 11:22	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/10/18 11:15
Sample Matrix:	Soil	**Date Received:**	07/18/18 09:50
Sample Name:	2018GC54-S2	**Basis:**	Dry
Lab Code:	K1806728-005		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**2.09**	mg/Kg	0.019	0.007	5	07/31/18 11:25	07/26/18	
Copper	200.8	**50.9**	mg/Kg	0.095	0.038	5	07/31/18 11:25	07/26/18	
Lead	200.8	**22.5**	mg/Kg	0.095	0.019	5	07/31/18 11:25	07/26/18	
Mercury	7471B	**0.108**	mg/Kg	0.020	0.002	1	07/31/18 08:12	07/30/18	
Selenium	200.8	**2.66**	mg/Kg	0.95	0.07	5	07/31/18 11:25	07/26/18	
Zinc	200.8	**326**	mg/Kg	0.48	0.19	5	07/31/18 11:25	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/10/18 11:15
Sample Matrix:	Soil	**Date Received:**	07/18/18 09:50
Sample Name:	2018GC54-S3	**Basis:**	Dry
Lab Code:	K1806728-006		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.79**	mg/Kg	0.018	0.006	5	07/31/18 11:34	07/26/18	
Copper	200.8	**47.1**	mg/Kg	0.091	0.037	5	07/31/18 11:34	07/26/18	
Lead	200.8	**20.6**	mg/Kg	0.091	0.018	5	07/31/18 11:34	07/26/18	
Mercury	7471B	**0.107**	mg/Kg	0.020	0.002	1	07/31/18 08:13	07/30/18	
Selenium	200.8	**2.59**	mg/Kg	0.91	0.06	5	07/31/18 11:34	07/26/18	
Zinc	200.8	**280**	mg/Kg	0.46	0.18	5	07/31/18 11:34	07/26/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/12/18 15:20
Sample Matrix:	Soil	**Date Received:**	07/18/18 09:50
Sample Name:	2018CC-S1	**Basis:**	Dry
Lab Code:	K1806728-007		

Total Metals

Analyte Name	Analysis Method	Result		Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.758**		mg/Kg	0.021	0.007	5	07/31/18 11:37	07/26/18	
Copper	200.8	**16.5**		mg/Kg	0.10	0.04	5	07/31/18 11:37	07/26/18	
Lead	200.8	**19.7**		mg/Kg	0.10	0.02	5	07/31/18 11:37	07/26/18	
Mercury	7471B	**0.026**		mg/Kg	0.012	0.001	1	07/31/18 08:15	07/30/18	
Selenium	200.8	**0.7**	**J**	mg/Kg	1.0	0.07	5	07/31/18 11:37	07/26/18	
Zinc	200.8	**141**		mg/Kg	0.52	0.21	5	07/31/18 11:37	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/12/18 15:20
Sample Matrix:	Soil	**Date Received:**	07/18/18 09:50
Sample Name:	2018CC-S2	**Basis:**	Dry
Lab Code:	K1806728-008		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.981**	mg/Kg	0.020	0.007	5	07/31/18 11:39	07/26/18	
Copper	200.8	**16.3**	mg/Kg	0.10	0.04	5	07/31/18 11:39	07/26/18	
Lead	200.8	**20.5**	mg/Kg	0.10	0.02	5	07/31/18 11:39	07/26/18	
Mercury	7471B	**0.024**	mg/Kg	0.018	0.002	1	07/31/18 08:17	07/30/18	
Selenium	200.8	**0.8**	mg/Kg	1.0	0.07	5	07/31/18 11:39	07/26/18	**J**
Zinc	200.8	**140**	mg/Kg	0.50	0.20	5	07/31/18 11:39	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/12/18 15:20
Sample Matrix:	Soil	**Date Received:**	07/18/18 09:50
Sample Name:	2018CC-S3	**Basis:**	Dry
Lab Code:	K1806728-009		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.852**	mg/Kg	0.020	0.007	5	07/31/18 11:42	07/26/18	
Copper	200.8	**23.3**	mg/Kg	0.10	0.04	5	07/31/18 11:42	07/26/18	
Lead	200.8	**22.1**	mg/Kg	0.10	0.02	5	07/31/18 11:42	07/26/18	
Mercury	7471B	**0.021**	**J** mg/Kg	0.021	0.002	1	07/31/18 08:18	07/30/18	
Selenium	200.8	**1.0**	**J** mg/Kg	1.0	0.07	5	07/31/18 11:42	07/26/18	
Zinc	200.8	**136**	mg/Kg	0.51	0.20	5	07/31/18 11:42	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/12/18 14:10
Sample Matrix:	Soil	**Date Received:**	07/18/18 09:50
Sample Name:	2018TC9-S1	**Basis:**	Dry
Lab Code:	K1806728-010		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.437**	mg/Kg	0.017	0.006	5	07/31/18 11:45	07/26/18	
Copper	200.8	**51.6**	mg/Kg	0.084	0.034	5	07/31/18 11:45	07/26/18	
Lead	200.8	**13.2**	mg/Kg	0.084	0.017	5	07/31/18 11:45	07/26/18	
Mercury	7471B	**0.030**	mg/Kg	0.015	0.002	1	07/31/18 08:20	07/30/18	
Selenium	200.8	**0.60**	mg/Kg	0.84	0.06	5	07/31/18 11:45	07/26/18	**J**
Zinc	200.8	**97.7**	mg/Kg	0.42	0.17	5	07/31/18 11:45	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/12/18 14:10
Sample Matrix:	Soil	**Date Received:**	07/18/18 09:50
Sample Name:	2018TC9-S2	**Basis:**	Dry
Lab Code:	K1806728-011		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.701**	mg/Kg	0.041	0.014	5	07/31/18 11:48	07/26/18	
Copper	200.8	**26.0**	mg/Kg	0.20	0.08	5	07/31/18 11:48	07/26/18	
Lead	200.8	**31.7**	mg/Kg	0.20	0.04	5	07/31/18 11:48	07/26/18	
Mercury	7471B	**0.112**	mg/Kg	0.044	0.004	1	07/31/18 08:21	07/30/18	
Selenium	200.8	**1.1**	mg/Kg	2.0	0.1	5	07/31/18 11:48	07/26/18	**J**
Zinc	200.8	**113**	mg/Kg	1.0	0.4	5	07/31/18 11:48	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/12/18 14:10
Sample Matrix:	Soil	**Date Received:**	07/18/18 09:50
Sample Name:	2018TC9-S3	**Basis:**	Dry
Lab Code:	K1806728-012		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.253**	mg/Kg	0.015	0.005	5	07/31/18 11:51	07/26/18	
Copper	200.8	**14.7**	mg/Kg	0.077	0.031	5	07/31/18 11:51	07/26/18	
Lead	200.8	**8.90**	mg/Kg	0.077	0.015	5	07/31/18 11:51	07/26/18	
Mercury	7471B	**0.054**	mg/Kg	0.018	0.002	1	07/31/18 08:23	07/30/18	
Selenium	200.8	**0.23**	mg/Kg	0.77	0.05	5	07/31/18 11:51	07/26/18	**J**
Zinc	200.8	**59.6**	mg/Kg	0.38	0.15	5	07/31/18 11:51	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/12/18 11:00
Sample Matrix:	Soil	**Date Received:**	07/18/18 09:50
Sample Name:	2018TC1847-S1	**Basis:**	Dry
Lab Code:	K1806728-013		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.410**	mg/Kg	0.017	0.006	5	07/31/18 11:53	07/26/18	
Copper	200.8	**14.6**	mg/Kg	0.084	0.034	5	07/31/18 11:53	07/26/18	
Lead	200.8	**17.3**	mg/Kg	0.084	0.017	5	07/31/18 11:53	07/26/18	
Mercury	7471B	**0.024**	mg/Kg	0.017	0.002	1	07/31/18 08:25	07/30/18	
Selenium	200.8	**0.34**	mg/Kg	0.84	0.06	5	07/31/18 11:53	07/26/18	**J**
Zinc	200.8	**94.8**	mg/Kg	0.42	0.17	5	07/31/18 11:53	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/12/18 11:00
Sample Matrix:	Soil	**Date Received:**	07/18/18 09:50
Sample Name:	2018TC1847-S2	**Basis:**	Dry
Lab Code:	K1806728-014		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.343**	mg/Kg	0.018	0.006	5	07/31/18 11:56	07/26/18	
Copper	200.8	**17.5**	mg/Kg	0.089	0.036	5	07/31/18 11:56	07/26/18	
Lead	200.8	**14.7**	mg/Kg	0.089	0.018	5	07/31/18 11:56	07/26/18	
Mercury	7471B	**0.023**	mg/Kg	0.013	0.001	1	07/31/18 08:26	07/30/18	
Selenium	200.8	**0.32 J**	mg/Kg	0.89	0.06	5	07/31/18 11:56	07/26/18	
Zinc	200.8	**83.1**	mg/Kg	0.44	0.18	5	07/31/18 11:56	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/12/18 11:00
Sample Matrix:	Soil	**Date Received:**	07/18/18 09:50
Sample Name:	2018TC1847-S3	**Basis:**	Dry
Lab Code:	K1806728-015		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.373**	mg/Kg	0.022	0.008	5	07/31/18 12:05	07/26/18	
Copper	200.8	**12.9**	mg/Kg	0.11	0.04	5	07/31/18 12:05	07/26/18	
Lead	200.8	**15.0**	mg/Kg	0.11	0.02	5	07/31/18 12:05	07/26/18	
Mercury	7471B	**0.020**	mg/Kg	0.016	0.002	1	07/31/18 08:31	07/30/18	
Selenium	200.8	**0.3**	mg/Kg	1.1	0.08	5	07/31/18 12:05	07/26/18	**J**
Zinc	200.8	**79.3**	mg/Kg	0.56	0.22	5	07/31/18 12:05	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1810099-03		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	ND U	mg/Kg	0.020	0.007	5	07/31/18 11:03	07/26/18	
Copper	200.8	ND U	mg/Kg	0.10	0.04	5	07/31/18 11:03	07/26/18	
Lead	200.8	ND U	mg/Kg	0.10	0.02	5	07/31/18 11:03	07/26/18	
Selenium	200.8	ND U	mg/Kg	1.0	0.07	5	07/31/18 11:03	07/26/18	
Zinc	200.8	**0.36 J**	mg/Kg	0.5	0.20	5	07/31/18 11:03	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1810100-03		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Mercury	7471B	ND U	mg/Kg	0.02	0.002	1	07/31/18 07:51	07/30/18	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project	Greens Creek Mine Project	**Date Collected:**	07/11/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
		Date Analyzed:	07/31/18

Replicate Sample Summary
Total Metals

Sample Name:	2018GC48-S1	**Units:**	mg/Kg
Lab Code:	K1806728-001	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample KQ1810099-05 Result	Average	RPD	RPD Limit
Cadmium	200.8	0.023	0.008	2.97	2.74	2.86	8	30
Copper	200.8	0.11	0.05	46.1	47.2	46.7	2	30
Lead	200.8	0.11	0.02	36.9	32.5	34.7	13	30
Selenium	200.8	1.1	0.08	3.4	3.3	3.4	3	30
Zinc	200.8	0.57	0.23	397	389	393	2	30

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

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

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

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project	Greens Creek Mine Project	**Date Collected:**	07/12/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
		Date Analyzed:	07/31/18

Replicate Sample Summary
Total Metals

Sample Name:	2018TC1847-S3	**Units:**	mg/Kg
Lab Code:	K1806728-015	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample KQ1810099-07 Result	Average	RPD	RPD Limit
Cadmium	200.8	0.015	0.005	0.373	0.343	0.358	8	30
Copper	200.8	0.076	0.031	12.9	12.5	12.7	3	30
Lead	200.8	0.076	0.015	15.0	14.1	14.6	7	30
Selenium	200.8	0.76	0.05	0.30 J	0.29 J	0.30	5	30
Zinc	200.8	0.38	0.15	79.3	80.1	79.7	1	30

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

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

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

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project	Greens Creek Mine Project	**Date Collected:**	07/11/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
		Date Analyzed:	07/31/18

Replicate Sample Summary

Total Metals

Sample Name:	2018GC48-S1	**Units:**	mg/Kg
Lab Code:	K1806728-001	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample KQ1810100-01 Result	Average	RPD	RPD Limit
Mercury	7471B	0.024	0.002	0.130	0.122	0.126	6	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 Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/11/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
		Date Analyzed:	07/31/18
		Date Extracted:	07/26/18

Matrix Spike Summary
Total Metals

Sample Name:	2018GC48-S1	**Units:**	mg/Kg
Lab Code:	K1806728-001	**Basis:**	Dry
Analysis Method:	200.8		
Prep Method:	EPA 3050B		

Matrix Spike
KQ1810099-06

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	2.97	14.5	11.2	102	70-130
Copper	46.1	100	56.0	97	70-130
Lead	36.9	161	112	111	70-130
Selenium	3.4	110	112	95	70-130
Zinc	397	527	112	116	70-130

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

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

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

ALS Group USA, Corp.
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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/12/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
		Date Analyzed:	07/31/18
		Date Extracted:	07/26/18

Matrix Spike Summary
Total Metals

Sample Name:	2018TC1847-S3	**Units:**	mg/Kg
Lab Code:	K1806728-015	**Basis:**	Dry
Analysis Method:	200.8		
Prep Method:	EPA 3050B		

Matrix Spike
KQ1810099-08

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	0.373	11.2	11.0	98	70-130
Copper	12.9	63.5	54.8	92	70-130
Lead	15.0	135	110	109	70-130
Selenium	0.3 J	107	110	97	70-130
Zinc	79.3	184	110	95	70-130

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

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

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

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dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1806728
Project:	Greens Creek Mine Project	**Date Collected:**	07/11/18
Sample Matrix:	Soil	**Date Received:**	07/18/18
		Date Analyzed:	07/31/18
		Date Extracted:	07/30/18

Matrix Spike Summary
Total Metals

Sample Name:	2018GC48-S1	**Units:**	mg/Kg
Lab Code:	K1806728-001	**Basis:**	Dry
Analysis Method:	7471B		
Prep Method:	Method		

Matrix Spike
KQ1810100-02

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Mercury	0.130	0.760	0.615	102	80-120

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.

Printed 8/13/2018 1:58:07 PM Superset Reference:

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QA/QC Report

Client: Alaska Department of Fish and Game
Project: Greens Creek Mine Project
Sample Matrix: Soil

Service Request: K1806728
Date Analyzed: 07/31/18

Lab Control Sample Summary
Total Metals

Units:mg/Kg
Basis: Dry

Lab Control Sample
KQ1810099-04

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	200.8	216	225	96	70-117
Copper	200.8	157	174	90	71-119
Lead	200.8	115	111	104	71-129
Selenium	200.8	197	206	96	64-122
Zinc	200.8	191	207	92	67-125

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Alaska Department of Fish and Game
Project: Greens Creek Mine Project
Sample Matrix: Soil

Service Request: K1806728
Date Analyzed: 07/31/18

Lab Control Sample Summary
Total Metals

Units:mg/Kg
Basis: Dry

Lab Control Sample
KQ1810100-04

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Mercury	7471B	10.2	12.0	85	60-139

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 07, 2018 **Analytical Report for Service Request No:** K1807787

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

RE: 2018 Greens Creek Mine Project Request - ADF&G

Dear Kate,

Enclosed are the results of the sample(s) submitted to our laboratory August 16, 2018
For your reference, these analyses have been assigned our service request number **K1807787.**

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 3356. You may also contact me via email at Kurt.Clarkson@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kelley Lovejoy

for Kurt Clarkson
Sr. 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

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

Inorganic Data Qualifiers

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

Metals Data Qualifiers

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

Organic Data Qualifiers

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

Additional Petroleum Hydrocarbon Specific Qualifiers

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

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

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	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	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	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)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	NA

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

Case Narrative

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

ALS Environmental

Client: Alaska Department of Fish and Game
Project: 2018 Greens Creek Mine Project Request - ADF&G
Sample Matrix: Soil

Service Request: K1807787
Date Received: 08/16/2018

CASE NARRATIVE

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

Sample Receipt:

Three soil samples were received for analysis at ALS Environmental on 08/16/2018. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

Metals:

Method 200.8, 08/28/2018: The Relative Percent Difference (RPD) for the replicate analysis of Lead in sample GC63B-S1 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.

General Chemistry:

160.4 Modified :All samples for Total Volatile Solids were received past holding time. The analysis was performed as soon as possible after receipt by the laboratory. The data was flagged to indicate the holding time violation.
Method PSEP Sulfide, 08/29/2018:Samples GC63B-S1, GC63B-S2 and GC63B-S3 were received past holding time. The analysis was performed as soon as possible after receipt by the laboratory. The data was flagged to indicate the holding time violation.

Approved by Kelley Bourjoy Date 09/07/2018

Chain of Custody

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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COC#_____

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Project Name	Greens Creek Mine Project
Project Number	
Project Manager	Johnny Zutz
Company	ADF&G Division of Habitat
Address	802 3rd Street Douglas AK 99824
Phone #	907 465-4290
email	johnny.zutz@alaska.gov
Sampler Signature	
Sampler Printed Name	Johnny Zutz

CLIENT SAMPLE ID	LABID	SAMPLING Date	SAMPLING Time	Matrix	NUMBER OF CONTAINERS	7D 160.4 Modified / TVS	14D PSEP TOC / PSEP TOC T	28D 7471B / Hg	180D 200.8 / Metals T	180D ASTM D422M / Partsize	999D 160.3 Modified / TS	1 PSEP Sulfide	2	3	4	5	Remarks
1. GC63B-S1		8-8-18	8:00	Soil	2	✓	✓	✓	✓	✓	✓	✓					
2. GC63B-S2		8-8-18	8:00	Soil	2	✓	✓	✓	✓	✓	✓	✓					
3. GC63B-S3		8-8-18	8:00	Soil	2	✓	✓	✓	✓	✓	✓	✓					
4.																	
5.																	
6.																	
7.																	
8.																	
9.																	
10.																	

Report Requirements

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

Invoice Information

P.O.#_____

Bill To: Hecla

cwallace@hecla-mining.com

Turnaround Requirements

___ 24 hr. ___ 48 hr.
___ 5 Day
___ Standard

Requested Report Date

Circle which metals are to be analyzed

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

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

Special Instructions/Comments:

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

Relinquished By:	Received By:	Relinquished By:	Received By:	Relinquished By:	Received By:
Signature	Signature	Signature	Signature	Signature	Signature
Printed Name: Johnny Zutz	Printed Name: ALS	Printed Name	Printed Name	Printed Name	Printed Name
Firm: ADFG	Firm: 8/16/18 0945	Firm	Firm	Firm	Firm
Date/Time: 8/13/18	Date/Time	Date/Time	Date/Time	Date/Time	Date/Time

PC KC

Cooler Receipt and Preservation Form

Client ADF&G Service Request *K18* 07787

Received: 8/16/18 Opened: 8/16/18 By: [illegible] Unloaded: 8/16/18 By: [illegible]

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 custody seals on coolers? NA (Y) N If yes, how many and where? one, front
   If present, were custody seals intact? (Y) N If present, were they signed and dated? (Y) N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID (NA)	Tracking Number NA	Filed
6.8	6.7	7.1	7.0-0.1		371		7822 9429 7382	

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

Sample ID on Bottle	Sample ID on COC	Identified by:

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

Notes, Discrepancies, & Resolutions: _____

Total Solids

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	08/8/18
Sample Matrix:	Soil	**Date Received:**	08/16/18
Analysis Method:	160.3 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	As Received

Solids, Total

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
GC63B-S1	K1807787-001	**70.4**	-	-	1	08/21/18 16:36	
GC63B-S2	K1807787-002	**71.5**	-	-	1	08/21/18 16:36	
GC63B-S3	K1807787-003	**77.7**	-	-	1	08/21/18 16:36	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	08/08/18
Sample Matrix:	Soil	**Date Received:**	08/16/18
		Date Analyzed:	08/21/18

Replicate Sample Summary
Inorganic Parameters

Sample Name:	GC63B-S1	**Units:**	Percent
Lab Code:	K1807787-001	**Basis:**	As Received

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample K1807787-001DUP Result	Average	RPD	RPD Limit
Solids, Total	160.3 Modified	-	-	70.4	71.6	71.0	2	20

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

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

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

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	08/8/18
Sample Matrix:	Soil	**Date Received:**	08/16/18
Analysis Method:	160.4 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	Dry, per Method

Solids, Total Volatile

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
GC63B-S1	K1807787-001	**2.90**	0.10	-	1	08/21/18 16:35	*
GC63B-S2	K1807787-002	**2.90**	0.10	-	1	08/21/18 16:35	*
GC63B-S3	K1807787-003	**2.70**	0.10	-	1	08/21/18 16:35	*
Method Blank	K1807787-MB	ND U	0.10	-	1	08/21/18 16:35	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	08/08/18
Sample Matrix:	Soil	**Date Received:**	08/16/18
		Date Analyzed:	08/21/18

Replicate Sample Summary

General Chemistry Parameters

Sample Name:	GC63B-S3	**Units:**	Percent
Lab Code:	K1807787-003	**Basis:**	Dry, per Method

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample K1807787-003DUP Result	Average	RPD	RPD Limit
Solids, Total Volatile	160.4 Modified	0.10	-	2.70	2.70	2.70	<1	20

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

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General Chemistry

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF	**Date Collected:**	8/8/2018
Sample Matrix:	Soil	**Date Received:**	8/16/2018
		Date Analyzed:	8/28/2018

Particle Size Determination
ASTM D422M

Sample Name: GC63B-S1
Lab Code: K1807787-001

Sand Fraction: Dry Weight (Grams)	56.0661
Sand Fraction: Weight Recovered (Grams)	55.9495
Sand Fraction: Percent Recovery	99.79

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.7532	1.32
Gravel, Fine	-2 Ø to -1 Ø	2.6506	4.65
Sand, Very Coarse	-1 to 0 Ø	15.3749	26.98
Sand, Coarse	0 to 1 Ø	25.0388	43.93
Sand, Medium	1 to 2 Ø	8.5055	14.92
Sand, Fine	2 to 3 Ø	3.0627	5.37
Sand, Very Fine	3 to 4 Ø	0.3124	0.55
75.0 µm	4 Ø	0.4750	0.83
31.3 µm	5 Ø	0.2500	0.44
15.6 µm	6 Ø	0.2950	0.52
7.8 µm	7 Ø	0.2100	0.37
3.9 µm	8 Ø	0.1650	0.29
1.95 µm	9 Ø	0.0900	0.16
0.98 µm	> 10 Ø	0.0050	0.01
		57.1881	100.35

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF	**Date Collected:**	8/8/2018
Sample Matrix:	Soil	**Date Received:**	8/16/2018
		Date Analyzed:	8/28/2018

Particle Size Determination
ASTM D422M

Sample Name: GC63B-S1
Lab Code: K1807787-001DUP

Sand Fraction: Dry Weight (Grams)	54.9747
Sand Fraction: Weight Recovered (Grams)	54.8254
Sand Fraction: Percent Recovery	99.73

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.4601	0.81
Gravel, Fine	-2 Ø to -1 Ø	4.2678	7.54
Sand, Very Coarse	-1 to 0 Ø	14.3815	25.40
Sand, Coarse	0 to 1 Ø	23.0155	40.66
Sand, Medium	1 to 2 Ø	8.4408	14.91
Sand, Fine	2 to 3 Ø	3.6553	6.46
Sand, Very Fine	3 to 4 Ø	0.4272	0.75
75.0 µm	4 Ø	0.3800	0.67
31.3 µm	5 Ø	0.2500	0.44
15.6 µm	6 Ø	0.1850	0.33
7.8 µm	7 Ø	0.2300	0.41
3.9 µm	8 Ø	0.0950	0.17
1.95 µm	9 Ø	0.0550	0.10
0.98 µm	> 10 Ø	0.0050	0.01
		55.8482	98.66

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF	**Date Collected:**	8/8/2018
Sample Matrix:	Soil	**Date Received:**	8/16/2018
		Date Analyzed:	8/28/2018

Particle Size Determination
ASTM D422M

Sample Name: GC63B-S2
Lab Code: K1807787-002

Sand Fraction: Dry Weight (Grams)	60.2712
Sand Fraction: Weight Recovered (Grams)	60.2513
Sand Fraction: Percent Recovery	99.97

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	0.1247	0.22
Gravel, Fine	-2 Ø to -1 Ø	2.7982	4.85
Sand, Very Coarse	-1 to 0 Ø	18.3730	31.82
Sand, Coarse	0 to 1 Ø	27.0560	46.85
Sand, Medium	1 to 2 Ø	8.5778	14.85
Sand, Fine	2 to 3 Ø	2.9238	5.06
Sand, Very Fine	3 to 4 Ø	0.2638	0.46
75.0 µm	4 Ø	0.1300	0.23
31.3 µm	5 Ø	0.3200	0.55
15.6 µm	6 Ø	0.1450	0.25
7.8 µm	7 Ø	0.1600	0.28
3.9 µm	8 Ø	0.0300	0.05
1.95 µm	9 Ø	0.1000	0.17
0.98 µm	> 10 Ø	0.0100	0.02
		61.0123	105.65

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF	**Date Collected:**	8/8/2018
Sample Matrix:	Soil	**Date Received:**	8/16/2018
		Date Analyzed:	8/28/2018

Particle Size Determination
ASTM D422M

Sample Name: GC63B-S3
Lab Code: K1807787-003

Sand Fraction: Dry Weight (Grams)	55.7012
Sand Fraction: Weight Recovered (Grams)	55.7249
Sand Fraction: Percent Recovery	100.04

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel, Medium	<-2 Ø	1.6247	2.60
Gravel, Fine	-2 Ø to -1 Ø	3.4028	5.45
Sand, Very Coarse	-1 to 0 Ø	13.6483	21.85
Sand, Coarse	0 to 1 Ø	23.3675	37.41
Sand, Medium	1 to 2 Ø	9.2898	14.87
Sand, Fine	2 to 3 Ø	3.7715	6.04
Sand, Very Fine	3 to 4 Ø	0.4072	0.65
75.0 µm	4 Ø	0.3350	0.54
31.3 µm	5 Ø	0.2500	0.40
15.6 µm	6 Ø	0.1450	0.23
7.8 µm	7 Ø	0.0750	0.12
3.9 µm	8 Ø	0.0850	0.14
1.95 µm	9 Ø	0.0750	0.12
0.98 µm	> 10 Ø	0.0000	0.00
		56.4768	90.43

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	08/8/18
Sample Matrix:	Soil	**Date Received:**	08/16/18
Analysis Method:	PSEP Sulfide	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry

Sulfide, Total

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
GC63B-S1	K1807787-001	**1.1 J**	2.2	0.7	1	08/29/18 18:28	8/29/18	*
GC63B-S2	K1807787-002	ND U	2.2	0.7	1	08/29/18 18:28	8/29/18	*
GC63B-S3	K1807787-003	**0.8 J**	2.0	0.7	1	08/29/18 18:28	8/29/18	*
Method Blank	K1807787-MB	ND U	1.0	0.3	1	08/29/18 18:28	8/29/18	

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Analyzed:**	08/29/18
Sample Matrix:	Soil	**Date Extracted:**	08/29/18

Lab Control Sample Summary
Sulfide, Total

Analysis Method:	PSEP Sulfide	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry
		Analysis Lot:	604655

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1807787-LCS	473	400	120	39-166

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	08/8/18
Sample Matrix:	Soil	**Date Received:**	08/16/18
Analysis Method:	PSEP TOC	**Units:**	Percent
Prep Method:	ALS SOP	**Basis:**	Dry, per Method

Carbon, Total Organic (TOC)

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
GC63B-S1	K1807787-001	**0.501**	0.050	0.020	1	08/22/18 13:45	8/22/18	
GC63B-S2	K1807787-002	**0.445**	0.050	0.020	1	08/22/18 13:45	8/22/18	
GC63B-S3	K1807787-003	**0.548**	0.050	0.020	1	08/22/18 13:45	8/22/18	
Method Blank	K1807787-MB	ND U	0.050	0.020	1	08/22/18 13:45	8/22/18	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	08/08/18
Sample Matrix:	Soil	**Date Received:**	08/16/18
		Date Analyzed:	08/22/18

Triplicate Sample Summary
General Chemistry Parameters

Sample Name:	GC63B-S1	**Units:**	Percent
Lab Code:	K1807787-001	**Basis:**	Dry, per Method
Analysis Method:	PSEP TOC		
Prep Method:	ALS SOP		

Analyte Name	MRL	MDL	Sample Result	Duplicate K1807787-001DUP Result	Triplicate K1807787-001TRP Result	Average	RSD	RSD Limit
Carbon, Total Organic (TOC)	0.050	0.020	0.501	0.503	0.507	0.504	<1	27

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

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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.

Printed 9/4/2018 1:17:57 PM

SuperSet Reference:18-0000477620 rev 00

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	08/08/18
Sample Matrix:	Soil	**Date Received:**	08/16/18
		Date Analyzed:	08/22/18
		Date Extracted:	08/22/18

Duplicate Matrix Spike Summary
Carbon, Total Organic (TOC)

Sample Name:	GC63B-S1	**Units:**	Percent
Lab Code:	K1807787-001	**Basis:**	Dry, per Method
Analysis Method:	PSEP TOC		
Prep Method:	ALS SOP		

		Matrix Spike K1807787-001MS			Duplicate Matrix Spike K1807787-001DMS				
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Carbon, Total Organic (TOC)	0.501	3.77	3.28	100	3.62	3.15	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.

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 Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Analyzed:**	08/22/18
Sample Matrix:	Soil	**Date Extracted:**	08/22/18

Lab Control Sample Summary
Carbon, Total Organic (TOC)

Analysis Method:	PSEP TOC	**Units:**	Percent
Prep Method:	ALS SOP	**Basis:**	Dry, per Method
		Analysis Lot:	603665

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1807787-LCS	0.595	0.603	99	74-118

Metals

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	08/08/18 08:00
Sample Matrix:	Soil	**Date Received:**	08/16/18 09:45
Sample Name:	GC63B-S1	**Basis:**	Dry
Lab Code:	K1807787-001		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.79**	mg/Kg	0.028	0.010	5	08/28/18 11:09	08/22/18	
Copper	200.8	**40.3**	mg/Kg	0.14	0.06	5	08/28/18 11:09	08/22/18	
Lead	200.8	**27.8**	mg/Kg	0.070	0.028	5	08/28/18 11:09	08/22/18	
Mercury	7471B	**0.089**	mg/Kg	0.022	0.002	1	08/30/18 12:11	08/24/18	
Selenium	200.8	**1.9**	mg/Kg	1.4	0.10	5	08/28/18 11:09	08/22/18	
Zinc	200.8	**237**	mg/Kg	0.70	0.28	5	08/28/18 11:09	08/22/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	08/08/18 08:00
Sample Matrix:	Soil	**Date Received:**	08/16/18 09:45
Sample Name:	GC63B-S2	**Basis:**	Dry
Lab Code:	K1807787-002		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**2.38**	mg/Kg	0.027	0.009	5	08/28/18 11:17	08/22/18	
Copper	200.8	**46.4**	mg/Kg	0.13	0.05	5	08/28/18 11:17	08/22/18	
Lead	200.8	**25.1**	mg/Kg	0.067	0.027	5	08/28/18 11:17	08/22/18	
Mercury	7471B	**0.125**	mg/Kg	0.027	0.003	1	08/30/18 12:12	08/24/18	
Selenium	200.8	**3.3**	mg/Kg	1.3	0.09	5	08/28/18 11:17	08/22/18	
Zinc	200.8	**369**	mg/Kg	0.67	0.27	5	08/28/18 11:17	08/22/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	08/08/18 08:00
Sample Matrix:	Soil	**Date Received:**	08/16/18 09:45
Sample Name:	GC63B-S3	**Basis:**	Dry
Lab Code:	K1807787-003		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**2.18**	mg/Kg	0.024	0.008	5	08/28/18 11:20	08/22/18	
Copper	200.8	**42.5**	mg/Kg	0.12	0.05	5	08/28/18 11:20	08/22/18	
Lead	200.8	**18.9**	mg/Kg	0.060	0.024	5	08/28/18 11:20	08/22/18	
Mercury	7471B	**0.156**	mg/Kg	0.017	0.002	1	08/30/18 12:14	08/24/18	
Selenium	200.8	**2.6**	mg/Kg	1.2	0.08	5	08/28/18 11:20	08/22/18	
Zinc	200.8	**314**	mg/Kg	0.60	0.24	5	08/28/18 11:20	08/22/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1811495-03		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	ND U	mg/Kg	0.020	0.007	5	08/28/18 11:04	08/22/18	
Copper	200.8	ND U	mg/Kg	0.10	0.04	5	08/28/18 11:04	08/22/18	
Lead	200.8	ND U	mg/Kg	0.05	0.020	5	08/28/18 11:04	08/22/18	
Selenium	200.8	ND U	mg/Kg	1.0	0.07	5	08/28/18 11:04	08/22/18	
Zinc	200.8	ND U	mg/Kg	0.5	0.20	5	08/28/18 11:04	08/22/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1811727-01		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Mercury	7471B	ND U	mg/Kg	0.02	0.002	1	08/30/18 11:58	08/24/18	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	08/08/18
Sample Matrix:	Soil	**Date Received:**	08/16/18
		Date Analyzed:	08/28/18

Replicate Sample Summary

Total Metals

Sample Name:	GC63B-S1	**Units:**	mg/Kg
Lab Code:	K1807787-001	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample KQ1811495-01 Result	Average	RPD	RPD Limit
Cadmium	200.8	0.028	0.010	1.79	2.15	1.97	18	30
Copper	200.8	0.14	0.06	40.3	37.4	38.9	8	30
Lead	200.8	0.069	0.028	27.8	38.9	33.4	33 *	30
Selenium	200.8	1.4	0.10	1.9	2.0	2.0	5	30
Zinc	200.8	0.69	0.28	237	285	261	18	30

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

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

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

Printed 8/30/2018 5:48:49 PM Superset Reference:

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Collected:**	08/08/18
Sample Matrix:	Soil	**Date Received:**	08/16/18
		Date Analyzed:	08/28/18
		Date Extracted:	08/22/18

Matrix Spike Summary
Total Metals

Sample Name:	GC63B-S1	**Units:**	mg/Kg
Lab Code:	K1807787-001	**Basis:**	Dry
Analysis Method:	200.8		
Prep Method:	EPA 3050B		

Matrix Spike
KQ1811495-02

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	1.79	14.9	13.5	98	70-130
Copper	40.3	99.7	67.3	88	70-130
Lead	27.8	154	135	93	70-130
Selenium	1.9	138	135	101	70-130
Zinc	237	374	135	102	70-130

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

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

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

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Alaska Department of Fish and Game
Project: 2018 Greens Creek Mine Project Request - ADF&G
Sample Matrix: Soil

Service Request: K1807787
Date Analyzed: 08/28/18

Lab Control Sample Summary
Total Metals

Units:mg/Kg
Basis: Dry

Lab Control Sample
KQ1811495-04

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	200.8	235	225	104	70-117
Copper	200.8	177	174	102	71-119
Lead	200.8	121	111	109	71-129
Selenium	200.8	213	206	103	64-122
Zinc	200.8	200	207	97	67-125

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807787
Project:	2018 Greens Creek Mine Project Request - ADF&G	**Date Analyzed:**	08/30/18
Sample Matrix:	Soil		

Lab Control Sample Summary
Total Metals

Units:mg/Kg
Basis: Dry

Lab Control Sample
KQ1811727-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Mercury	7471B	11.5	12.0	95	60-139

APPENDIX C: FISH DATA AND LABORATORY REPORTS

Appendix C.1–Whole body Dolly Varden char element concentrations.

Sample No.	FL (mm)	Weight (g)	Concentration (mg/kg dry weight) Cd	Cu	Hg	Pb	Se	Zn
Hawk Inlet Head Creek Site 2061								
2018HIHCDV1	88	6.3	0.921	2.95	0.715	0.121	2.83	185
2018HIHCDV2	111	12.3	0.064	2.67	0.0481	0.026	1.69	109
2018HIHCDV3	104	9.8	0.053	2.35	0.101	<0.020	1.56	102
2018HIHCDV4	109	10.2	0.625	3.62	0.309	0.066	2.2	158
2018HIHCDV5	137	22.7	0.068	2.90	0.0809	<0.020	1.80	114
2018HIHCDV6	129	17.3	0.143	2.57	0.0606	0.021	1.72	114
Unnamed Creek Site 2062								
2018UCDV2	90	7.2	0.042	2.19	0.0374	0.085	1.4	105
2018UCDV3	84	5.4	0.097	2.13	0.0618	0.028	1.5	111
2018UCDV4	134	19.7	0.043	1.96	0.0258	<0.020	1.47	111
2018UCDV5	124	15.2	0.530	4.63	0.0515	<0.020	1.83	125
2018UCDV6	120	15.3	0.041	2.05	0.0308	<0.020	1.40	121
2018UCDV7	124	19.8	0.029	1.90	0.0359	<0.020	1.51	102
Jimmy Green Creek Site 2063								
2018JGCDV1	155	30.4	0.076	4.65	0.0388	<0.020	1.5	96.7
2018JGCDV3	141	25.1	0.201	4.05	0.0762	<0.020	1.73	128
2018JGCDV4	113	11.1	1.03	5.22	0.189	0.350	4.40	204
2018JGCDV5	92	8.8	1.24	4.76	0.197	0.201	4.40	209
2018JGCDV6	131	22.2	0.791	5.05	0.237	0.172	3.48	220
2018JGCDV7	113	14.3	0.592	2.53	0.133	0.046	2.92	169
Piledriver Creek Site 2065								
2018PCDV1	126	19.3	<0.020	2.20	0.0671	<0.020	1.68	109
2018PCDV2	148	29.0	<0.020	3.61	0.0477	<0.020	1.33	94.3
2018PCDV3	124	17.5	0.029	2.49	0.1460	0.032	1.77	111
2018PCDV4	121	15.0	0.047	2.62	0.1620	0.040	1.8	122
2018PCDV5	111	13.4	0.022	2.57	0.0711	<0.020	1.44	108
2018PCDV6	121	14.7	<0.020	3.77	0.0630	<0.020	1.52	113
Zinc Creek Site 371								
2018ZCDV1	119	12.9	1.05	5.92	0.371	0.804	3.2	287
2018ZCDV2	117	13.0	0.982	9.79	0.285	2.21	2.7	289
2018ZCDV4	86	6.7	0.484	3.02	0.186	0.092	3.10	161
2018ZCDV5	88	6.8	0.690	3.15	0.274	0.166	3.2	174
2018ZCDV6	87	6.4	0.454	3.25	0.178	0.068	3.33	160
2018ZCDV7	124	13.4	1.04	7.80	0.325	2.040	2.35	276
Empire Creek Site 2064[a]								
Empire Creek sample #1	ND	ND	0.097	0.82	0.059	< 0.05	1.9	48
Empire Creek sample #2	ND	ND	0.13	0.71	0.079	< 0.05	1.8	66
Empire Creek sample #3	ND	ND	0.11	0.65	0.065	< 0.05	1.7	54
Empire Creek sample #4	ND	ND	0.16	0.69	0.11	< 0.05	1.8	63
Empire Creek sample #5	ND	ND	0.12	0.72	0.058	< 0.05	2.0	45
Empire Creek sample #6	118	18.0	0.11	0.63	0.068	< 0.05	1.9	51
Empire Creek sample #7	148	38.0	0.08	0.62	0.087	< 0.05	2.1	41
Empire Creek sample #8	139	29.0	0.14	0.73	0.083	< 0.05	1.9	60
Empire Creek sample #9	123	21.0	0.13	0.69	0.072	< 0.05	1.9	54
Empire Creek sample #10	108	14.0	0.17	1.1	0.066	< 0.05	2.3	57

-continued-

Sample No.	FL (mm)	Weight (g)	Concentration (mg/kg dry weight) Cd	Cu	Hg	Pb	Se	Zn
Empire Creek Site 2064								
2018ECDV2	134	16.7	1.00	5.13	0.5140	0.064	6.3	237
2018ECDV3	121	17.7	0.814	4.90	0.3050	0.087	4.96	167
2018ECDV4	113	16.7	1.02	6.56	0.3590	0.285	6.11	203
2018ECDV5	135	19.8	0.094	3.21	0.0421	<0.020	1.7	120
2018ECDV6	137	21.4	0.099	4.10	0.0801	0.020	2.1	152
2018ECDV7	150	28.4	0.123	5.75	0.0472	0.024	1.7	113
Tributary Creek Site 9								
2018TCDV1	105	12.4	0.705	2.31	0.490	0.385	6.3	154
2018TCDV2	81	6.7	1.09	2.80	0.577	0.963	7.2	160
2018TCDV3	92	9.4	0.313	2.90	0.406	0.196	5.03	109
2018TCDV4	106	11.9	0.509	2.32	0.457	0.353	5.40	137
2018TCDV5	85	7.5	1.30	2.80	0.353	1.02	6.00	171
2018TCDV6	92	8.3	0.969	2.84	0.863	0.381	6.70	94.8
2018TCDV7	85	6.4	1.36	2.73	0.364	0.871	6.31	144
2018TCDV8	108	11.6	0.793	2.53	0.435	0.162	6.2	143
2018TCDV9	86	5.8	1.88	2.63	0.771	0.636	6.4	128
2018TCDV10	109	12.5	0.708	2.37	0.664	0.945	6.4	154
Greens Creek Site 54								
2018GC54DV1	125	18.7	1.11	5.65	0.171	0.325	6.3	230
2018GC54DV2	90	6.3	2.17	6.05	0.154	1.15	7.86	260
2018GC54DV3	90	7.5	1.75	5.47	0.139	1.08	8.0	225
2018GC54DV4	95	8.1	0.729	3.37	0.183	1.70	6.46	278
2018GC54DV5	110	14.1	0.639	3.82	0.156	0.568	6.4	208
2018GC54DV6	95	9.7	1.28	7.36	0.119	0.769	7.32	258
2018GC54DV7	95	7.1	1.31	4.78	0.130	0.452	7.2	234
2018GC54DV8	85	6.9	0.726	4.22	0.118	0.675	6.84	206
2018GC54DV9	100	10.1	1.35	5.40	0.186	0.421	7.99	241
2018GC54DV10	105	12.9	1.45	6.08	0.136	0.538	8.9	217
Greens Creek Site 63A[b]								
2018GC48DV1	92	7.0	1.55	6.52	0.175	0.635	7.50	283
2018GC48DV2	95	8.0	1.13	5.15	0.169	0.906	6.56	236
2018GC48DV3	105	11.5	1.63	7.10	0.181	1.29	7.5	250
2018GC48DV4	87	6.5	1.65	4.65	0.127	0.263	7.4	244
2018GC48DV5	97	8.2	1.44	5.42	0.157	1.54	7.38	244
2018GC48DV6	90	6.8	1.18	4.60	0.149	0.324	7.00	195
2018GC48DV7	105	10.6	1.10	5.33	0.178	0.172	6.2	247
2018GC48DV8	95	8.1	1.43	4.89	0.134	0.187	8.0	189
2018GC48DV9	110	13.0	0.964	9.61	0.146	0.34	6.6	190
2018GC48DV10	104	10.1	1.21	5.57	0.228	1.30	6.40	250

[a] Reported in: Gordon Willson-Naranjo and Benjamin Brewster, Habitat Biolgoists, to Jackie Timothy, Southeast Regional Supervisor. Memorandum: Empire Mine investigation Stream No. 112-65-10110; 7/24/2015. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Habitat Section, 802 3rd Street, Douglas, AK.

[b] The Greens Creek Site 63A sample codes were mislabeled as Greens Creek Site 48.

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 20, 2018 **Analytical Report for Service Request No:** K1807739

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

RE: 2018 Greens Creek Mine Biomonitoring

Dear Kate,

Enclosed are the results of the sample(s) submitted to our laboratory August 15, 2018
For your reference, these analyses have been assigned our service request number **K1807739.**

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 3356. You may also contact me via email at Kurt.Clarkson@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kurt Clarkson
Sr. 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

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

Inorganic Data Qualifiers

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

Metals Data Qualifiers

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

Organic Data Qualifiers

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

Additional Petroleum Hydrocarbon Specific Qualifiers

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

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

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	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	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	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)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	NA

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

Case Narrative

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

ALS Environmental

Client: Alaska Department of Fish and Game
Project: 2018 Greens Creek Mine Biomonitoring
Sample Matrix: Animal Tissue

Service Request: K1807739
Date Received: 08/15/2018

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier IV validation deliverables including summary forms and all of the associated raw data for each of the analyses. When appropriate to the method, method blank results have been reported with each analytical test.

Sample Receipt:

Thirty animal tissue samples were received for analysis at ALS Environmental on 08/15/2018. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored frozen at -20ºC upon receipt at the laboratory.

Metals:

No significant anomalies were noted with this analysis.

Approved by _____ Date 09/20/2018

Chain of Custody

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

CHAIN OF CUSTODY

SR# K180 7739

ALS Environmental
1317 South 13th Ave., Kelso, WA 98626 | +1 360 577 222 | +1 800 695 7222 | +1 360 636 1068 (fax)

PROJECT NAME	2018 Greens Creek Mine Biomonitoring
PROJECT NUMBER	
PROJECT MANAGER	Johnny Zutz
COMPANY NAME	ADF&G, Division of Habitat
ADDRESS	802 3rd Street
CITY/STATE/ZIP	Douglas, AK 99824
E-MAIL ADDRESS	johnny.zutz@alaska.gov
PHONE #	(907) 465-6474 FAX#
SAMPLER'S SIGNATURE	

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS		Semivolatile Organics by GC/MS (625 8270 SIM PAH 8270LL)	Volatile Organics (624 8260 BTEX 8021)	Hydrocarbons (*see below) (Gas Diesel Oil)	Oil & Grease/TRPH (1664 HEM 1664 SGT)	PCBs (Aroclors Congeners)	Pesticides/Herbicides (608 8081 8141 8151)	Chlorophenolics - 8151M (Tri Tetra PCP)	Metals, Total or Dissolved (See list below)	Cyanide Hex-Chrom	(circle) pH, Cond., Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS, Turb.	(circle) NH3-N, COD, TKN, TOC, DOC, NO2+NO3, T-Phos	TOX 9020 AOX 1650 506	Alkalinity CO_3 HCO_3	Dioxins / Furans (1613 8290)	Dissolved Gases CO_2 (RSK 175 Methane Ethane Ethene)	asdfasdfadf	adfadf	sdfasdfsdfa	REMARKS
attachment 1 of 1					30									X											
see comments below																									
																									adfasdf

REPORT REQUIREMENTS

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

INVOICE INFORMATION

PO #

Bill To:

TURNAROUND REQUIREMENTS

- ____ 24 hr.
- ____ 48 hr.
- ____ 5 day
- X Standard (15 working days)

Requested Report Date

Circle which metals are to be analyzed:

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

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

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

SPECIAL INSTRUCTIONS/COMMENTS:

Note: see attachement 1 of 1 of whole metal juvenile fish individual samples

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

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
Signature	Signature (Received By:)	Signature	Signature
Date/Time: 8/13/18	Date/Time: 8-15-18 0845	Date/Time	Date/Time
Printed Name: Johnny Zutz	Printed Name: Daniel Powers	Printed Name	Printed Name
Firm	Firm: ALS-K	Firm	Firm

KI807739

Project Name:	2018 Greens Creek Mine Biomonitoring		**Attachment 1 of 1**
Project Manager:	Johnny Zutz	Sample Type:	Whole body juvenile Dolly Varden char
Company Name:	Alaska Department of Fish and Game	Analysis:	Total metals, dry weight basis, report percent solids
Contact Information:	johnny.zutz@alaska.gov; (907) 465-6474		

Caculations to account for measuring fish while in storage bag with label weight below

Matrix	Sample Date	Sample Name	Sample ID	Total Metals	Fork Length (mm)	Weight: fish & bag (g)	Weight: fish (g)
Whole Body	7/12/2018	Tributary Creek Site 9 DV Metals Fish #1	2018TC9DV1	Ag, Cd, Cu, Hg, Pb, Se, Zn	105	19.0	12.4
Whole Body	7/12/2018	Tributary Creek Site 9 DV Metals Fish #2	2018TC9DV2	Ag, Cd, Cu, Hg, Pb, Se, Zn	81	13.3	6.7
Whole Body	7/12/2018	Tributary Creek Site 9 DV Metals Fish #3	2018TC9DV3	Ag, Cd, Cu, Hg, Pb, Se, Zn	92	16.0	9.4
Whole Body	7/12/2018	Tributary Creek Site 9 DV Metals Fish #4	2018TC9DV4	Ag, Cd, Cu, Hg, Pb, Se, Zn	106	18.5	11.9
Whole Body	7/12/2018	Tributary Creek Site 9 DV Metals Fish #5	2018TC9DV5	Ag, Cd, Cu, Hg, Pb, Se, Zn	85	14.1	7.5
Whole Body	7/12/2018	Tributary Creek Site 9 DV Metals Fish #6	2018TC9DV6	Ag, Cd, Cu, Hg, Pb, Se, Zn	92	14.9	8.3
Whole Body	7/12/2018	Tributary Creek Site 9 DV Metals Fish #7	2018TC9DV7	Ag, Cd, Cu, Hg, Pb, Se, Zn	85	13.0	6.4
Whole Body	7/12/2018	Tributary Creek Site 9 DV Metals Fish #8	2018TC9DV8	Ag, Cd, Cu, Hg, Pb, Se, Zn	108	18.2	11.6
Whole Body	7/12/2018	Tributary Creek Site 9 DV Metals Fish #9	2018TC9DV9	Ag, Cd, Cu, Hg, Pb, Se, Zn	86	12.4	5.8
Whole Body	7/12/2018	Tributary Creek Site 9 DV Metals Fish #10	2018TC9DV10	Ag, Cd, Cu, Hg, Pb, Se, Zn	109	19.1	12.5
Whole Body	7/12/2018	Greens Creek Site 54 DV Metals Fish #1	2018GC54DV1	Ag, Cd, Cu, Hg, Pb, Se, Zn	125	25.3	18.7
Whole Body	7/12/2018	Greens Creek Site 54 DV Metals Fish #2	2018GC54DV2	Ag, Cd, Cu, Hg, Pb, Se, Zn	90	12.9	6.3
Whole Body	7/12/2018	Greens Creek Site 54 DV Metals Fish #3	2018GC54DV3	Ag, Cd, Cu, Hg, Pb, Se, Zn	90	14.1	7.5
Whole Body	7/12/2018	Greens Creek Site 54 DV Metals Fish #4	2018GC54DV4	Ag, Cd, Cu, Hg, Pb, Se, Zn	95	14.7	8.1
Whole Body	7/12/2018	Greens Creek Site 54 DV Metals Fish #5	2018GC54DV5	Ag, Cd, Cu, Hg, Pb, Se, Zn	110	20.7	14.1
Whole Body	7/12/2018	Greens Creek Site 54 DV Metals Fish #6	2018GC54DV6	Ag, Cd, Cu, Hg, Pb, Se, Zn	95	16.3	9.7
Whole Body	7/12/2018	Greens Creek Site 54 DV Metals Fish #7	2018GC54DV7	Ag, Cd, Cu, Hg, Pb, Se, Zn	95	13.7	7.1
Whole Body	7/12/2018	Greens Creek Site 54 DV Metals Fish #8	2018GC54DV8	Ag, Cd, Cu, Hg, Pb, Se, Zn	85	13.5	6.9
Whole Body	7/12/2018	Greens Creek Site 54 DV Metals Fish #9	2018GC54DV9	Ag, Cd, Cu, Hg, Pb, Se, Zn	100	16.7	10.1
Whole Body	7/12/2018	Greens Creek Site 54 DV Metals Fish #10	2018GC54DV10	Ag, Cd, Cu, Hg, Pb, Se, Zn	105	19.5	12.9
Whole Body	7/13/2018	Greens Creek Site 48 DV Metals Fish #1	2018GC48DV1	Ag, Cd, Cu, Hg, Pb, Se, Zn	92	13.6	7.0
Whole Body	7/13/2018	Greens Creek Site 48 DV Metals Fish #2	2018GC48DV2	Ag, Cd, Cu, Hg, Pb, Se, Zn	95	14.6	8.0
Whole Body	7/13/2018	Greens Creek Site 48 DV Metals Fish #3	2018GC48DV3	Ag, Cd, Cu, Hg, Pb, Se, Zn	105	18.1	11.5
Whole Body	7/13/2018	Greens Creek Site 48 DV Metals Fish #4	2018GC48DV4	Ag, Cd, Cu, Hg, Pb, Se, Zn	87	13.1	6.5
Whole Body	7/13/2018	Greens Creek Site 48 DV Metals Fish #5	2018GC48DV5	Ag, Cd, Cu, Hg, Pb, Se, Zn	97	14.8	8.2
Whole Body	7/13/2018	Greens Creek Site 48 DV Metals Fish #6	2018GC48DV6	Ag, Cd, Cu, Hg, Pb, Se, Zn	90	13.4	6.8
Whole Body	7/13/2018	Greens Creek Site 48 DV Metals Fish #7	2018GC48DV7	Ag, Cd, Cu, Hg, Pb, Se, Zn	105	17.2	10.6
Whole Body	7/13/2018	Greens Creek Site 48 DV Metals Fish #8	2018GC48DV8	Ag, Cd, Cu, Hg, Pb, Se, Zn	95	14.7	8.1
Whole Body	7/13/2018	Greens Creek Site 48 DV Metals Fish #9	2018GC48DV9	Ag, Cd, Cu, Hg, Pb, Se, Zn	110	19.6	13.0
Whole Body	7/13/2018	Greens Creek Site 48 DV Metals Fish #10	2018GC48DV10	Ag, Cd, Cu, Hg, Pb, Se, Zn	104	16.7	10.1

PC Kurt

Cooler Receipt and Preservation Form

Client ADF&G, Division of Habitat Service Request K18 07739

Received: 8-15-18 Opened: 8-15-18 By: DSP Unloaded: 8-15-18 By: DSP

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 custody seals on coolers? NA (Y) N If yes, how many and where? 1 Top Front
   If present, were custody seals intact? (Y) N If present, were they signed and dated? (Y) N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID (NA)	Tracking Number NA	Filed
3.0	2.8	Frozen	Frozen	-0.2	322		7822 9429 7371	

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

Sample ID on Bottle	Sample ID on COC	Identified by:

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

Notes, Discrepancies, & Resolutions: _____

Total Solids

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

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18 - 07/13/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18
Analysis Method:	Freeze Dry	**Units:**	Percent
Prep Method:	None	**Basis:**	Wet

Total Solids

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
2018TC9DV1	K1807739-001	**20.8**	-	1	08/31/18 13:20	
2018TC9DV2	K1807739-002	**18.4**	-	1	08/31/18 13:20	
2018TC9DV3	K1807739-003	**20.4**	-	1	08/31/18 13:20	
2018TC9DV4	K1807739-004	**21.6**	-	1	08/31/18 13:20	
2018TC9DV5	K1807739-005	**21.0**	-	1	08/31/18 13:20	
2018TC9DV6	K1807739-006	**22.5**	-	1	08/31/18 13:20	
2018TC9DV7	K1807739-007	**19.8**	-	1	08/31/18 13:20	
2018TC9DV8	K1807739-008	**21.6**	-	1	08/31/18 13:20	
2018TC9DV9	K1807739-009	**23.0**	-	1	08/31/18 13:20	
2018TC9DV10	K1807739-010	**22.2**	-	1	08/31/18 13:20	
2018GC54DV1	K1807739-011	**20.0**	-	1	08/31/18 13:20	
2018GC54DV2	K1807739-012	**20.7**	-	1	08/31/18 13:20	
2018GC54DV3	K1807739-013	**20.4**	-	1	08/31/18 13:20	
2018GC54DV4	K1807739-014	**19.4**	-	1	08/31/18 13:20	
2018GC54DV5	K1807739-015	**22.1**	-	1	08/31/18 13:20	
2018GC54DV6	K1807739-016	**23.5**	-	1	08/31/18 13:20	
2018GC54DV7	K1807739-017	**21.8**	-	1	08/31/18 13:20	
2018GC54DV8	K1807739-018	**20.9**	-	1	08/31/18 13:20	
2018GC54DV9	K1807739-019	**19.5**	-	1	08/31/18 13:20	
2018GC54DV10	K1807739-020	**19.9**	-	1	08/31/18 13:20	
2018GC48DV1	K1807739-021	**37.1**	-	1	08/31/18 13:20	
2018GC48DV2	K1807739-022	**21.2**	-	1	08/31/18 13:20	
2018GC48DV3	K1807739-023	**20.8**	-	1	08/31/18 13:20	
2018GC48DV4	K1807739-024	**39.2**	-	1	08/31/18 13:20	
2018GC48DV5	K1807739-025	**21.2**	-	1	08/31/18 13:20	
2018GC48DV6	K1807739-026	**21.5**	-	1	08/31/18 13:20	
2018GC48DV7	K1807739-027	**21.0**	-	1	08/31/18 13:20	
2018GC48DV8	K1807739-028	**23.0**	-	1	08/31/18 13:20	
2018GC48DV9	K1807739-029	**21.5**	-	1	08/31/18 13:20	
2018GC48DV10	K1807739-030	**21.3**	-	1	08/31/18 13:20	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18 - 07/13/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18
Analysis Method:	Freeze Dry	**Units:**	Percent
Prep Method:	None	**Basis:**	Wet

Replicate Sample Summary
Inorganic Parameters

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
2018GC54DV1	K1807739-011DUP	-	20.0	19.8	19.9	1	20	08/31/18
2018GC48DV9	K1807739-029DUP	-	21.5	21.7	21.6	<1	20	08/31/18

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.

Metals

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www.alsglobal.com

ALS Group USA, Corp.
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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal tissue	**Date Received:**	08/15/18

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/g
Basis: Dry

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
2018TC9DV1	K1807739-001	10	10	09/12/18	09/14/18	490	
2018TC9DV2	K1807739-002	9.9	10	09/12/18	09/14/18	577	
2018TC9DV3	K1807739-003	10	10	09/12/18	09/14/18	406	
2018TC9DV4	K1807739-004	9.9	10	09/12/18	09/14/18	457	
2018TC9DV5	K1807739-005	9.9	10	09/12/18	09/14/18	353	
2018TC9DV6	K1807739-006	9.7	10	09/12/18	09/14/18	863	
2018TC9DV7	K1807739-007	9.6	10	09/12/18	09/14/18	364	
2018TC9DV8	K1807739-008	10	10	09/12/18	09/14/18	435	
2018TC9DV9	K1807739-009	9.9	10	09/12/18	09/14/18	771	
2018TC9DV10	K1807739-010	9.8	10	09/12/18	09/14/18	664	
2018GC54DV1	K1807739-011	10	10	09/12/18	09/14/18	171	
2018GC54DV2	K1807739-012	9.9	10	09/12/18	09/14/18	154	
2018GC54DV3	K1807739-013	10	10	09/12/18	09/14/18	139	
2018GC54DV4	K1807739-014	9.6	10	09/12/18	09/14/18	183	
2018GC54DV5	K1807739-015	9.8	10	09/12/18	09/14/18	156	
2018GC54DV6	K1807739-016	9.9	10	09/12/18	09/14/18	119	
2018GC54DV7	K1807739-017	9.8	10	09/12/18	09/14/18	130	
2018GC54DV8	K1807739-018	9.9	10	09/12/18	09/14/18	118	
2018GC54DV9	K1807739-019	9.6	10	09/12/18	09/14/18	186	
2018GC54DV10	K1807739-020	9.8	10	09/12/18	09/14/18	136	
Method Blank	K1807739-MB1	1.0	1	09/12/18	09/14/18	ND	
Method Blank	K1807739-MB2	1.0	1	09/12/18	09/14/18	ND	
Method Blank	K1807739-MB3	1.0	1	09/12/18	09/14/18	ND	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/13/18
Sample Matrix:	Animal tissue	**Date Received:**	08/15/18

Mercury, Total

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

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
2018GC48DV1	K1807739-021	13	1	09/12/18	09/14/18	175	
2018GC48DV2	K1807739-022	9.8	1	09/12/18	09/14/18	169	
2018GC48DV3	K1807739-023	9.8	1	09/12/18	09/14/18	181	
2018GC48DV4	K1807739-024	9.9	1	09/12/18	09/14/18	127	
2018GC48DV5	K1807739-025	9.9	1	09/12/18	09/14/18	157	
2018GC48DV6	K1807739-026	9.8	1	09/12/18	09/14/18	149	
2018GC48DV7	K1807739-027	9.9	1	09/12/18	09/14/18	178	
2018GC48DV8	K1807739-028	9.8	1	09/12/18	09/14/18	134	
2018GC48DV9	K1807739-029	9.9	1	09/12/18	09/14/18	146	
2018GC48DV10	K1807739-030	9.9	1	09/12/18	09/14/18	228	
Method Blank	K1807739-MB1	1.0	1	09/12/18	09/14/18	ND	
Method Blank	K1807739-MB2	1.0	1	09/12/18	09/14/18	ND	
Method Blank	K1807739-MB3	1.0	1	09/12/18	09/14/18	ND	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal tissue	**Date Received:**	08/15/18
		Date Extracted:	09/12/18
		Date Analyzed:	09/14/18

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name:	2018TC9DV4	Units:	ng/g
Lab Code:	K1807739-004MS, K1807739-004DMS	Basis:	Dry
Test Notes:			

				Spike Level		Sample	Spike Result		Percent Recovery		ALS Acceptance	Relative Percent	Result
Analyte	**Prep Method**	**Analysis Method**	**MRL**	**MS**	**DMS**	**Result**	**MS**	**DMS**	**MS**	**DMS**	**Limits**	**Difference**	**Notes**
Mercury	METHOD	1631E	10	248	249	457	744	690	116	94	70-130	8	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal tissue	**Date Received:**	08/15/18
		Date Extracted:	09/12/18
		Date Analyzed:	09/14/18

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name:	2018GC54DV5	Units:	ng/g
Lab Code:	K1807739-015MS, K1807739-015DMS	Basis:	Dry
Test Notes:			

				Spike Level		Sample	Spike Result		Percent Recovery		ALS Acceptance	Relative Percent	Result
Analyte	**Prep Method**	**Analysis Method**	**MRL**	**MS**	**DMS**	**Result**	**MS**	**DMS**	**MS**	**DMS**	**Limits**	**Difference**	**Notes**
Mercury	METHOD	1631E	9.9	246	248	156	390	426	95	109	70-130	9	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	09/14/18

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Initial)

Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	5.45	109	70-130	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	09/14/18

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final)

Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	4.95	99	70-130	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	NA
LCS Matrix:	Animal tissue	**Date Received:**	NA
		Date Extracted:	09/12/18
		Date Analyzed:	09/14/18

Quality Control Sample (QCS) Summary
Total Metals

Sample Name:	Quality Control Sample	Units:	ng/g
Lab Code:		Basis:	Dry
Test Notes:	Tort-3 Solids = 99.1%		

Source: TORT-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	292	271	93	70-130	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/13/18
Sample Matrix:	Animal tissue	**Date Received:**	08/15/18
		Date Extracted:	09/12/18
		Date Analyzed:	09/14/18

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name:	2018GC48DV3	Units:	ng/g
Lab Code:	K1807739-023MS, K1807739-023DMS	Basis:	Dry
Test Notes:			

				Spike Level		Sample	Spike Result		Percent Recovery		ALS Acceptance	Relative Percent	Result
Analyte	**Prep Method**	**Analysis Method**	**MRL**	**MS**	**DMS**	**Result**	**MS**	**DMS**	**MS**	**DMS**	**Limits**	**Difference**	**Notes**
Mercury	METHOD	1631E	9.9	249	246	181	461	429	112	101	70-130	7	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	09/14/18

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Initial)

Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	5.04	101	70-130	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	09/14/18

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final)

Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	5.35	107	70-130	

ALS Group USA, Corp.
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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	NA
LCS Matrix:	Animal tissue	**Date Received:**	NA
		Date Extracted:	09/12/18
		Date Analyzed:	09/14/18

Quality Control Sample (QCS) Summary
Total Metals

Sample Name:	Quality Control Sample	Units:	ng/g
Lab Code:		Basis:	Dry
Test Notes:	Tort-3 Solids = 99.1%		

Source: TORT-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	292	291	100	70-130	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018TC9DV1	**Basis:**	Dry
Lab Code:	K1807739-001		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.701**	mg/Kg	0.020	5	09/13/18 15:24	09/04/18	
Copper	200.8	**2.34**	mg/Kg	0.10	5	09/13/18 15:24	09/04/18	
Lead	200.8	**0.365**	mg/Kg	0.020	5	09/13/18 15:24	09/04/18	
Selenium	200.8	**6.27**	mg/Kg	1.0	5	09/13/18 15:24	09/04/18	
Silver	200.8	**0.096**	mg/Kg	0.020	5	09/13/18 15:24	09/04/18	
Zinc	200.8	**149**	mg/Kg	0.50	5	09/13/18 15:24	09/04/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018TC9DV2	**Basis:**	Dry
Lab Code:	K1807739-002		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.09**	mg/Kg	0.020	5	09/13/18 15:31	09/04/18	
Copper	200.8	**2.80**	mg/Kg	0.10	5	09/13/18 15:31	09/04/18	
Lead	200.8	**0.963**	mg/Kg	0.020	5	09/13/18 15:31	09/04/18	
Selenium	200.8	**7.2**	mg/Kg	1.0	5	09/13/18 15:31	09/04/18	
Silver	200.8	**0.115**	mg/Kg	0.020	5	09/13/18 15:31	09/04/18	
Zinc	200.8	**160**	mg/Kg	0.50	5	09/13/18 15:31	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018TC9DV3	**Basis:**	Dry
Lab Code:	K1807739-003		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.313**	mg/Kg	0.020	5	09/13/18 15:34	09/04/18	
Copper	200.8	**2.90**	mg/Kg	0.099	5	09/13/18 15:34	09/04/18	
Lead	200.8	**0.196**	mg/Kg	0.020	5	09/13/18 15:34	09/04/18	
Selenium	200.8	**5.03**	mg/Kg	0.99	5	09/13/18 15:34	09/04/18	
Silver	200.8	**0.070**	mg/Kg	0.020	5	09/13/18 15:34	09/04/18	
Zinc	200.8	**109**	mg/Kg	0.50	5	09/13/18 15:34	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018TC9DV4	**Basis:**	Dry
Lab Code:	K1807739-004		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.509**	mg/Kg	0.020	5	09/13/18 15:36	09/04/18	
Copper	200.8	**2.32**	mg/Kg	0.10	5	09/13/18 15:36	09/04/18	
Lead	200.8	**0.353**	mg/Kg	0.020	5	09/13/18 15:36	09/04/18	
Selenium	200.8	**5.40**	mg/Kg	1.0	5	09/13/18 15:36	09/04/18	
Silver	200.8	**0.044**	mg/Kg	0.020	5	09/13/18 15:36	09/04/18	
Zinc	200.8	**137**	mg/Kg	0.50	5	09/13/18 15:36	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018TC9DV5	**Basis:**	Dry
Lab Code:	K1807739-005		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.30**	mg/Kg	0.020	5	09/13/18 15:39	09/04/18	
Copper	200.8	**2.80**	mg/Kg	0.10	5	09/13/18 15:39	09/04/18	
Lead	200.8	**1.02**	mg/Kg	0.020	5	09/13/18 15:39	09/04/18	
Selenium	200.8	**6.00**	mg/Kg	1.0	5	09/13/18 15:39	09/04/18	
Silver	200.8	**0.085**	mg/Kg	0.020	5	09/13/18 15:39	09/04/18	
Zinc	200.8	**171**	mg/Kg	0.50	5	09/13/18 15:39	09/04/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018TC9DV6	**Basis:**	Dry
Lab Code:	K1807739-006		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.969**	mg/Kg	0.020	5	09/13/18 15:46	09/04/18	
Copper	200.8	**2.84**	mg/Kg	0.099	5	09/13/18 15:46	09/04/18	
Lead	200.8	**0.381**	mg/Kg	0.020	5	09/13/18 15:46	09/04/18	
Selenium	200.8	**6.70**	mg/Kg	0.99	5	09/13/18 15:46	09/04/18	
Silver	200.8	**0.108**	mg/Kg	0.020	5	09/13/18 15:46	09/04/18	
Zinc	200.8	**94.8**	mg/Kg	0.50	5	09/13/18 15:46	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018TC9DV7	**Basis:**	Dry
Lab Code:	K1807739-007		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.36**	mg/Kg	0.020	5	09/13/18 15:48	09/04/18	
Copper	200.8	**2.73**	mg/Kg	0.10	5	09/13/18 15:48	09/04/18	
Lead	200.8	**0.871**	mg/Kg	0.020	5	09/13/18 15:48	09/04/18	
Selenium	200.8	**6.31**	mg/Kg	1.0	5	09/13/18 15:48	09/04/18	
Silver	200.8	**0.093**	mg/Kg	0.020	5	09/13/18 15:48	09/04/18	
Zinc	200.8	**144**	mg/Kg	0.50	5	09/13/18 15:48	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018TC9DV8	**Basis:**	Dry
Lab Code:	K1807739-008		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.793**	mg/Kg	0.020	5	09/13/18 15:51	09/04/18	
Copper	200.8	**2.53**	mg/Kg	0.10	5	09/13/18 15:51	09/04/18	
Lead	200.8	**0.162**	mg/Kg	0.020	5	09/13/18 15:51	09/04/18	
Selenium	200.8	**6.2**	mg/Kg	1.0	5	09/13/18 15:51	09/04/18	
Silver	200.8	**0.084**	mg/Kg	0.020	5	09/13/18 15:51	09/04/18	
Zinc	200.8	**143**	mg/Kg	0.50	5	09/13/18 15:51	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018TC9DV9	**Basis:**	Dry
Lab Code:	K1807739-009		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.88**	mg/Kg	0.020	5	09/13/18 15:53	09/04/18	
Copper	200.8	**2.63**	mg/Kg	0.10	5	09/13/18 15:53	09/04/18	
Lead	200.8	**0.636**	mg/Kg	0.020	5	09/13/18 15:53	09/04/18	
Selenium	200.8	**6.4**	mg/Kg	1.0	5	09/13/18 15:53	09/04/18	
Silver	200.8	**0.096**	mg/Kg	0.020	5	09/13/18 15:53	09/04/18	
Zinc	200.8	**128**	mg/Kg	0.50	5	09/13/18 15:53	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018TC9DV10	**Basis:**	Dry
Lab Code:	K1807739-010		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.708**	mg/Kg	0.020	5	09/13/18 15:56	09/04/18	
Copper	200.8	**2.37**	mg/Kg	0.10	5	09/13/18 15:56	09/04/18	
Lead	200.8	**0.945**	mg/Kg	0.020	5	09/13/18 15:56	09/04/18	
Selenium	200.8	**6.4**	mg/Kg	1.0	5	09/13/18 15:56	09/04/18	
Silver	200.8	**0.139**	mg/Kg	0.020	5	09/13/18 15:56	09/04/18	
Zinc	200.8	**154**	mg/Kg	0.50	5	09/13/18 15:56	09/04/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC54DV1	**Basis:**	Dry
Lab Code:	K1807739-011		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.14**	mg/Kg	0.020	5	09/13/18 15:58	09/04/18	
Copper	200.8	**5.69**	mg/Kg	0.10	5	09/13/18 15:58	09/04/18	
Lead	200.8	**0.314**	mg/Kg	0.020	5	09/13/18 15:58	09/04/18	
Selenium	200.8	**6.32**	mg/Kg	1.0	5	09/13/18 15:58	09/04/18	
Silver	200.8	**0.024**	mg/Kg	0.020	5	09/13/18 15:58	09/04/18	
Zinc	200.8	**236**	mg/Kg	0.50	5	09/13/18 15:58	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC54DV2	**Basis:**	Dry
Lab Code:	K1807739-012		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**2.17**	mg/Kg	0.020	5	09/13/18 16:06	09/04/18	
Copper	200.8	**6.05**	mg/Kg	0.10	5	09/13/18 16:06	09/04/18	
Lead	200.8	**1.15**	mg/Kg	0.020	5	09/13/18 16:06	09/04/18	
Selenium	200.8	**7.86**	mg/Kg	1.0	5	09/13/18 16:06	09/04/18	
Silver	200.8	ND U	mg/Kg	0.020	5	09/13/18 16:06	09/04/18	
Zinc	200.8	**260**	mg/Kg	0.50	5	09/13/18 16:06	09/04/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC54DV3	**Basis:**	Dry
Lab Code:	K1807739-013		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.75**	mg/Kg	0.020	5	09/13/18 16:08	09/04/18	
Copper	200.8	**5.47**	mg/Kg	0.10	5	09/13/18 16:08	09/04/18	
Lead	200.8	**1.08**	mg/Kg	0.020	5	09/13/18 16:08	09/04/18	
Selenium	200.8	**8.0**	mg/Kg	1.0	5	09/13/18 16:08	09/04/18	
Silver	200.8	**0.032**	mg/Kg	0.020	5	09/13/18 16:08	09/04/18	
Zinc	200.8	**225**	mg/Kg	0.50	5	09/13/18 16:08	09/04/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC54DV4	**Basis:**	Dry
Lab Code:	K1807739-014		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.729**	mg/Kg	0.020	5	09/13/18 16:15	09/04/18	
Copper	200.8	**3.37**	mg/Kg	0.099	5	09/13/18 16:15	09/04/18	
Lead	200.8	**1.70**	mg/Kg	0.020	5	09/13/18 16:15	09/04/18	
Selenium	200.8	**6.46**	mg/Kg	0.99	5	09/13/18 16:15	09/04/18	
Silver	200.8	**0.037**	mg/Kg	0.020	5	09/13/18 16:15	09/04/18	
Zinc	200.8	**278**	mg/Kg	0.50	5	09/13/18 16:15	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC54DV5	**Basis:**	Dry
Lab Code:	K1807739-015		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.639**	mg/Kg	0.020	5	09/13/18 16:18	09/04/18	
Copper	200.8	**3.82**	mg/Kg	0.10	5	09/13/18 16:18	09/04/18	
Lead	200.8	**0.568**	mg/Kg	0.020	5	09/13/18 16:18	09/04/18	
Selenium	200.8	**6.4**	mg/Kg	1.0	5	09/13/18 16:18	09/04/18	
Silver	200.8	**0.040**	mg/Kg	0.020	5	09/13/18 16:18	09/04/18	
Zinc	200.8	**208**	mg/Kg	0.50	5	09/13/18 16:18	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC54DV6	**Basis:**	Dry
Lab Code:	K1807739-016		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.28**	mg/Kg	0.020	5	09/13/18 16:20	09/04/18	
Copper	200.8	**7.36**	mg/Kg	0.099	5	09/13/18 16:20	09/04/18	
Lead	200.8	**0.769**	mg/Kg	0.020	5	09/13/18 16:20	09/04/18	
Selenium	200.8	**7.32**	mg/Kg	0.99	5	09/13/18 16:20	09/04/18	
Silver	200.8	**0.026**	mg/Kg	0.020	5	09/13/18 16:20	09/04/18	
Zinc	200.8	**258**	mg/Kg	0.50	5	09/13/18 16:20	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC54DV7	**Basis:**	Dry
Lab Code:	K1807739-017		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.31**	mg/Kg	0.020	5	09/13/18 16:23	09/04/18	
Copper	200.8	**4.78**	mg/Kg	0.10	5	09/13/18 16:23	09/04/18	
Lead	200.8	**0.452**	mg/Kg	0.020	5	09/13/18 16:23	09/04/18	
Selenium	200.8	**7.2**	mg/Kg	1.0	5	09/13/18 16:23	09/04/18	
Silver	200.8	**0.023**	mg/Kg	0.020	5	09/13/18 16:23	09/04/18	
Zinc	200.8	**234**	mg/Kg	0.50	5	09/13/18 16:23	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC54DV8	**Basis:**	Dry
Lab Code:	K1807739-018		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.726**	mg/Kg	0.020	5	09/13/18 16:25	09/04/18	
Copper	200.8	**4.22**	mg/Kg	0.099	5	09/13/18 16:25	09/04/18	
Lead	200.8	**0.675**	mg/Kg	0.020	5	09/13/18 16:25	09/04/18	
Selenium	200.8	**6.84**	mg/Kg	0.99	5	09/13/18 16:25	09/04/18	
Silver	200.8	**0.029**	mg/Kg	0.020	5	09/13/18 16:25	09/04/18	
Zinc	200.8	**206**	mg/Kg	0.50	5	09/13/18 16:25	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC54DV9	**Basis:**	Dry
Lab Code:	K1807739-019		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.35**	mg/Kg	0.020	5	09/13/18 16:28	09/04/18	
Copper	200.8	**5.40**	mg/Kg	0.10	5	09/13/18 16:28	09/04/18	
Lead	200.8	**0.421**	mg/Kg	0.020	5	09/13/18 16:28	09/04/18	
Selenium	200.8	**7.99**	mg/Kg	1.0	5	09/13/18 16:28	09/04/18	
Silver	200.8	**0.056**	mg/Kg	0.020	5	09/13/18 16:28	09/04/18	
Zinc	200.8	**241**	mg/Kg	0.50	5	09/13/18 16:28	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC54DV10	**Basis:**	Dry
Lab Code:	K1807739-020		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.45**	mg/Kg	0.020	5	09/13/18 16:30	09/04/18	
Copper	200.8	**6.08**	mg/Kg	0.10	5	09/13/18 16:30	09/04/18	
Lead	200.8	**0.538**	mg/Kg	0.020	5	09/13/18 16:30	09/04/18	
Selenium	200.8	**8.9**	mg/Kg	1.0	5	09/13/18 16:30	09/04/18	
Silver	200.8	**0.036**	mg/Kg	0.020	5	09/13/18 16:30	09/04/18	
Zinc	200.8	**217**	mg/Kg	0.50	5	09/13/18 16:30	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/13/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC48DV1	**Basis:**	Dry
Lab Code:	K1807739-021		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.57**	mg/Kg	0.020	5	09/13/18 16:45	09/04/18	
Copper	200.8	**6.70**	mg/Kg	0.10	5	09/13/18 16:45	09/04/18	
Lead	200.8	**0.614**	mg/Kg	0.020	5	09/13/18 16:45	09/04/18	
Selenium	200.8	**7.51**	mg/Kg	1.0	5	09/13/18 16:45	09/04/18	
Silver	200.8	**0.039**	mg/Kg	0.020	5	09/13/18 16:45	09/04/18	
Zinc	200.8	**276**	mg/Kg	0.50	5	09/13/18 16:45	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/13/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC48DV2	**Basis:**	Dry
Lab Code:	K1807739-022		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.13**	mg/Kg	0.020	5	09/13/18 16:52	09/04/18	
Copper	200.8	**5.15**	mg/Kg	0.099	5	09/13/18 16:52	09/04/18	
Lead	200.8	**0.906**	mg/Kg	0.020	5	09/13/18 16:52	09/04/18	
Selenium	200.8	**6.56**	mg/Kg	0.99	5	09/13/18 16:52	09/04/18	
Silver	200.8	**0.056**	mg/Kg	0.020	5	09/13/18 16:52	09/04/18	
Zinc	200.8	**236**	mg/Kg	0.50	5	09/13/18 16:52	09/04/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/13/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC48DV3	**Basis:**	Dry
Lab Code:	K1807739-023		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.63**	mg/Kg	0.020	5	09/13/18 16:54	09/04/18	
Copper	200.8	**7.10**	mg/Kg	0.10	5	09/13/18 16:54	09/04/18	
Lead	200.8	**1.29**	mg/Kg	0.020	5	09/13/18 16:54	09/04/18	
Selenium	200.8	**7.5**	mg/Kg	1.0	5	09/13/18 16:54	09/04/18	
Silver	200.8	**0.045**	mg/Kg	0.020	5	09/13/18 16:54	09/04/18	
Zinc	200.8	**250**	mg/Kg	0.50	5	09/13/18 16:54	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/13/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC48DV4	**Basis:**	Dry
Lab Code:	K1807739-024		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.65**	mg/Kg	0.020	5	09/13/18 16:57	09/04/18	
Copper	200.8	**4.65**	mg/Kg	0.10	5	09/13/18 16:57	09/04/18	
Lead	200.8	**0.263**	mg/Kg	0.020	5	09/13/18 16:57	09/04/18	
Selenium	200.8	**7.4**	mg/Kg	1.0	5	09/13/18 16:57	09/04/18	
Silver	200.8	**0.021**	mg/Kg	0.020	5	09/13/18 16:57	09/04/18	
Zinc	200.8	**244**	mg/Kg	0.50	5	09/13/18 16:57	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/13/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC48DV5	**Basis:**	Dry
Lab Code:	K1807739-025		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.44**	mg/Kg	0.020	5	09/13/18 16:59	09/04/18	
Copper	200.8	**5.42**	mg/Kg	0.10	5	09/13/18 16:59	09/04/18	
Lead	200.8	**1.54**	mg/Kg	0.020	5	09/13/18 16:59	09/04/18	
Selenium	200.8	**7.38**	mg/Kg	1.0	5	09/13/18 16:59	09/04/18	
Silver	200.8	**0.044**	mg/Kg	0.020	5	09/13/18 16:59	09/04/18	
Zinc	200.8	**244**	mg/Kg	0.50	5	09/13/18 16:59	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/13/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC48DV6	**Basis:**	Dry
Lab Code:	K1807739-026		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.18**	mg/Kg	0.020	5	09/13/18 17:07	09/04/18	
Copper	200.8	**4.60**	mg/Kg	0.10	5	09/13/18 17:07	09/04/18	
Lead	200.8	**0.324**	mg/Kg	0.020	5	09/13/18 17:07	09/04/18	
Selenium	200.8	**7.00**	mg/Kg	1.0	5	09/13/18 17:07	09/04/18	
Silver	200.8	**0.026**	mg/Kg	0.020	5	09/13/18 17:07	09/04/18	
Zinc	200.8	**195**	mg/Kg	0.50	5	09/13/18 17:07	09/04/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/13/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC48DV7	**Basis:**	Dry
Lab Code:	K1807739-027		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.10**	mg/Kg	0.020	5	09/13/18 17:09	09/04/18	
Copper	200.8	**5.33**	mg/Kg	0.10	5	09/13/18 17:09	09/04/18	
Lead	200.8	**0.172**	mg/Kg	0.020	5	09/13/18 17:09	09/04/18	
Selenium	200.8	**6.2**	mg/Kg	1.0	5	09/13/18 17:09	09/04/18	
Silver	200.8	**0.025**	mg/Kg	0.020	5	09/13/18 17:09	09/04/18	
Zinc	200.8	**247**	mg/Kg	0.50	5	09/13/18 17:09	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/13/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC48DV8	**Basis:**	Dry
Lab Code:	K1807739-028		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.43**	mg/Kg	0.020	5	09/13/18 17:12	09/04/18	
Copper	200.8	**4.89**	mg/Kg	0.10	5	09/13/18 17:12	09/04/18	
Lead	200.8	**0.187**	mg/Kg	0.020	5	09/13/18 17:12	09/04/18	
Selenium	200.8	**8.0**	mg/Kg	1.0	5	09/13/18 17:12	09/04/18	
Silver	200.8	ND U	mg/Kg	0.020	5	09/13/18 17:12	09/04/18	
Zinc	200.8	**189**	mg/Kg	0.50	5	09/13/18 17:12	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/13/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC48DV9	**Basis:**	Dry
Lab Code:	K1807739-029		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.964**	mg/Kg	0.020	5	09/13/18 17:14	09/04/18	
Copper	200.8	**9.61**	mg/Kg	0.10	5	09/13/18 17:14	09/04/18	
Lead	200.8	**0.340**	mg/Kg	0.020	5	09/13/18 17:14	09/04/18	
Selenium	200.8	**6.6**	mg/Kg	1.0	5	09/13/18 17:14	09/04/18	
Silver	200.8	**0.037**	mg/Kg	0.020	5	09/13/18 17:14	09/04/18	
Zinc	200.8	**190**	mg/Kg	0.50	5	09/13/18 17:14	09/04/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/13/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18 09:45
Sample Name:	2018GC48DV10	**Basis:**	Dry
Lab Code:	K1807739-030		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.21**	mg/Kg	0.020	5	09/13/18 17:17	09/04/18	
Copper	200.8	**5.57**	mg/Kg	0.10	5	09/13/18 17:17	09/04/18	
Lead	200.8	**1.30**	mg/Kg	0.020	5	09/13/18 17:17	09/04/18	
Selenium	200.8	**6.40**	mg/Kg	1.0	5	09/13/18 17:17	09/04/18	
Silver	200.8	**0.043**	mg/Kg	0.020	5	09/13/18 17:17	09/04/18	
Zinc	200.8	**250**	mg/Kg	0.50	5	09/13/18 17:17	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	NA
Sample Matrix:	Animal Tissue	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1812205-01		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	ND U	mg/Kg	0.020	5	09/13/18 15:17	09/04/18	
Copper	200.8	ND U	mg/Kg	0.10	5	09/13/18 15:17	09/04/18	
Lead	200.8	ND U	mg/Kg	0.020	5	09/13/18 15:17	09/04/18	
Selenium	200.8	ND U	mg/Kg	1.0	5	09/13/18 15:17	09/04/18	
Silver	200.8	ND U	mg/Kg	0.020	5	09/13/18 15:17	09/04/18	
Zinc	200.8	ND U	mg/Kg	0.5	5	09/13/18 15:17	09/04/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	NA
Sample Matrix:	Animal Tissue	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1812206-01		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	ND U	mg/Kg	0.020	5	09/13/18 16:37	09/04/18	
Copper	200.8	ND U	mg/Kg	0.10	5	09/13/18 16:37	09/04/18	
Lead	200.8	ND U	mg/Kg	0.020	5	09/13/18 16:37	09/04/18	
Selenium	200.8	ND U	mg/Kg	1.0	5	09/13/18 16:37	09/04/18	
Silver	200.8	ND U	mg/Kg	0.020	5	09/13/18 16:37	09/04/18	
Zinc	200.8	ND U	mg/Kg	0.5	5	09/13/18 16:37	09/04/18	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18
		Date Analyzed:	09/13/18

Replicate Sample Summary
Total Metals

Sample Name:	2018TC9DV1	**Units:**	mg/Kg
Lab Code:	K1807739-001	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1812205-05 Result	Average	RPD	RPD Limit
Cadmium	200.8	0.020	0.701	0.708	0.705	<1	20
Copper	200.8	0.10	2.34	2.28	2.31	3	20
Lead	200.8	0.020	0.365	0.404	0.385	10	20
Selenium	200.8	1.0	6.3	6.3	6.3	<1	20
Silver	200.8	0.020	0.096	0.095	0.096	1	20
Zinc	200.8	0.5	149	158	154	6	20

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

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

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

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18
		Date Analyzed:	09/13/18

Replicate Sample Summary
Total Metals

Sample Name:	2018GC54DV1	**Units:**	mg/Kg
Lab Code:	K1807739-011	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1812205-07 Result	Average	RPD	RPD Limit
Cadmium	200.8	0.020	1.14	1.08	1.11	5	20
Copper	200.8	0.10	5.69	5.60	5.65	2	20
Lead	200.8	0.020	0.314	0.335	0.325	6	20
Selenium	200.8	1.0	6.3	6.3	6.3	<1	20
Silver	200.8	0.020	0.024	0.024	0.024	<1	20
Zinc	200.8	0.5	236	224	230	5	20

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

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/13/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18
		Date Analyzed:	09/13/18

Replicate Sample Summary
Total Metals

Sample Name:	2018GC48DV1	**Units:**	mg/Kg
Lab Code:	K1807739-021	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1812206-05 Result	Average	RPD	RPD Limit
Cadmium	200.8	0.020	1.57	1.52	1.55	3	20
Copper	200.8	0.10	6.70	6.33	6.52	6	20
Lead	200.8	0.020	0.614	0.656	0.635	7	20
Selenium	200.8	1.0	7.51	7.48	7.50	<1	20
Silver	200.8	0.020	0.039	0.037	0.038	5	20
Zinc	200.8	0.5	276	289	283	5	20

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

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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.

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18
		Date Analyzed:	09/13/18
		Date Extracted:	09/4/18

Matrix Spike Summary
Total Metals

Sample Name:	2018TC9DV1	**Units:**	mg/Kg
Lab Code:	K1807739-001	**Basis:**	Dry
Analysis Method:	200.8		
Prep Method:	PSEP Metals		

Matrix Spike
KQ1812205-06

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	0.701	5.54	5.00	97	70-130
Copper	2.34	25.0	25.0	91	70-130
Lead	0.365	46.3	50.0	92	70-130
Selenium	6.3	23.5	16.7	103	70-130
Silver	0.096	5.24	5.00	103	70-130
Zinc	149	194	50.0	90	70-130

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

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

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

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/12/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18
		Date Analyzed:	09/13/18
		Date Extracted:	09/4/18

Matrix Spike Summary
Total Metals

Sample Name:	2018GC54DV1	**Units:**	mg/Kg
Lab Code:	K1807739-011	**Basis:**	Dry
Analysis Method:	200.8		
Prep Method:	PSEP Metals		

Matrix Spike
KQ1812205-08

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	1.14	5.96	5.00	96	70-130
Copper	5.69	29.2	25.0	94	70-130
Lead	0.314	46.2	50.0	92	70-130
Selenium	6.3	24.0	16.7	106	70-130
Silver	0.024	5.22	5.00	104	70-130
Zinc	236	293	50.0	113 #	70-130

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

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

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

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	07/13/18
Sample Matrix:	Animal Tissue	**Date Received:**	08/15/18
		Date Analyzed:	09/13/18
		Date Extracted:	09/4/18

Matrix Spike Summary
Total Metals

Sample Name:	2018GC48DV1	**Units:**	mg/Kg
Lab Code:	K1807739-021	**Basis:**	Dry
Analysis Method:	200.8		
Prep Method:	PSEP Metals		

Matrix Spike
KQ1812206-06

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	1.57	6.60	4.98	101	70-130
Copper	6.70	29.7	24.9	92	70-130
Lead	0.614	48.0	49.8	95	70-130
Selenium	7.51	25.6	16.6	109	70-130
Silver	0.039	5.54	4.98	110	70-130
Zinc	276	351	49.8	151 #	70-130

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

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

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

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Client: Alaska Department of Fish and Game
Project: 2018 Greens Creek Mine Biomonitoring
Sample Matrix: Animal Tissue

Service Request: K1807739
Date Analyzed: 09/13/18

Lab Control Sample Summary
Total Metals

Units:mg/Kg
Basis: Dry

Lab Control Sample
KQ1812205-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	200.8	4.84	5.00	97	85-115
Copper	200.8	23.1	25.0	92	85-115
Lead	200.8	47.6	50.0	95	85-115
Selenium	200.8	15.8	16.7	95	85-115
Silver	200.8	5.35	5.00	107	85-115
Zinc	200.8	46.4	50.0	93	85-115

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QA/QC Report

Client: Alaska Department of Fish and Game
Project: 2018 Greens Creek Mine Biomonitoring
Sample Matrix: Animal Tissue

Service Request: K1807739
Date Analyzed: 09/13/18

Lab Control Sample Summary
Total Metals

Units:mg/Kg
Basis: Dry

Lab Control Sample
KQ1812206-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	200.8	4.82	5.00	96	85-115
Copper	200.8	23.8	25.0	95	85-115
Lead	200.8	46.7	50.0	93	85-115
Selenium	200.8	16.3	16.7	98	85-115
Silver	200.8	5.36	5.00	107	85-115
Zinc	200.8	46.8	50.0	94	85-115

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	NA
LCS Matrix:	Tissue	**Date Received:**	NA
		Date Extracted:	09/04/18
		Date Analyzed:	09/13/18

Standard Reference Material Summary
Total Metals

Sample Name:	Standard Reference Material	Units:	mg/Kg (ppm)
Lab Code:	KQ1812205-04	Basis:	Dry
Test Notes:	Tort-3 Solids = 99.1%		

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

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Cadmium	PSEP Tissue	200.8	42.3	40.6	96	32.4-52.9	
Copper	PSEP Tissue	200.8	497	476	96	380-623	
Lead	PSEP Tissue	200.8	0.225	0.203	90	0.166-0.292	
Selenium	PSEP Tissue	200.8	10.9	11.1	102	7.9-14.3	
Zinc	PSEP Tissue	200.8	136	130	96	104-170	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1807739
Project:	2018 Greens Creek Mine Biomonitoring	**Date Collected:**	NA
LCS Matrix:	Tissue	**Date Received:**	NA
		Date Extracted:	09/04/18
		Date Analyzed:	09/13/18

Standard Reference Material Summary
Total Metals

Sample Name:	Standard Reference Material	Units:	mg/Kg (ppm)
Lab Code:	KQ1812206-04	Basis:	Dry
Test Notes:	Tort-3 Solids = 99.1%		

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

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Cadmium	PSEP Tissue	200.8	42.3	40.7	96	32.4-52.9	
Copper	PSEP Tissue	200.8	497	474	95	380-623	
Lead	PSEP Tissue	200.8	0.225	0.193	86	0.166-0.292	
Selenium	PSEP Tissue	200.8	10.9	10.8	99	7.9-14.3	
Zinc	PSEP Tissue	200.8	136	126	93	104-170	

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

July 31, 2018 **Analytical Report for Service Request No:** K1805613

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

RE: 2018 Greens Creek Mine Project

Dear Kate,

Enclosed are the results of the sample(s) submitted to our laboratory June 13, 2018
For your reference, these analyses have been assigned our service request number **K1805613.**

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 3356. You may also contact me via email at Kurt.Clarkson@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kurt Clarkson
Sr. 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

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

Inorganic Data Qualifiers

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

Metals Data Qualifiers

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

Organic Data Qualifiers

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

Additional Petroleum Hydrocarbon Specific Qualifiers

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

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

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	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	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	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)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	NA

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

Case Narrative

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

ALS Environmental

Client: Alaska Department of Fish and Game
Project: 2018 Greens Creek Mine Project
Sample Matrix: Animal Tissue

Service Request: K1805613
Date Received: 06/13/2018

CASE NARRATIVE

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

Sample Receipt:

Thirty six animal tissue samples were received for analysis at ALS Environmental on 06/13/2018. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored frozen at -20ºC upon receipt at the laboratory.

Metals:

Method 200.8, 07/27/2018: The Relative Percent Difference (RPD) for the replicate analysis of Cadmium in sample 2018ZCDV1 and Lead in sample 2018JGCDV4 was outside the normal ALS control limits. The samples were homogenized, freeze dried, then ground prior to digestion, however this was not sufficient to achieve a completely uniform distribution of these analytes in the tissue.

Approved by _____ Date 07/31/2018

Chain of Custody

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

Project Name: 2018 Greens Creek Mine Project
Company Name: Alaska Department of Fish and Game
Project Manager: Kate Kanouse
Contact Information: email: kate.kanouse@alaska.gov, phone: (907) 465-4290
Sample Type: Whole body Dolly Varden char
Analyses: EPA 6020A total metals and EPA 1631E Hg, dry weight basis, report percent solids

1805613

Matrix	Sample Date	Sample Name	Sample ID	Analytes	Fork Length (mm)	Weight (g)
Whole Body	5/16/2018	Zinc Creek DV Metals Fish #1	2018ZCDV1	Ag, Cd, Cu, Hg, Pb, Se, Zn	119	12.9
Whole Body	5/16/2018	Zinc Creek DV Metals Fish #2	2018ZCDV2	Ag, Cd, Cu, Hg, Pb, Se, Zn	117	13.0
Whole Body	5/16/2018	Zinc Creek DV Metals Fish #4	2018ZCDV4	Ag, Cd, Cu, Hg, Pb, Se, Zn	86	6.7
Whole Body	5/16/2018	Zinc Creek DV Metals Fish #5	2018ZCDV5	Ag, Cd, Cu, Hg, Pb, Se, Zn	88	6.8
Whole Body	5/16/2018	Zinc Creek DV Metals Fish #6	2018ZCDV6	Ag, Cd, Cu, Hg, Pb, Se, Zn	87	6.4
Whole Body	5/16/2018	Zinc Creek DV Metals Fish #7	2018ZCDV7	Ag, Cd, Cu, Hg, Pb, Se, Zn	124	13.4
Whole Body	5/16/2018	Piledriver Creek DV Metals Fish #1	2018PCDV1	Ag, Cd, Cu, Hg, Pb, Se, Zn	126	19.3
Whole Body	5/16/2018	Piledriver Creek DV Metals Fish #2	2018PCDV2	Ag, Cd, Cu, Hg, Pb, Se, Zn	148	29.0
Whole Body	5/16/2018	Piledriver Creek DV Metals Fish #3	2018PCDV3	Ag, Cd, Cu, Hg, Pb, Se, Zn	124	17.5
Whole Body	5/16/2018	Piledriver Creek DV Metals Fish #4	2018PCDV4	Ag, Cd, Cu, Hg, Pb, Se, Zn	121	15.0
Whole Body	5/16/2018	Piledriver Creek DV Metals Fish #5	2018PCDV5	Ag, Cd, Cu, Hg, Pb, Se, Zn	111	13.4
Whole Body	5/16/2018	Piledriver Creek DV Metals Fish #6	2018PCDV6	Ag, Cd, Cu, Hg, Pb, Se, Zn	121	14.7
Whole Body	5/16/2018	Empire Creek DV Metals Fish #2	2018ECDV2	Ag, Cd, Cu, Hg, Pb, Se, Zn	134	16.7
Whole Body	5/16/2018	Empire Creek DV Metals Fish #3	2018ECDV3	Ag, Cd, Cu, Hg, Pb, Se, Zn	121	17.7
Whole Body	5/16/2018	Empire Creek DV Metals Fish #4	2018ECDV4	Ag, Cd, Cu, Hg, Pb, Se, Zn	113	16.7
Whole Body	5/16/2018	Empire Creek DV Metals Fish #5	2018ECDV5	Ag, Cd, Cu, Hg, Pb, Se, Zn	135	19.8
Whole Body	5/16/2018	Empire Creek DV Metals Fish #6	2018ECDV6	Ag, Cd, Cu, Hg, Pb, Se, Zn	137	21.4
Whole Body	5/16/2018	Empire Creek DV Metals Fish #7	2018ECDV7	Ag, Cd, Cu, Hg, Pb, Se, Zn	150	28.4
Whole Body	5/15/2018	Jimmy Green Creek DV Metals Fish #1	2018JGCDV1	Ag, Cd, Cu, Hg, Pb, Se, Zn	155	30.4
Whole Body	5/15/2018	Jimmy Green Creek DV Metals Fish #3	2018JGCDV3	Ag, Cd, Cu, Hg, Pb, Se, Zn	141	25.1
Whole Body	5/15/2018	Jimmy Green Creek DV Metals Fish #4	2018JGCDV4	Ag, Cd, Cu, Hg, Pb, Se, Zn	113	11.1
Whole Body	5/15/2018	Jimmy Green Creek DV Metals Fish #5	2018JGCDV5	Ag, Cd, Cu, Hg, Pb, Se, Zn	92	8.8
Whole Body	5/15/2018	Jimmy Green Creek DV Metals Fish #6	2018JGCDV6	Ag, Cd, Cu, Hg, Pb, Se, Zn	131	22.2
Whole Body	5/15/2018	Jimmy Green Creek DV Metals Fish #7	2018JGCDV7	Ag, Cd, Cu, Hg, Pb, Se, Zn	113	14.3

Project Name: 2018 Greens Creek Mine Project
Project Manager: Kate Kanouse
Contact Information: email: kate.kanouse@alaska.gov, phone: (907) 465-4290

K18056B

Matrix	Sample Date	Sample Name	Sample ID	Analytes	Fork Length (mm)	Weight (g)
Whole Body	5/15/2018	Hawk Inlet Head Creek DV Metals Fish #1	2018HIHCDV1	Ag, Cd, Cu, Hg, Pb, Se, Zn	88	6.3
Whole Body	5/15/2018	Hawk Inlet Head Creek DV Metals Fish #2	2018HIHCDV2	Ag, Cd, Cu, Hg, Pb, Se, Zn	111	12.3
Whole Body	5/15/2018	Hawk Inlet Head Creek DV Metals Fish #3	2018HIHCDV3	Ag, Cd, Cu, Hg, Pb, Se, Zn	104	9.8
Whole Body	5/15/2018	Hawk Inlet Head Creek DV Metals Fish #4	2018HIHCDV4	Ag, Cd, Cu, Hg, Pb, Se, Zn	109	10.2
Whole Body	5/15/2018	Hawk Inlet Head Creek DV Metals Fish #5	2018HIHCDV5	Ag, Cd, Cu, Hg, Pb, Se, Zn	137	22.7
Whole Body	5/15/2018	Hawk Inlet Head Creek DV Metals Fish #6	2018HIHCDV6	Ag, Cd, Cu, Hg, Pb, Se, Zn	129	17.3
Whole Body	5/15/2018	Unnamed Creek DV Metals Fish #2	2018UCDV2	Ag, Cd, Cu, Hg, Pb, Se, Zn	90	7.2
Whole Body	5/15/2018	Unnamed Creek DV Metals Fish #3	2018UCDV3	Ag, Cd, Cu, Hg, Pb, Se, Zn	84	5.4
Whole Body	5/15/2018	Unnamed Creek DV Metals Fish #4	2018UCDV4	Ag, Cd, Cu, Hg, Pb, Se, Zn	134	19.7
Whole Body	5/15/2018	Unnamed Creek DV Metals Fish #5	2018UCDV5	Ag, Cd, Cu, Hg, Pb, Se, Zn	124	15.2
Whole Body	5/15/2018	Unnamed Creek DV Metals Fish #6	2018UCDV6	Ag, Cd, Cu, Hg, Pb, Se, Zn	120	15.3
Whole Body	5/15/2018	Unnamed Creek DV Metals Fish #7	2018UCDV7	Ag, Cd, Cu, Hg, Pb, Se, Zn	124	19.8

CHAIN OF CUSTODY

ALS Environmental

1317 South 13th Ave., Kelso, WA 98626 | +1 360 577 7222 | +1 800 695 7222 | +1 360 636 1068 (fax)

PAGE 1 OF 3 SR# KJ806613 COC#

PROJECT NAME: 2018 Greens Creek Mine Project
PROJECT NUMBER:
PROJECT MANAGER: Kate Kanouse
COMPANY NAME: Alaska Dept. of Fish and Game
ADDRESS: 802 3rd St
CITY/STATE/ZIP: Douglas, AK 99824
E-MAIL ADDRESS: kate.kanouse@alaska.gov
PHONE # 907-465-4290 FAX #
SAMPLER'S SIGNATURE: Kate Kanouse

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625☐ 8270☐ 8270LL☐ SIM PAH☐	Volatile Organics 624☐ 8260☐	Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐	BTEX☐ 8021☐	Oil & Grease/TRPH 1664 HEM☐	1664 SGT☐	PCBs Aroclors☐	Congeners☐	Pesticides/Herbicides 608☐ 8081☐	8141☐ 8151☐	Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐	Metals, Total or Dissolved (See List below)	Cyanide☐	Hex-Chrom☐	(circle) pH, Cond., Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS, Turb.	(circle) NH_3-N, COD, TKN, TOC, DOC, NO_2+NO_3, T-Phos	TOX 9020☐	AOX 1650☐ 506☐	Alkalinity ☐ CO_3☐ HCO_3☐	Dioxins/Furans 1613☐ 8290☐	Dissolved Gases CO_2☐ RSK 175☐ Methane☐ Ethane☐ Ethene☐			REMARKS
see attachment 1 of 1 for whole body fish individual samples (2 pages)					36												X (6020A)										X	Hg-1631E		

REPORT REQUIREMENTS

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

INVOICE INFORMATION

P.O. # Chris Wallace
Bill To: HECLA
cwallace@hecla-mining.com

TURNAROUND REQUIREMENTS

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

Requested Report Date

Circle which metals are to be analyzed:

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

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

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

SPECIAL INSTRUCTIONS/COMMENTS:
please email report to kate.kanouse@alaska.gov

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

RELINQUISHED BY:		RECEIVED BY:		RELINQUISHED BY:		RECEIVED BY:	
Signature: Kate Kanouse	Date/Time: 6/11/18 0830	Signature: [illegible]	Date/Time: 6/13/18	Signature	Date/Time	Signature	Date/Time
Printed Name: Kate Kanouse	Firm: ADFG	Printed Name: [illegible]	Firm: ACS 1015	Printed Name	Firm	Printed Name	Firm

PC KC

Cooler Receipt and Preservation Form

Client AK Dept of Fish + Game Service Request *K18* 05613

Received: 6/13/18 Opened: 6/13/18 By: KM Unloaded: 6/13/18 By: KM

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 custody seals on coolers? NA (Y) N If yes, how many and where? 1 Front
   If present, were custody seals intact? (Y) N If present, were they signed and dated? (Y) N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID (NA)	Tracking Number NA	File
-0.5	-0.5	3.8	3.8	0	383		781365095796	

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

Sample ID on Bottle	Sample ID on COC	Identified by:

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

Notes, Discrepancies, & Resolutions: _____

Total Solids

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

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18 - 05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18
Analysis Method:	Freeze Dry	**Units:**	Percent
Prep Method:	None	**Basis:**	Wet

Total Solids

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
2018ZCDV1	K1805613-001	**19.0**	-	1	06/20/18 16:59	
2018ZCDV2	K1805613-002	**21.8**	-	1	06/20/18 16:59	
2018ZCDV4	K1805613-003	**21.1**	-	1	06/20/18 16:59	
2018ZCDV5	K1805613-004	**21.2**	-	1	06/20/18 16:59	
2018ZCDV6	K1805613-005	**21.9**	-	1	06/20/18 16:59	
2018ZCDV7	K1805613-006	**20.3**	-	1	06/20/18 16:59	
2018PCDV1	K1805613-007	**22.9**	-	1	06/20/18 16:59	
2018PCDV2	K1805613-008	**26.2**	-	1	06/20/18 16:59	
2018PCDV3	K1805613-009	**21.9**	-	1	06/20/18 16:59	
2018PCDV4	K1805613-010	**21.2**	-	1	06/20/18 16:59	
2018PCDV5	K1805613-011	**23.7**	-	1	06/20/18 16:59	
2018PCDV6	K1805613-012	**24.4**	-	1	06/20/18 16:59	
2018ECDV2	K1805613-013	**18.6**	-	1	06/20/18 16:59	
2018ECDV3	K1805613-014	**20.9**	-	1	06/20/18 16:59	
2018ECDV4	K1805613-015	**20.4**	-	1	06/20/18 16:59	
2018ECDV5	K1805613-016	**23.6**	-	1	06/20/18 16:59	
2018ECDV6	K1805613-017	**20.2**	-	1	06/20/18 16:59	
2018ECDV7	K1805613-018	**25.7**	-	1	06/20/18 16:59	
2018JGCDV1	K1805613-019	**26.9**	-	1	06/20/18 16:59	
2018JGCDV3	K1805613-020	**23.0**	-	1	06/20/18 16:59	
2018JGCDV4	K1805613-021	**20.9**	-	1	06/20/18 16:59	
2018JGCDV5	K1805613-022	**20.4**	-	1	06/20/18 16:59	
2018JGCDV6	K1805613-023	**19.3**	-	1	06/20/18 16:59	
2018JGCDV7	K1805613-024	**20.3**	-	1	06/20/18 16:59	
2018HIHCDV1	K1805613-025	**20.4**	-	1	06/20/18 16:59	
2018HIHCDV2	K1805613-026	**23.1**	-	1	06/20/18 16:59	
2018HIHCDV3	K1805613-027	**24.9**	-	1	06/20/18 16:59	
2018HIHCDV4	K1805613-028	**20.6**	-	1	06/20/18 16:59	
2018HIHCDV5	K1805613-029	**23.1**	-	1	06/20/18 16:59	
2018HIHCDV6	K1805613-030	**24.8**	-	1	06/20/18 16:59	
2018UCDV2	K1805613-031	**24.0**	-	1	06/20/18 16:59	
2018UCDV3	K1805613-032	**24.0**	-	1	06/20/18 16:59	
2018UCDV4	K1805613-033	**25.6**	-	1	06/20/18 16:59	
2018UCDV5	K1805613-034	**23.4**	-	1	06/20/18 16:59	
2018UCDV6	K1805613-035	**24.4**	-	1	06/20/18 16:59	
2018UCDV7	K1805613-036	**25.1**	-	1	06/20/18 16:59	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18 - 05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18
Analysis Method:	Freeze Dry	**Units:**	Percent
Prep Method:	None	**Basis:**	Wet

Replicate Sample Summary
Inorganic Parameters

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
2018PCDV2	K1805613-008DUP	-	26.2	26.5	26.4	1	20	06/20/18
2018JGCDV1	K1805613-019DUP	-	26.9	26.2	26.6	3	20	06/20/18

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.

Metals

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

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15-16/18
Sample Matrix:	Animal tissue	**Date Received:**	06/13/18

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/g
Basis: Dry

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
2018ZCDV1	K1805613-001	5.0	5	07/19/18	07/23/18	371	
2018ZCDV2	K1805613-002	4.9	5	07/19/18	07/23/18	285	
2018ZCDV4	K1805613-003	4.8	5	07/19/18	07/23/18	186	
2018ZCDV5	K1805613-004	4.9	5	07/19/18	07/23/18	274	
2018ZCDV6	K1805613-005	4.9	5	07/19/18	07/23/18	178	
2018ZCDV7	K1805613-006	4.8	5	07/19/18	07/23/18	325	
2018PCDV1	K1805613-007	5.0	5	07/19/18	07/23/18	67.1	
2018PCDV2	K1805613-008	4.9	5	07/19/18	07/23/18	47.7	
2018PCDV3	K1805613-009	5.0	5	07/19/18	07/23/18	146	
2018PCDV4	K1805613-010	5.0	5	07/19/18	07/23/18	162	
2018PCDV5	K1805613-011	5.0	5	07/19/18	07/23/18	71.1	
2018PCDV6	K1805613-012	5.0	5	07/19/18	07/23/18	63.0	
2018ECDV2	K1805613-013	4.9	5	07/19/18	07/23/18	514	
2018ECDV3	K1805613-014	4.9	5	07/19/18	07/23/18	305	
2018ECDV4	K1805613-015	5.0	5	07/19/18	07/23/18	359	
2018ECDV5	K1805613-016	4.9	5	07/19/18	07/23/18	42.1	
2018ECDV6	K1805613-017	5.0	5	07/19/18	07/23/18	80.1	
2018ECDV7	K1805613-018	5.0	5	07/19/18	07/23/18	47.2	
2018JGCDV1	K1805613-019	4.9	5	07/19/18	07/23/18	38.8	
2018JGCDV3	K1805613-020	4.8	5	07/19/18	07/23/18	76.2	
Method Blank 1	K1805613-MB1	1.0	1	07/19/18	07/23/18	ND	
Method Blank 2	K1805613-MB2	1.0	1	07/19/18	07/23/18	ND	
Method Blank 3	K1805613-MB3	1.0	1	07/19/18	07/23/18	ND	

ALS Group USA, Corp.
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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal tissue	**Date Received:**	06/13/18
		Date Extracted:	07/19/18
		Date Analyzed:	07/23/18

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name:	2018ZCDV7	Units:	ng/g
Lab Code:	K1805613-006MS, K1805613-006DMS	Basis:	Dry
Test Notes:			

									Percent Recovery				
				Spike Level		Sample	Spike Result				ALS Acceptance	Relative Percent	Result
Analyte	**Prep Method**	**Analysis Method**	**MRL**	**MS**	**DMS**	**Result**	**MS**	**DMS**	**MS**	**DMS**	**Limits**	**Difference**	**Notes**
Mercury	METHOD	1631E	4.9	240	246	325	539	554	89	93	70-130	3	

ALS Group USA, Corp.
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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal tissue	**Date Received:**	06/13/18
		Date Extracted:	07/19/18
		Date Analyzed:	07/23/18

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name:	2018PCDV5	Units:	ng/g
Lab Code:	K1805613-011MS, K1805613-011DMS	Basis:	Dry
Test Notes:			

				Spike Level		Sample	Spike Result		Percent Recovery		ALS Acceptance	Relative Percent	
Analyte	**Prep Method**	**Analysis Method**	**MRL**	**MS**	**DMS**	**Result**	**MS**	**DMS**	**MS**	**DMS**	**Limits**	**Difference**	**Result Notes**
Mercury	METHOD	1631E	4.9	244	244	71.1	317	303	101	95	70-130	5	

ALS Group USA, Corp.
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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	07/23/18

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Initial)

Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	5.47	109	70-130	

ALS Group USA, Corp.
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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	07/23/18

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final)

Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	5.14	103	70-130	

ALS Group USA, Corp.
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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	NA
LCS Matrix:	Animal tissue	**Date Received:**	NA
		Date Extracted:	07/19/18
		Date Analyzed:	07/23/18

Quality Control Sample (QCS) Summary
Total Metals

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

Source: TORT-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	292	271	93	70-130	

ALS Group USA, Corp.
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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal tissue	**Date Received:**	06/13/18

Mercury, Total

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

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
2018JGCDV4	K1805613-021	5.0	5	07/19/18	07/23/18	189	
2018JGCDV5	K1805613-022	4.8	5	07/19/18	07/23/18	197	
2018JGCDV6	K1805613-023	4.9	5	07/19/18	07/23/18	237	
2018JGCDV7	K1805613-024	4.9	5	07/19/18	07/23/18	133	
2018HIHCDV1	K1805613-025	5.0	5	07/19/18	07/23/18	715	
2018HIHCDV2	K1805613-026	5.0	5	07/19/18	07/23/18	48.1	
2018HIHCDV3	K1805613-027	4.9	5	07/19/18	07/23/18	101	
2018HIHCDV4	K1805613-028	4.9	5	07/19/18	07/23/18	309	
2018HIHCDV5	K1805613-029	5.0	5	07/19/18	07/23/18	80.9	
2018HIHCDV6	K1805613-030	4.9	5	07/19/18	07/23/18	60.6	
2018UCDV2	K1805613-031	5.0	5	07/19/18	07/23/18	37.4	
2018UCDV3	K1805613-032	5.0	5	07/19/18	07/23/18	61.8	
2018UCDV4	K1805613-033	4.9	5	07/19/18	07/23/18	25.8	
2018UCDV5	K1805613-034	4.9	5	07/19/18	07/23/18	51.5	
2018UCDV6	K1805613-035	5.0	5	07/19/18	07/23/18	30.8	
2018UCDV7	K1805613-036	5.0	5	07/19/18	07/23/18	35.9	
Method Blank 1	K1805613-MB1	1.0	1	07/19/18	07/23/18	ND	
Method Blank 2	K1805613-MB2	1.0	1	07/19/18	07/23/18	ND	
Method Blank 3	K1805613-MB3	1.0	1	07/19/18	07/23/18	ND	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal tissue	**Date Received:**	06/13/18
		Date Extracted:	07/19/18
		Date Analyzed:	07/23/18

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name:	2018JGCDV6	Units:	ng/g
Lab Code:	K1805613-023MS, K1805613-023DMS	Basis:	Dry
Test Notes:			

									Percent Recovery				
				Spike Level		Sample	Spike Result				ALS	Relative	
	Prep	Analysis									Acceptance	Percent	Result
Analyte	**Method**	**Method**	**MRL**	**MS**	**DMS**	**Result**	**MS**	**DMS**	**MS**	**DMS**	**Limits**	**Difference**	**Notes**
Mercury	METHOD	1631E	4.9	247	245	237	470	472	94	96	70-130	<1	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal tissue	**Date Received:**	06/13/18
		Date Extracted:	07/19/18
		Date Analyzed:	07/23/18

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name:	2018UCDV4	Units:	ng/g
Lab Code:	K1805613-033MS, K1805613-033MS	Basis:	Dry
Test Notes:			

				Spike Level		Sample	Spike Result		Percent Recovery		ALS Acceptance	Relative Percent	
Analyte	**Prep Method**	**Analysis Method**	**MRL**	**MS**	**DMS**	**Result**	**MS**	**DMS**	**MS**	**DMS**	**Limits**	**Difference**	**Result Notes**
Mercury	METHOD	1631E	4.9	249	247	25.8	278	267	101	98	70-130	4	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	07/23/18

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Initial)

Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	5.14	103	70-130	

ALS Group USA, Corp.
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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	07/23/18

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final)

Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	5.30	106	70-130	

ALS Group USA, Corp.
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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	NA
LCS Matrix:	Animal tissue	**Date Received:**	NA
		Date Extracted:	07/19/18
		Date Analyzed:	07/23/18

Quality Control Sample (QCS) Summary
Total Metals

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

Source: TORT-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	292	274	94	70-130	

ALS Group USA, Corp.
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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018ZCDV1	**Basis:**	Dry
Lab Code:	K1805613-001		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.922**	mg/Kg	0.020	5	07/27/18 15:36	07/26/18	
Copper	200.8	**6.10**	mg/Kg	0.10	5	07/27/18 15:36	07/26/18	
Lead	200.8	**0.824**	mg/Kg	0.020	5	07/27/18 15:36	07/26/18	
Selenium	200.8	**3.1**	mg/Kg	1.0	5	07/27/18 15:36	07/26/18	
Silver	200.8	**0.080**	mg/Kg	0.020	5	07/27/18 15:36	07/26/18	
Zinc	200.8	**277**	mg/Kg	0.50	5	07/27/18 15:36	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018ZCDV2	**Basis:**	Dry
Lab Code:	K1805613-002		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.982**	mg/Kg	0.020	5	07/27/18 15:43	07/26/18	
Copper	200.8	**9.79**	mg/Kg	0.10	5	07/27/18 15:43	07/26/18	
Lead	200.8	**2.21**	mg/Kg	0.020	5	07/27/18 15:43	07/26/18	
Selenium	200.8	**2.7**	mg/Kg	1.0	5	07/27/18 15:43	07/26/18	
Silver	200.8	**0.049**	mg/Kg	0.020	5	07/27/18 15:43	07/26/18	
Zinc	200.8	**289**	mg/Kg	0.50	5	07/27/18 15:43	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018ZCDV4	**Basis:**	Dry
Lab Code:	K1805613-003		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.484**	mg/Kg	0.020	5	07/27/18 15:51	07/26/18	
Copper	200.8	**3.02**	mg/Kg	0.099	5	07/27/18 15:51	07/26/18	
Lead	200.8	**0.092**	mg/Kg	0.020	5	07/27/18 15:51	07/26/18	
Selenium	200.8	**3.10**	mg/Kg	0.99	5	07/27/18 15:51	07/26/18	
Silver	200.8	**0.027**	mg/Kg	0.020	5	07/27/18 15:51	07/26/18	
Zinc	200.8	**161**	mg/Kg	0.50	5	07/27/18 15:51	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018ZCDV5	**Basis:**	Dry
Lab Code:	K1805613-004		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.690**	mg/Kg	0.020	5	07/27/18 15:53	07/26/18	
Copper	200.8	**3.15**	mg/Kg	0.10	5	07/27/18 15:53	07/26/18	
Lead	200.8	**0.166**	mg/Kg	0.020	5	07/27/18 15:53	07/26/18	
Selenium	200.8	**3.2**	mg/Kg	1.0	5	07/27/18 15:53	07/26/18	
Silver	200.8	**0.039**	mg/Kg	0.020	5	07/27/18 15:53	07/26/18	
Zinc	200.8	**174**	mg/Kg	0.50	5	07/27/18 15:53	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018ZCDV6	**Basis:**	Dry
Lab Code:	K1805613-005		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.454**	mg/Kg	0.020	5	07/27/18 15:56	07/26/18	
Copper	200.8	**3.25**	mg/Kg	0.099	5	07/27/18 15:56	07/26/18	
Lead	200.8	**0.068**	mg/Kg	0.020	5	07/27/18 15:56	07/26/18	
Selenium	200.8	**3.33**	mg/Kg	0.99	5	07/27/18 15:56	07/26/18	
Silver	200.8	**0.040**	mg/Kg	0.020	5	07/27/18 15:56	07/26/18	
Zinc	200.8	**160**	mg/Kg	0.50	5	07/27/18 15:56	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018ZCDV7	**Basis:**	Dry
Lab Code:	K1805613-006		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.04**	mg/Kg	0.020	5	07/27/18 15:58	07/26/18	
Copper	200.8	**7.80**	mg/Kg	0.099	5	07/27/18 15:58	07/26/18	
Lead	200.8	**2.04**	mg/Kg	0.020	5	07/27/18 15:58	07/26/18	
Selenium	200.8	**2.35**	mg/Kg	0.99	5	07/27/18 15:58	07/26/18	
Silver	200.8	**0.054**	mg/Kg	0.020	5	07/27/18 15:58	07/26/18	
Zinc	200.8	**276**	mg/Kg	0.50	5	07/27/18 15:58	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018PCDV1	**Basis:**	Dry
Lab Code:	K1805613-007		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:01	07/26/18	
Copper	200.8	**2.20**	mg/Kg	0.099	5	07/27/18 16:01	07/26/18	
Lead	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:01	07/26/18	
Selenium	200.8	**1.68**	mg/Kg	0.99	5	07/27/18 16:01	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:01	07/26/18	
Zinc	200.8	**109**	mg/Kg	0.50	5	07/27/18 16:01	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018PCDV2	**Basis:**	Dry
Lab Code:	K1805613-008		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:03	07/26/18	
Copper	200.8	**3.61**	mg/Kg	0.10	5	07/27/18 16:03	07/26/18	
Lead	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:03	07/26/18	
Selenium	200.8	**1.33**	mg/Kg	1.0	5	07/27/18 16:03	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:03	07/26/18	
Zinc	200.8	**94.3**	mg/Kg	0.50	5	07/27/18 16:03	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018PCDV3	**Basis:**	Dry
Lab Code:	K1805613-009		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.029**	mg/Kg	0.020	5	07/27/18 16:06	07/26/18	
Copper	200.8	**2.49**	mg/Kg	0.10	5	07/27/18 16:06	07/26/18	
Lead	200.8	**0.032**	mg/Kg	0.020	5	07/27/18 16:06	07/26/18	
Selenium	200.8	**1.77**	mg/Kg	1.0	5	07/27/18 16:06	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:06	07/26/18	
Zinc	200.8	**111**	mg/Kg	0.50	5	07/27/18 16:06	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018PCDV4	**Basis:**	Dry
Lab Code:	K1805613-010		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.047**	mg/Kg	0.020	5	07/27/18 16:08	07/26/18	
Copper	200.8	**2.62**	mg/Kg	0.10	5	07/27/18 16:08	07/26/18	
Lead	200.8	**0.040**	mg/Kg	0.020	5	07/27/18 16:08	07/26/18	
Selenium	200.8	**1.8**	mg/Kg	1.0	5	07/27/18 16:08	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:08	07/26/18	
Zinc	200.8	**122**	mg/Kg	0.50	5	07/27/18 16:08	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018PCDV5	**Basis:**	Dry
Lab Code:	K1805613-011		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.020**	mg/Kg	0.020	5	07/27/18 16:11	07/26/18	
Copper	200.8	**2.62**	mg/Kg	0.10	5	07/27/18 16:11	07/26/18	
Lead	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:11	07/26/18	
Selenium	200.8	**1.5**	mg/Kg	1.0	5	07/27/18 16:11	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:11	07/26/18	
Zinc	200.8	**112**	mg/Kg	0.50	5	07/27/18 16:11	07/26/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018PCDV6	**Basis:**	Dry
Lab Code:	K1805613-012		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:23	07/26/18	
Copper	200.8	**3.77**	mg/Kg	0.099	5	07/27/18 16:23	07/26/18	
Lead	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:23	07/26/18	
Selenium	200.8	**1.52**	mg/Kg	0.99	5	07/27/18 16:23	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:23	07/26/18	
Zinc	200.8	**113**	mg/Kg	0.50	5	07/27/18 16:23	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018ECDV2	**Basis:**	Dry
Lab Code:	K1805613-013		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.00**	mg/Kg	0.020	5	07/27/18 16:26	07/26/18	
Copper	200.8	**5.13**	mg/Kg	0.10	5	07/27/18 16:26	07/26/18	
Lead	200.8	**0.064**	mg/Kg	0.020	5	07/27/18 16:26	07/26/18	
Selenium	200.8	**6.3**	mg/Kg	1.0	5	07/27/18 16:26	07/26/18	
Silver	200.8	**0.106**	mg/Kg	0.020	5	07/27/18 16:26	07/26/18	
Zinc	200.8	**237**	mg/Kg	0.50	5	07/27/18 16:26	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018ECDV3	**Basis:**	Dry
Lab Code:	K1805613-014		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.814**	mg/Kg	0.020	5	07/27/18 16:29	07/26/18	
Copper	200.8	**4.90**	mg/Kg	0.099	5	07/27/18 16:29	07/26/18	
Lead	200.8	**0.087**	mg/Kg	0.020	5	07/27/18 16:29	07/26/18	
Selenium	200.8	**4.96**	mg/Kg	0.99	5	07/27/18 16:29	07/26/18	
Silver	200.8	**0.101**	mg/Kg	0.020	5	07/27/18 16:29	07/26/18	
Zinc	200.8	**167**	mg/Kg	0.50	5	07/27/18 16:29	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018ECDV4	**Basis:**	Dry
Lab Code:	K1805613-015		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.02**	mg/Kg	0.020	5	07/27/18 16:31	07/26/18	
Copper	200.8	**6.56**	mg/Kg	0.10	5	07/27/18 16:31	07/26/18	
Lead	200.8	**0.285**	mg/Kg	0.020	5	07/27/18 16:31	07/26/18	
Selenium	200.8	**6.11**	mg/Kg	1.0	5	07/27/18 16:31	07/26/18	
Silver	200.8	**0.103**	mg/Kg	0.020	5	07/27/18 16:31	07/26/18	
Zinc	200.8	**203**	mg/Kg	0.50	5	07/27/18 16:31	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018ECDV5	**Basis:**	Dry
Lab Code:	K1805613-016		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.094**	mg/Kg	0.020	5	07/27/18 16:34	07/26/18	
Copper	200.8	**3.21**	mg/Kg	0.10	5	07/27/18 16:34	07/26/18	
Lead	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:34	07/26/18	
Selenium	200.8	**1.7**	mg/Kg	1.0	5	07/27/18 16:34	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:34	07/26/18	
Zinc	200.8	**120**	mg/Kg	0.50	5	07/27/18 16:34	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018ECDV6	**Basis:**	Dry
Lab Code:	K1805613-017		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.099**	mg/Kg	0.020	5	07/27/18 16:36	07/26/18	
Copper	200.8	**4.10**	mg/Kg	0.10	5	07/27/18 16:36	07/26/18	
Lead	200.8	**0.020**	mg/Kg	0.020	5	07/27/18 16:36	07/26/18	
Selenium	200.8	**2.1**	mg/Kg	1.0	5	07/27/18 16:36	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:36	07/26/18	
Zinc	200.8	**152**	mg/Kg	0.50	5	07/27/18 16:36	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018ECDV7	**Basis:**	Dry
Lab Code:	K1805613-018		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.123**	mg/Kg	0.020	5	07/27/18 16:39	07/26/18	
Copper	200.8	**5.75**	mg/Kg	0.10	5	07/27/18 16:39	07/26/18	
Lead	200.8	**0.024**	mg/Kg	0.020	5	07/27/18 16:39	07/26/18	
Selenium	200.8	**1.7**	mg/Kg	1.0	5	07/27/18 16:39	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:39	07/26/18	
Zinc	200.8	**113**	mg/Kg	0.50	5	07/27/18 16:39	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018JGCDV1	**Basis:**	Dry
Lab Code:	K1805613-019		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.076**	mg/Kg	0.020	5	07/27/18 16:41	07/26/18	
Copper	200.8	**4.65**	mg/Kg	0.10	5	07/27/18 16:41	07/26/18	
Lead	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:41	07/26/18	
Selenium	200.8	**1.5**	mg/Kg	1.0	5	07/27/18 16:41	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:41	07/26/18	
Zinc	200.8	**96.7**	mg/Kg	0.50	5	07/27/18 16:41	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018JGCDV3	**Basis:**	Dry
Lab Code:	K1805613-020		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.201**	mg/Kg	0.020	5	07/27/18 16:44	07/26/18	
Copper	200.8	**4.05**	mg/Kg	0.10	5	07/27/18 16:44	07/26/18	
Lead	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:44	07/26/18	
Selenium	200.8	**1.73**	mg/Kg	1.0	5	07/27/18 16:44	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:44	07/26/18	
Zinc	200.8	**128**	mg/Kg	0.50	5	07/27/18 16:44	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018JGCDV4	**Basis:**	Dry
Lab Code:	K1805613-021		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.944**	mg/Kg	0.020	5	07/27/18 17:01	07/26/18	
Copper	200.8	**5.62**	mg/Kg	0.10	5	07/27/18 17:01	07/26/18	
Lead	200.8	**0.395**	mg/Kg	0.020	5	07/27/18 17:01	07/26/18	
Selenium	200.8	**4.41**	mg/Kg	1.0	5	07/27/18 17:01	07/26/18	
Silver	200.8	**0.043**	mg/Kg	0.020	5	07/27/18 17:01	07/26/18	
Zinc	200.8	**221**	mg/Kg	0.50	5	07/27/18 17:01	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018JGCDV5	**Basis:**	Dry
Lab Code:	K1805613-022		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**1.24**	mg/Kg	0.020	5	07/27/18 17:09	07/26/18	
Copper	200.8	**4.76**	mg/Kg	0.10	5	07/27/18 17:09	07/26/18	
Lead	200.8	**0.201**	mg/Kg	0.020	5	07/27/18 17:09	07/26/18	
Selenium	200.8	**4.40**	mg/Kg	1.0	5	07/27/18 17:09	07/26/18	
Silver	200.8	**0.135**	mg/Kg	0.020	5	07/27/18 17:09	07/26/18	
Zinc	200.8	**209**	mg/Kg	0.50	5	07/27/18 17:09	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018JGCDV6	**Basis:**	Dry
Lab Code:	K1805613-023		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.791**	mg/Kg	0.020	5	07/27/18 17:11	07/26/18	
Copper	200.8	**5.05**	mg/Kg	0.10	5	07/27/18 17:11	07/26/18	
Lead	200.8	**0.172**	mg/Kg	0.020	5	07/27/18 17:11	07/26/18	
Selenium	200.8	**3.48**	mg/Kg	1.0	5	07/27/18 17:11	07/26/18	
Silver	200.8	**0.059**	mg/Kg	0.020	5	07/27/18 17:11	07/26/18	
Zinc	200.8	**220**	mg/Kg	0.50	5	07/27/18 17:11	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018JGCDV7	**Basis:**	Dry
Lab Code:	K1805613-024		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.592**	mg/Kg	0.020	5	07/27/18 17:14	07/26/18	
Copper	200.8	**2.53**	mg/Kg	0.10	5	07/27/18 17:14	07/26/18	
Lead	200.8	**0.046**	mg/Kg	0.020	5	07/27/18 17:14	07/26/18	
Selenium	200.8	**2.92**	mg/Kg	1.0	5	07/27/18 17:14	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 17:14	07/26/18	
Zinc	200.8	**169**	mg/Kg	0.50	5	07/27/18 17:14	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018HIHCDV1	**Basis:**	Dry
Lab Code:	K1805613-025		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.921**	mg/Kg	0.020	5	07/27/18 17:22	07/26/18	
Copper	200.8	**2.95**	mg/Kg	0.099	5	07/27/18 17:22	07/26/18	
Lead	200.8	**0.121**	mg/Kg	0.020	5	07/27/18 17:22	07/26/18	
Selenium	200.8	**2.83**	mg/Kg	0.99	5	07/27/18 17:22	07/26/18	
Silver	200.8	**0.089**	mg/Kg	0.020	5	07/27/18 17:22	07/26/18	
Zinc	200.8	**185**	mg/Kg	0.50	5	07/27/18 17:22	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018HIHCDV2	**Basis:**	Dry
Lab Code:	K1805613-026		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.064**	mg/Kg	0.020	5	07/27/18 17:24	07/26/18	
Copper	200.8	**2.67**	mg/Kg	0.099	5	07/27/18 17:24	07/26/18	
Lead	200.8	**0.026**	mg/Kg	0.020	5	07/27/18 17:24	07/26/18	
Selenium	200.8	**1.69**	mg/Kg	0.99	5	07/27/18 17:24	07/26/18	
Silver	200.8	ND	U mg/Kg	0.020	5	07/27/18 17:24	07/26/18	
Zinc	200.8	**109**	mg/Kg	0.50	5	07/27/18 17:24	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018HIHCDV3	**Basis:**	Dry
Lab Code:	K1805613-027		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.053**	mg/Kg	0.020	5	07/27/18 17:27	07/26/18	
Copper	200.8	**2.35**	mg/Kg	0.10	5	07/27/18 17:27	07/26/18	
Lead	200.8	ND U	mg/Kg	0.020	5	07/27/18 17:27	07/26/18	
Selenium	200.8	**1.56**	mg/Kg	1.0	5	07/27/18 17:27	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 17:27	07/26/18	
Zinc	200.8	**102**	mg/Kg	0.50	5	07/27/18 17:27	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018HIHCDV4	**Basis:**	Dry
Lab Code:	K1805613-028		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.625**	mg/Kg	0.020	5	07/27/18 17:29	07/26/18	
Copper	200.8	**3.62**	mg/Kg	0.10	5	07/27/18 17:29	07/26/18	
Lead	200.8	**0.066**	mg/Kg	0.020	5	07/27/18 17:29	07/26/18	
Selenium	200.8	**2.2**	mg/Kg	1.0	5	07/27/18 17:29	07/26/18	
Silver	200.8	**0.066**	mg/Kg	0.020	5	07/27/18 17:29	07/26/18	
Zinc	200.8	**158**	mg/Kg	0.50	5	07/27/18 17:29	07/26/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018HIHCDV5	**Basis:**	Dry
Lab Code:	K1805613-029		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.068**	mg/Kg	0.020	5	07/27/18 17:32	07/26/18	
Copper	200.8	**2.90**	mg/Kg	0.10	5	07/27/18 17:32	07/26/18	
Lead	200.8	ND U	mg/Kg	0.020	5	07/27/18 17:32	07/26/18	
Selenium	200.8	**1.80**	mg/Kg	1.0	5	07/27/18 17:32	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 17:32	07/26/18	
Zinc	200.8	**114**	mg/Kg	0.50	5	07/27/18 17:32	07/26/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018HIHCDV6	**Basis:**	Dry
Lab Code:	K1805613-030		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.143**	mg/Kg	0.020	5	07/27/18 17:34	07/26/18	
Copper	200.8	**2.57**	mg/Kg	0.10	5	07/27/18 17:34	07/26/18	
Lead	200.8	**0.021**	mg/Kg	0.020	5	07/27/18 17:34	07/26/18	
Selenium	200.8	**1.72**	mg/Kg	1.0	5	07/27/18 17:34	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 17:34	07/26/18	
Zinc	200.8	**114**	mg/Kg	0.50	5	07/27/18 17:34	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018UCDV2	**Basis:**	Dry
Lab Code:	K1805613-031		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.041**	mg/Kg	0.020	5	07/27/18 17:37	07/26/18	
Copper	200.8	**2.17**	mg/Kg	0.10	5	07/27/18 17:37	07/26/18	
Lead	200.8	**0.144**	mg/Kg	0.020	5	07/27/18 17:37	07/26/18	
Selenium	200.8	**1.3**	mg/Kg	1.0	5	07/27/18 17:37	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 17:37	07/26/18	
Zinc	200.8	**101**	mg/Kg	0.50	5	07/27/18 17:37	07/26/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018UCDV3	**Basis:**	Dry
Lab Code:	K1805613-032		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.097**	mg/Kg	0.020	5	07/27/18 17:44	07/26/18	
Copper	200.8	**2.13**	mg/Kg	0.10	5	07/27/18 17:44	07/26/18	
Lead	200.8	**0.028**	mg/Kg	0.020	5	07/27/18 17:44	07/26/18	
Selenium	200.8	**1.5**	mg/Kg	1.0	5	07/27/18 17:44	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 17:44	07/26/18	
Zinc	200.8	**111**	mg/Kg	0.50	5	07/27/18 17:44	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018UCDV4	**Basis:**	Dry
Lab Code:	K1805613-033		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.043**	mg/Kg	0.020	5	07/27/18 17:52	07/26/18	
Copper	200.8	**1.96**	mg/Kg	0.099	5	07/27/18 17:52	07/26/18	
Lead	200.8	ND U	mg/Kg	0.020	5	07/27/18 17:52	07/26/18	
Selenium	200.8	**1.47**	mg/Kg	0.99	5	07/27/18 17:52	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 17:52	07/26/18	
Zinc	200.8	**111**	mg/Kg	0.50	5	07/27/18 17:52	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018UCDV5	**Basis:**	Dry
Lab Code:	K1805613-034		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.530**	mg/Kg	0.020	5	07/27/18 17:54	07/26/18	
Copper	200.8	**4.63**	mg/Kg	0.10	5	07/27/18 17:54	07/26/18	
Lead	200.8	ND U	mg/Kg	0.020	5	07/27/18 17:54	07/26/18	
Selenium	200.8	**1.83**	mg/Kg	1.0	5	07/27/18 17:54	07/26/18	
Silver	200.8	**0.056**	mg/Kg	0.020	5	07/27/18 17:54	07/26/18	
Zinc	200.8	**125**	mg/Kg	0.50	5	07/27/18 17:54	07/26/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018UCDV6	**Basis:**	Dry
Lab Code:	K1805613-035		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.041**	mg/Kg	0.020	5	07/27/18 17:57	07/26/18	
Copper	200.8	**2.05**	mg/Kg	0.099	5	07/27/18 17:57	07/26/18	
Lead	200.8	ND U	mg/Kg	0.020	5	07/27/18 17:57	07/26/18	
Selenium	200.8	**1.40**	mg/Kg	0.99	5	07/27/18 17:57	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 17:57	07/26/18	
Zinc	200.8	**121**	mg/Kg	0.50	5	07/27/18 17:57	07/26/18	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18 10:15
Sample Name:	2018UCDV7	**Basis:**	Dry
Lab Code:	K1805613-036		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	**0.029**	mg/Kg	0.020	5	07/27/18 17:59	07/26/18	
Copper	200.8	**1.90**	mg/Kg	0.10	5	07/27/18 17:59	07/26/18	
Lead	200.8	ND U	mg/Kg	0.020	5	07/27/18 17:59	07/26/18	
Selenium	200.8	**1.51**	mg/Kg	1.0	5	07/27/18 17:59	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 17:59	07/26/18	
Zinc	200.8	**102**	mg/Kg	0.50	5	07/27/18 17:59	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	NA
Sample Matrix:	Animal Tissue	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1810092-01		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	ND U	mg/Kg	0.020	5	07/27/18 15:26	07/26/18	
Copper	200.8	ND U	mg/Kg	0.10	5	07/27/18 15:26	07/26/18	
Lead	200.8	ND U	mg/Kg	0.020	5	07/27/18 15:26	07/26/18	
Selenium	200.8	ND U	mg/Kg	1.0	5	07/27/18 15:26	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 15:26	07/26/18	
Zinc	200.8	ND U	mg/Kg	0.5	5	07/27/18 15:26	07/26/18	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	NA
Sample Matrix:	Animal Tissue	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1810093-01		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Cadmium	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:51	07/26/18	
Copper	200.8	ND U	mg/Kg	0.10	5	07/27/18 16:51	07/26/18	
Lead	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:51	07/26/18	
Selenium	200.8	ND U	mg/Kg	1.0	5	07/27/18 16:51	07/26/18	
Silver	200.8	ND U	mg/Kg	0.020	5	07/27/18 16:51	07/26/18	
Zinc	200.8	ND U	mg/Kg	0.5	5	07/27/18 16:51	07/26/18	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18
		Date Analyzed:	07/27/18

Replicate Sample Summary
Total Metals

Sample Name:	2018PCDV5	**Units:**	mg/Kg
Lab Code:	K1805613-011	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1810092-05 Result	Average	RPD	RPD Limit
Cadmium	200.8	0.020	0.020	0.023	0.022	14	20
Copper	200.8	0.10	2.62	2.51	2.57	4	20
Lead	200.8	0.020	ND U	ND U	ND	-	20
Selenium	200.8	1.0	1.50	1.38	1.44	8	20
Silver	200.8	0.020	ND U	ND U	ND	-	20
Zinc	200.8	0.5	112	103	108	8	20

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

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18
		Date Analyzed:	07/27/18

Replicate Sample Summary
Total Metals

Sample Name:	2018ZCDV1	**Units:**	mg/Kg
Lab Code:	K1805613-001	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1810092-07 Result	Average	RPD	RPD Limit
Cadmium	200.8	0.020	0.922	1.18	1.05	25 *	20
Copper	200.8	0.10	6.10	5.73	5.92	6	20
Lead	200.8	0.020	0.824	0.783	0.804	5	20
Selenium	200.8	1.0	3.1	3.2	3.2	3	20
Silver	200.8	0.020	0.080	0.072	0.076	11	20
Zinc	200.8	0.5	277	297	287	7	20

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18
		Date Analyzed:	07/27/18

Replicate Sample Summary
Total Metals

Sample Name:	2018JGCDV4	**Units:**	mg/Kg
Lab Code:	K1805613-021	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1810093-05 Result	Average	RPD	RPD Limit
Cadmium	200.8	0.020	0.944	1.12	1.03	17	20
Copper	200.8	0.10	5.62	4.81	5.22	16	20
Lead	200.8	0.020	0.395	0.304	0.350	26 *	20
Selenium	200.8	1.0	4.41	4.38	4.40	<1	20
Silver	200.8	0.020	0.043	0.037	0.040	15	20
Zinc	200.8	0.5	221	186	204	17	20

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18
		Date Analyzed:	07/27/18

Replicate Sample Summary
Total Metals

Sample Name:	2018UCDV2	**Units:**	mg/Kg
Lab Code:	K1805613-031	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1810093-07 Result	Average	RPD	RPD Limit
Cadmium	200.8	0.020	0.041	0.042	0.042	2	20
Copper	200.8	0.10	2.17	2.21	2.19	2	20
Lead	200.8	0.020	0.144	0.025	0.085	141 #	20
Selenium	200.8	1.0	1.3	1.4	1.4	7	20
Silver	200.8	0.020	ND U	ND U	ND	-	20
Zinc	200.8	0.5	101	108	105	7	20

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18
		Date Analyzed:	07/27/18
		Date Extracted:	07/26/18

Matrix Spike Summary
Total Metals

Sample Name:	2018PCDV5	**Units:**	mg/Kg
Lab Code:	K1805613-011	**Basis:**	Dry
Analysis Method:	200.8		
Prep Method:	PSEP Metals		

Matrix Spike
KQ1810092-06

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	0.020	4.82	4.97	97	70-130
Copper	2.62	26.4	24.8	96	70-130
Lead	ND U	46.8	49.7	94	70-130
Selenium	1.53	18.9	16.6	105	70-130
Silver	ND U	5.34	4.97	108	70-130
Zinc	112	161	49.7	97	70-130

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/16/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18
		Date Analyzed:	07/27/18
		Date Extracted:	07/26/18

Matrix Spike Summary
Total Metals

Sample Name:	2018ZCDV1	**Units:**	mg/Kg
Lab Code:	K1805613-001	**Basis:**	Dry
Analysis Method:	200.8		
Prep Method:	PSEP Metals		

Matrix Spike
KQ1810092-08

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	0.922	5.82	4.98	98	70-130
Copper	6.10	29.6	24.9	94	70-130
Lead	0.824	47.4	49.8	94	70-130
Selenium	3.11	20.2	16.6	103	70-130
Silver	0.080	5.31	4.98	105	70-130
Zinc	277	364	49.8	175 #	70-130

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18
		Date Analyzed:	07/27/18
		Date Extracted:	07/26/18

Matrix Spike Summary
Total Metals

Sample Name:	2018JGCDV4	**Units:**	mg/Kg
Lab Code:	K1805613-021	**Basis:**	Dry
Analysis Method:	200.8		
Prep Method:	PSEP Metals		

Matrix Spike
KQ1810093-06

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	0.944	5.51	4.98	92	70-130
Copper	5.62	27.6	24.9	88	70-130
Lead	0.395	44.4	49.8	88	70-130
Selenium	4.41	20.7	16.6	98	70-130
Silver	0.043	5.15	4.98	103	70-130
Zinc	221	270	49.8	99 #	70-130

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	05/15/18
Sample Matrix:	Animal Tissue	**Date Received:**	06/13/18
		Date Analyzed:	07/27/18
		Date Extracted:	07/26/18

Matrix Spike Summary
Total Metals

Sample Name:	2018UCDV2	**Units:**	mg/Kg
Lab Code:	K1805613-031	**Basis:**	Dry
Analysis Method:	200.8		
Prep Method:	PSEP Metals		

Matrix Spike
KQ1810093-08

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	0.041	4.82	4.98	96	70-130
Copper	2.17	25.2	24.9	93	70-130
Lead	0.144	45.5	49.8	91	70-130
Selenium	1.33	18.5	16.6	104	70-130
Silver	ND U	5.29	4.98	106	70-130
Zinc	101	150	49.8	100	70-130

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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.

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QA/QC Report

Client: Alaska Department of Fish and Game
Project: 2018 Greens Creek Mine Project
Sample Matrix: Animal Tissue

Service Request: K1805613
Date Analyzed: 07/27/18

Lab Control Sample Summary
Total Metals

Units:mg/Kg
Basis: Dry

Lab Control Sample
KQ1810092-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	200.8	4.87	5.00	97	85-115
Copper	200.8	24.4	25.0	98	85-115
Lead	200.8	48.7	50.0	97	85-115
Selenium	200.8	16.3	16.7	98	85-115
Silver	200.8	5.52	5.00	110	85-115
Zinc	200.8	48.1	50.0	96	85-115

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QA/QC Report

Client: Alaska Department of Fish and Game
Project: 2018 Greens Creek Mine Project
Sample Matrix: Animal Tissue

Service Request: K1805613
Date Analyzed: 07/27/18

Lab Control Sample Summary
Total Metals

Units:mg/Kg
Basis: Dry

Lab Control Sample
KQ1810093-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Cadmium	200.8	4.91	5.00	98	85-115
Copper	200.8	24.3	25.0	97	85-115
Lead	200.8	47.8	50.0	96	85-115
Selenium	200.8	16.2	16.7	97	85-115
Silver	200.8	5.61	5.00	112	85-115
Zinc	200.8	47.9	50.0	96	85-115

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	NA
LCS Matrix:	Tissue	**Date Received:**	NA
		Date Extracted:	07/26/18
		Date Analyzed:	07/27/18

Standard Reference Material Summary
Total Metals

Sample Name:	Standard Reference Material	Units:	mg/Kg (ppm)
Lab Code:	KQ1810092-03	Basis:	Dry
Test Notes:	Dorm-4 Solids = 94.5%		

Source: N.R.C.C. Dorm-4

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Cadmium	PSEP Tissue	200.8	0.306	0.314	103	0.233 - 0.385	
Copper	PSEP Tissue	200.8	15.9	15.8	99	12.0 - 20.2	
Lead	PSEP Tissue	200.8	0.416	0.404	97	0.290 - 0.563	
Selenium	PSEP Tissue	200.8	3.56	4.08	115	2.58 - 4.68	
Zinc	PSEP Tissue	200.8	52.20	55.7	107	39.2 - 66.5	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	NA
LCS Matrix:	Tissue	**Date Received:**	NA
		Date Extracted:	07/26/18
		Date Analyzed:	07/27/18

Standard Reference Material Summary
Total Metals

Sample Name:	Standard Reference Material	Units:	mg/Kg (ppm)
Lab Code:	KQ1810092-04	Basis:	Dry
Test Notes:	Tort-3 Solids = 99.1%		

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

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Cadmium	PSEP Tissue	200.8	42.3	40.3	95	32.4-52.9	
Copper	PSEP Tissue	200.8	497	506	102	380-623	
Lead	PSEP Tissue	200.8	0.225	0.197	88	0.166-0.292	
Selenium	PSEP Tissue	200.8	10.9	10.9	100	7.9-14.3	
Zinc	PSEP Tissue	200.8	136	131	96	104-170	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	NA
LCS Matrix:	Tissue	**Date Received:**	NA
		Date Extracted:	07/26/18
		Date Analyzed:	07/27/18

Standard Reference Material Summary
Total Metals

Sample Name:	Standard Reference Material	Units:	mg/Kg (ppm)
Lab Code:	KQ1810093-03	Basis:	Dry
Test Notes:	Dorm-4 Solids = 94.5%		

Source: N.R.C.C. Dorm-4

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Cadmium	PSEP Tissue	200.8	0.306	0.301	98	0.233 - 0.385	
Copper	PSEP Tissue	200.8	15.9	15.7	99	12.0 - 20.2	
Lead	PSEP Tissue	200.8	0.416	0.403	97	0.290 - 0.563	
Selenium	PSEP Tissue	200.8	3.56	3.97	112	2.58 - 4.68	
Zinc	PSEP Tissue	200.8	52.20	52.9	101	39.2 - 66.5	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1805613
Project:	2018 Greens Creek Mine Project	**Date Collected:**	NA
LCS Matrix:	Tissue	**Date Received:**	NA
		Date Extracted:	07/26/18
		Date Analyzed:	07/27/18

Standard Reference Material Summary
Total Metals

Sample Name:	Standard Reference Material	Units:	mg/Kg (ppm)
Lab Code:	KQ1810093-04	Basis:	Dry
Test Notes:	Tort-3 Solids = 99.1%		

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

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Cadmium	PSEP Tissue	200.8	42.3	39.4	93	32.4-52.9	
Copper	PSEP Tissue	200.8	497	477	96	380-623	
Lead	PSEP Tissue	200.8	0.225	0.194	86	0.166-0.292	
Selenium	PSEP Tissue	200.8	10.9	11.1	102	7.9-14.3	
Zinc	PSEP Tissue	200.8	136	127	93	104-170	