An Investigation of Metals in Sediment and Biota of Marine Ways Bay at U.S. Coast Guard Base Ketchikan

Prepared for:

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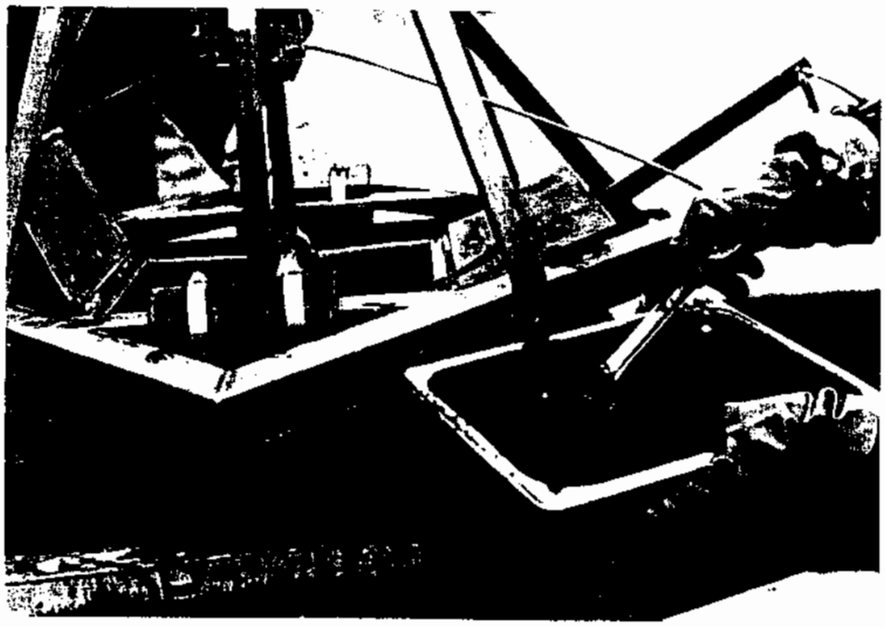

Executive Summary

The U.S. Fish and Wildlife Service, Southeast Alaska Ecological Services, sampled sediments, resident fish, and blue mussels for metals analyses in October 1993 from U.S. Coast Guard Base Ketchikan. The sampling strategy mapped metals contaminant loading in sediments from Marine Ways Bay and the pier area. Comparisons were made with metal concentrations from Bostwick Inlet, a reference area on Gravina Island. Highest concentrations of arsenic (257 ppm), chromium (410 ppm), copper (1320 ppm), nickel (190 ppm), lead (1500 ppm), mercury (2.17 ppm), and zinc (1260 ppm) were found in the inner Bay and by the floating dock, and adjacent to the pier.

Fish tissue metal residues were not elevated in resident fish with the exception of strontium, which was detected at 314 ppm in one sample. Blue mussels collected from the Marine Ways Bay shoreline had elevated concentrations of chromium, copper, lead, nickel, and zinc when compared to metal concentrations in mussels from Bostwick Inlet. Mussel tissue concentrations confirm sediment contamination in Marine Ways Bay. Recommended remediation is sediment removal from areas with highest metal concentrations and resampling to determine success of clean-up activities.

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Aknowledgements

Frank Madison of the Civil Engineering Unit of the Seventeenth Coast Guard District initiated this study and provided guidance for development of the sampling plan. Ted Estrada of the U.S. Fish and Wildlife Service, Juneau Field Office, served as captain of the M/V Curlew and tracked all sample locations using the global positioning system. Bill Hughes of the U.S.Fish and Wildlife Service - Sitka Field Office, Linda Meyer of the US Environmental Protection Agency - Region 10, Randy Rice of the Alaska Department of Environmental Conservation - Southeast Regional Office, and Frank Madison, U.S.Coast Guard, assisted with sample collection. Many of the U.S.Coast Guard Base Ketchikan staff under the command of Captain Michael Dorsey, assisted in numerous ways. Technical reviews were provided by Everett Robinson-Wilson of the U.S. Fish and Wildlife Service and Gerry Woloszynski of the U.S. Coast Guard.

Funding

This study was funded under Military Interdepartmental Purchase Request No.28948746XA011, effective 10-01-93 through 9-30-94. This was developed under an Interagency Agreement to facilitate a study of metal contamination in sediments and biota at USCG Base Ketchikan.

INTRODUCTION

A Site Investigation was conducted at U.S. Coast Guard Base Ketchikan in December of 1992 by Engineering-Science, Inc (E-S). This work involved sampling sediment, soil, and water for metals and volatile organic compounds to assess the extent of contamination at the facility. Organic compounds were detected in low concentrations. Sediments at Marine Ways Bay and boat shelter and under the waterfront pier where numerous batteries were removed in 1992, had the highest concentrations of metals. Concentrations of arsenic, copper, lead, and zinc were elevated compared to background levels. Because of the possibility of adverse effects from metals to fish and other aquatic life in the marine environment, the U.S. Fish and Wildlife Service (Service), Juneau Field Office, was asked to cooperate on an additional site investigation that would furthur define the extent of contamination in sediment and biota. The Service sampled sediment, resident fish, and blue mussels from Marine Ways Bay. Bostwick Inlet on Gravina Island was selected as a reference location. All samples were analyzed for a suite of metals and for tributyltin.

OBJECTIVES

Objectives of this investigation were (1) to determine the extent of metals contamination of sediments in Marine Ways Bay, and (2) to determine if resident species of fish and molluscs have accumulated metals.

METHODS

Sample Collection Procedures

Sediment samples, resident marine fish, and blue mussels were collected from twelve locations in Marine Ways Bay, and the area along the pier. Samples were also collected at a reference location, Bostwick Inlet on Gravina Island, for comparison of metals data. This inlet is nearby, uninhabited, and has no history of human perturbation (Fig 1.).

Sample collection was completed during 10-14 October 1993, using the Service's M/V Curlew as a work platform. Sediment sampling stations are shown in Figure 2. Sample stations were located using GPS aboard the M/V Curlew. A total of sixteen sediment sampling stations were selected; because some locations had a scoured rocky bottom or were almost all sand, samples could not be taken at those stations. Sediment sampling stations were concentrated in the area of the Marine Ways Bay that had the highest concentrations reported in the 1992 E-S report.

Sediment samples were collected at each station using a stainless steel Smith McIntyre dredge. Three grabs were made at each

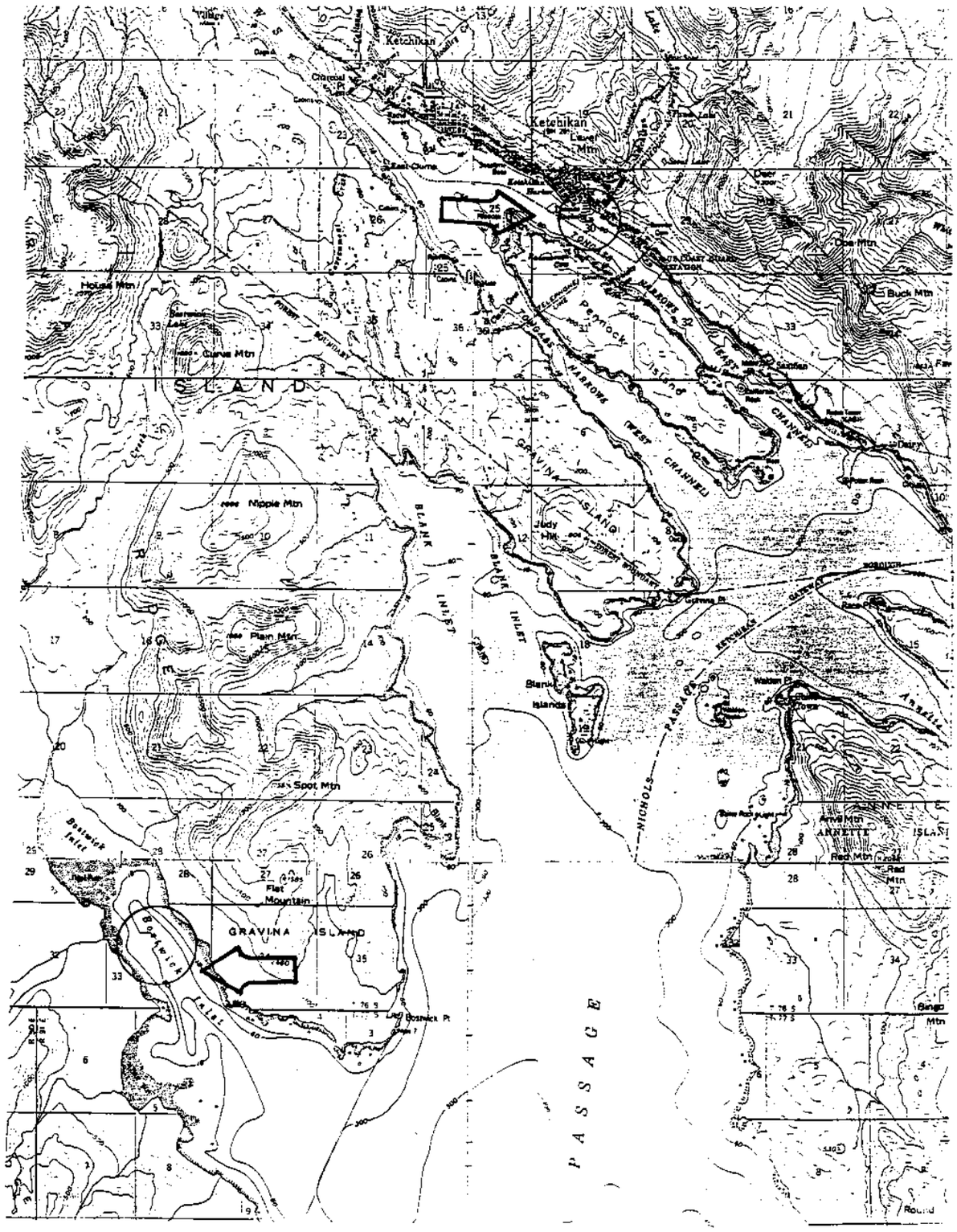

Fig. 1 Location map for US Coast Guard Base Ketchikan and Bostwick Inlet, reference location.

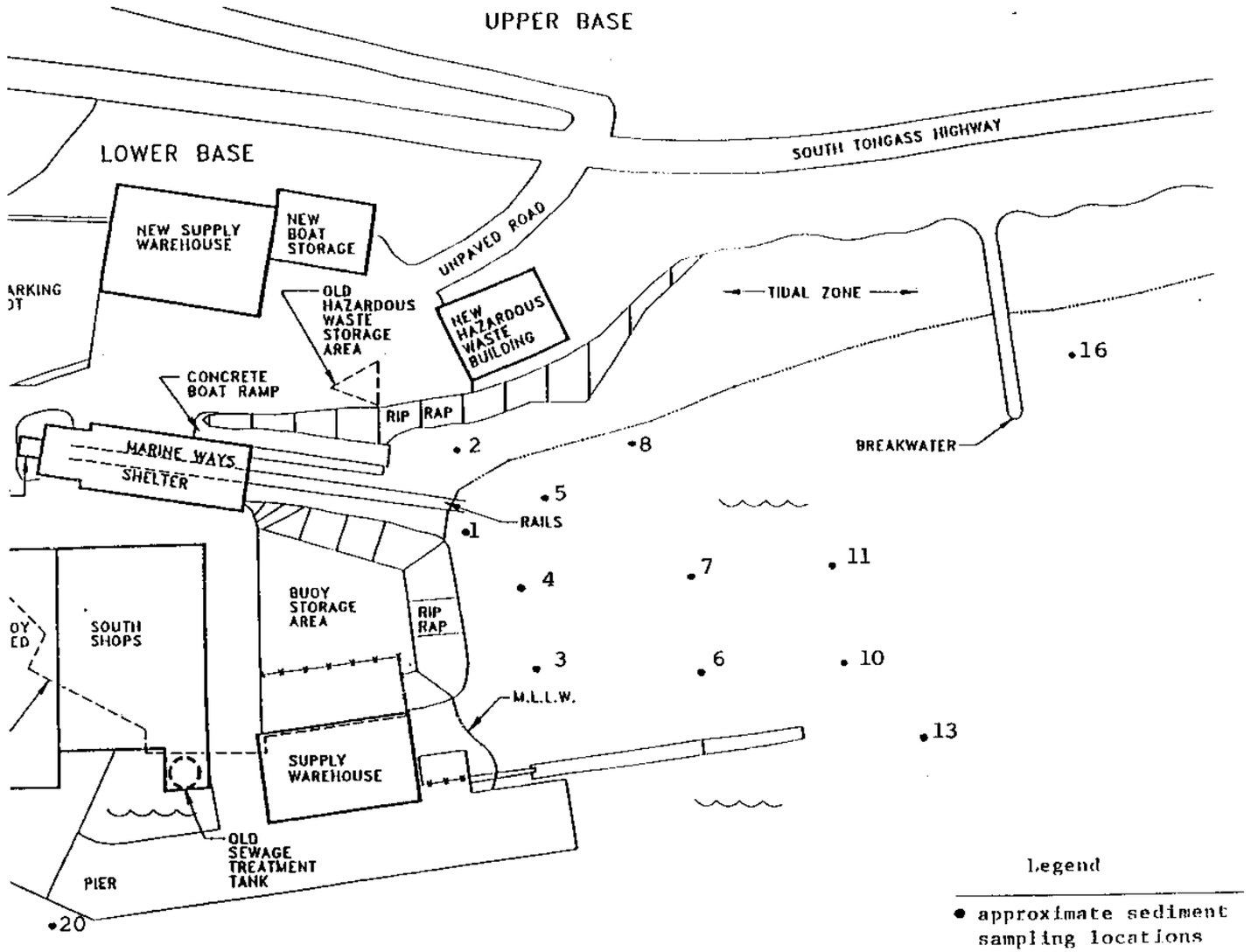

Fig. 2 Sediment sampling locations at US Coast Guard Base Ketchikan.

station and homogenized to form a composite sample. All samples were taken in triplicate. A blind duplicate and trip blank were taken at one Base station. Sediments were mixed with a stainless steel spoon in a stainless steel pan. Between stations, the dredge, spoon, and pan were rinsed with ambient seawater. Each homogenized sample was placed in precleaned jars (I-Chem 200 series, 125 ml) and frozen aboard ship under chain-of-custody procedures. Because of the possibility of paint chips in sediment samples, visual inspection of sediment samples was done to look for sediment layers. Because an obvious grit layer was not found in any of the grab samples, all samples were homogenized.

Three sediment samples were collected using the same procedure at the reference location, Bostwick Inlet. All sediment sampling equipment (dredge, spoon, mixing pan) was decontaminated prior to use with a detergent and tap water solution followed by rinsing with tap water and a final rinse with bottled deionized water.

Fish were collected using hook and line and trawl. Fish were identified to species, weighed and measured, wrapped in foil and labeled as a composite of two or three fish. All fish were frozen. Blue mussels (Mytilus trossulus), were collected throughout the tidal zone at both sites at low tide. Between 40 and 60 mussels were used for each composite sample. Molluscs were depurated overnight in seawater. Tissue was removed from each mussel using a clean stainless steel scalpel or knife. All tissue samples were placed in labeled, precleaned jars and frozen.

Samples were shipped from Juneau by Federal Express to the analytical laboratory. Samples were wrapped to prevent breakage and shipped frozen in an ice cooler. Chain of custody forms were attached to the outside of the cooler.

Laboratory Analytical Methods

Samples were analyzed through the Environmental Trace Substances Research Center in Columbia, Missouri, an approved contract laboratory of the National Biological Survey's Patuxent Analytical Control Facility. Standard Reference Materials, duplicates, spike recoveries and procedural blanks were used to determine acceptability of laboratory data.

Analysis of metals was conducted through either inductively coupled plasma emission spectroscopy (ICP) or hydride generation. Mercury was analyzed by cold vapor reduction AAS.

Samples were weighed and frozen prior to homogenization. An aliquot of each sample was weighed, freeze-dried and rehomogenized. Tissue samples were digested by nitric acid reflux for mercury, and analysis was conducted using a Perkin-Elmer Model 403 Atomic Absorption Spectrophotometer. Hydride generation required nitric-percholoric digestion for arsenic and

selenium. Samples were analyzed by ICP using a Jarrell-Ash Model 1100 Mark III Inductively Coupled Plasma Photometer; these samples were also acid digested. Minimum sample weight needed for ICP analysis of sediment samples was 5 g and 10 g for tissue. Actual sample weights for sediment analysis were 130 to 212 g and 44 to 1700 g for tissue, considered ideal sample sizes of greater than ten times the required weight.

Percent moisture was determined for all samples. Total organic carbon analysis used the dry oxidation method. Grain size of sediment samples determined percents of sand, clay, and silt.

Because of the use of tributyl tin in bottom paints, analysis for this metal compound was conducted in sediments and tissue. These results are not available at this time.

All means reported are geometric means. Where values reported were at less than the detection limit, one-half of the detection limit was used in calculations.

RESULTS

Sediments

Metal concentrations of concern include, arsenic, chromium, copper, mercury, nickel, lead, strontium, and zinc. Other metals analyses included, aluminum, boron, barium, beryllium, cadmium, magnesium, manganese, molybdenum, selenium, and vanadium. These latter elements were not detected in elevated concentrations when compared with the reference location. Generally, metal concentrations were highest close to the Marine Ways shelter, the floating dock, and the pier (Figures 3 - 10). Many of these metals can be considered elevated because their concentrations are more than ten orders of magnitude higher than concentrations from the reference location. Washington State Sediment Management Standards (April 1991), developed for marine sediments, were also used as a comparison to these data. Metal concentrations of arsenic, chromium, copper, mercury, nickel, lead, and zinc, exceeded the Washington State Sediment Management Standards (Table 1). Strontium concentrations were elevated in some samples but there are no standards for comparison.

Total organic carbon (TOC) was low in sediments and ranged from 0.5 to 5.4 percent with a mean of 1.8 percent at the reference location and 2.0 at the Base. Grain size varied between locations with percent sand ranging from 49.5 to 95.9 with a mean of 70.2 percent for reference location samples and 77.7 percent sand for Base sediment samples.

Tissue

Fish species collected for analysis from the Base area included, copper rockfish (Sebastes caurinus), quillback rockfish (S.

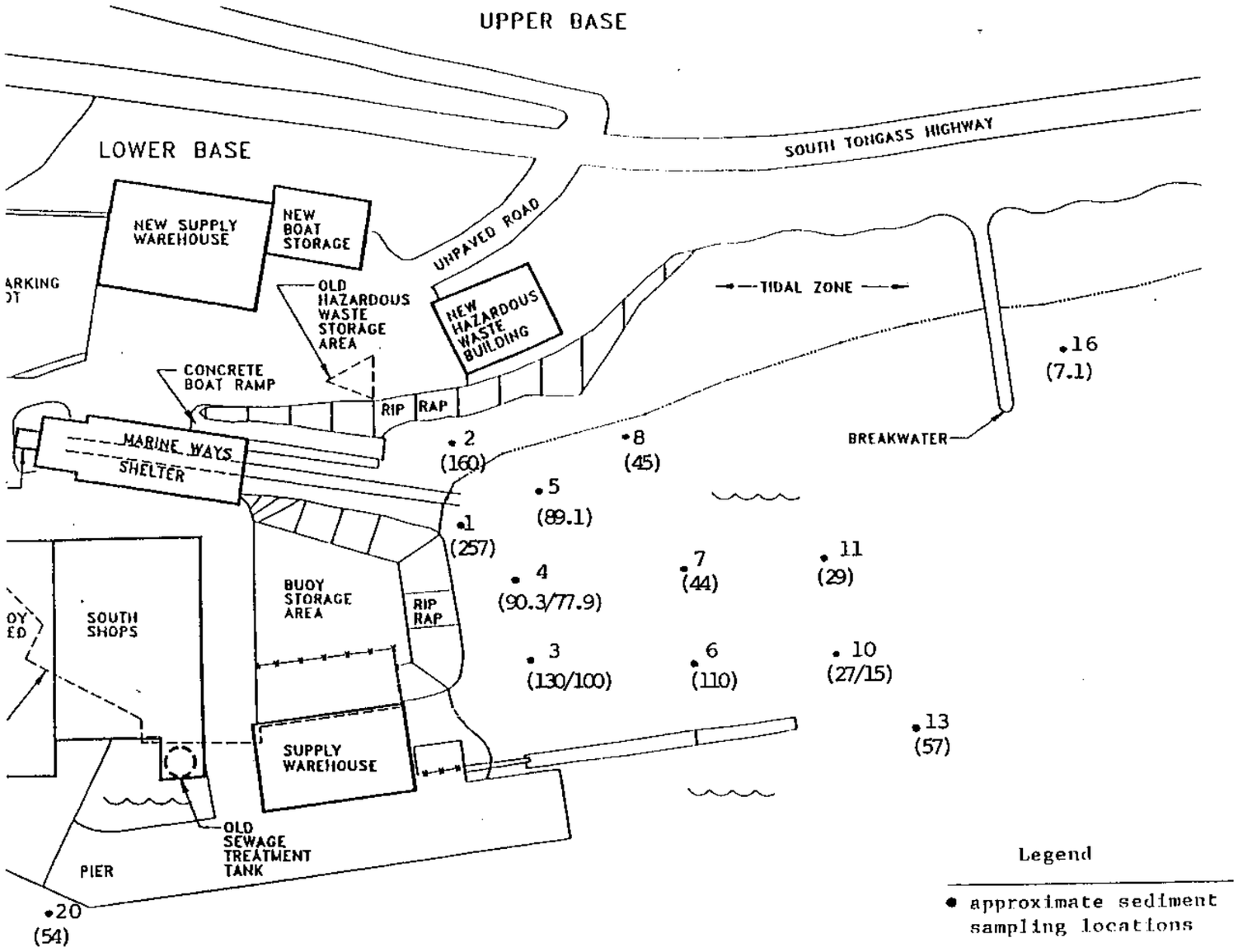

Fig. 3. Arsenic concentrations (ppm dry weight) in sediments at USCG Base Ketchikan

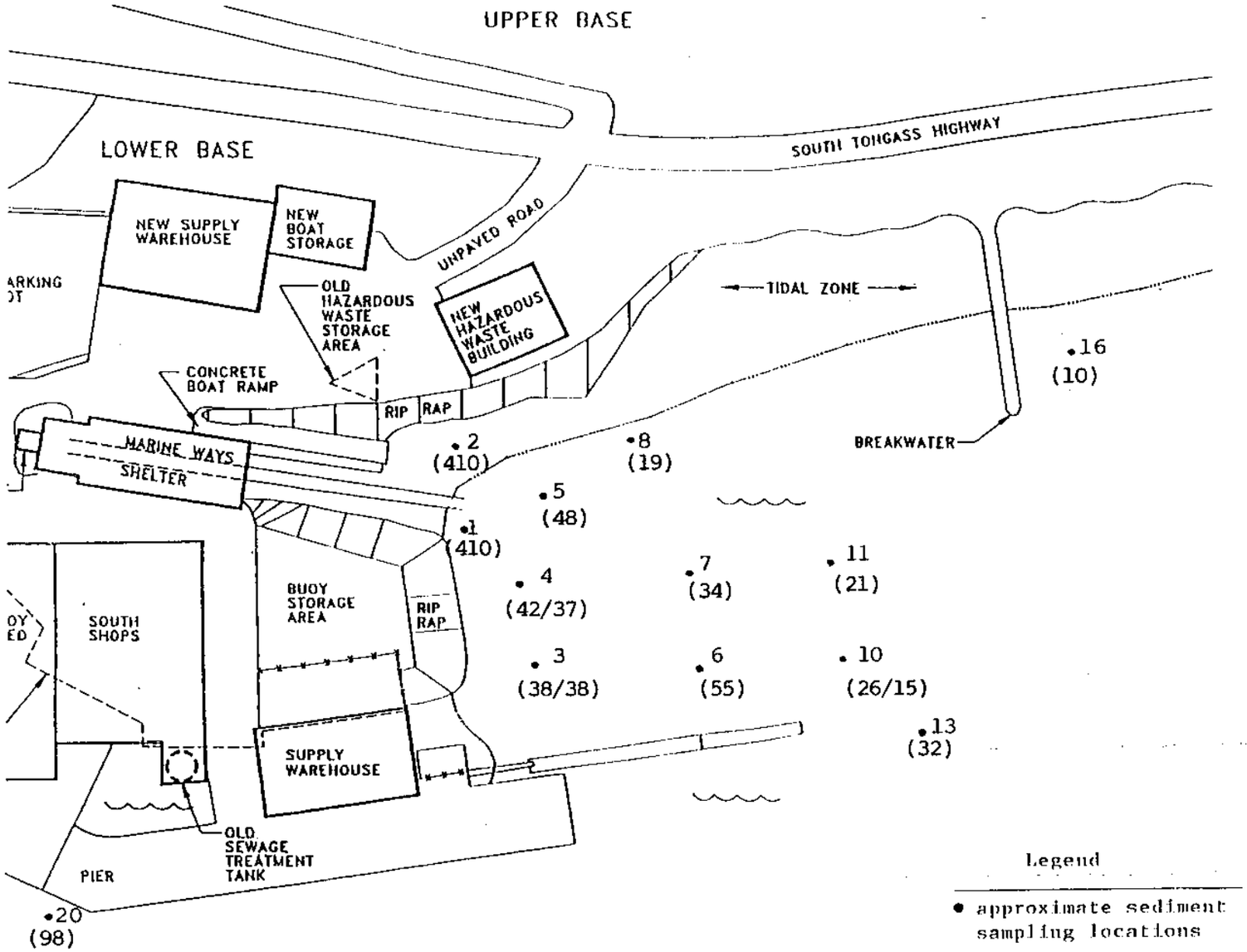

Fig. 4 Chromium concentration (ppm dry weight) in sediments at USCG Base Ketchikan

COPPER (Cu)

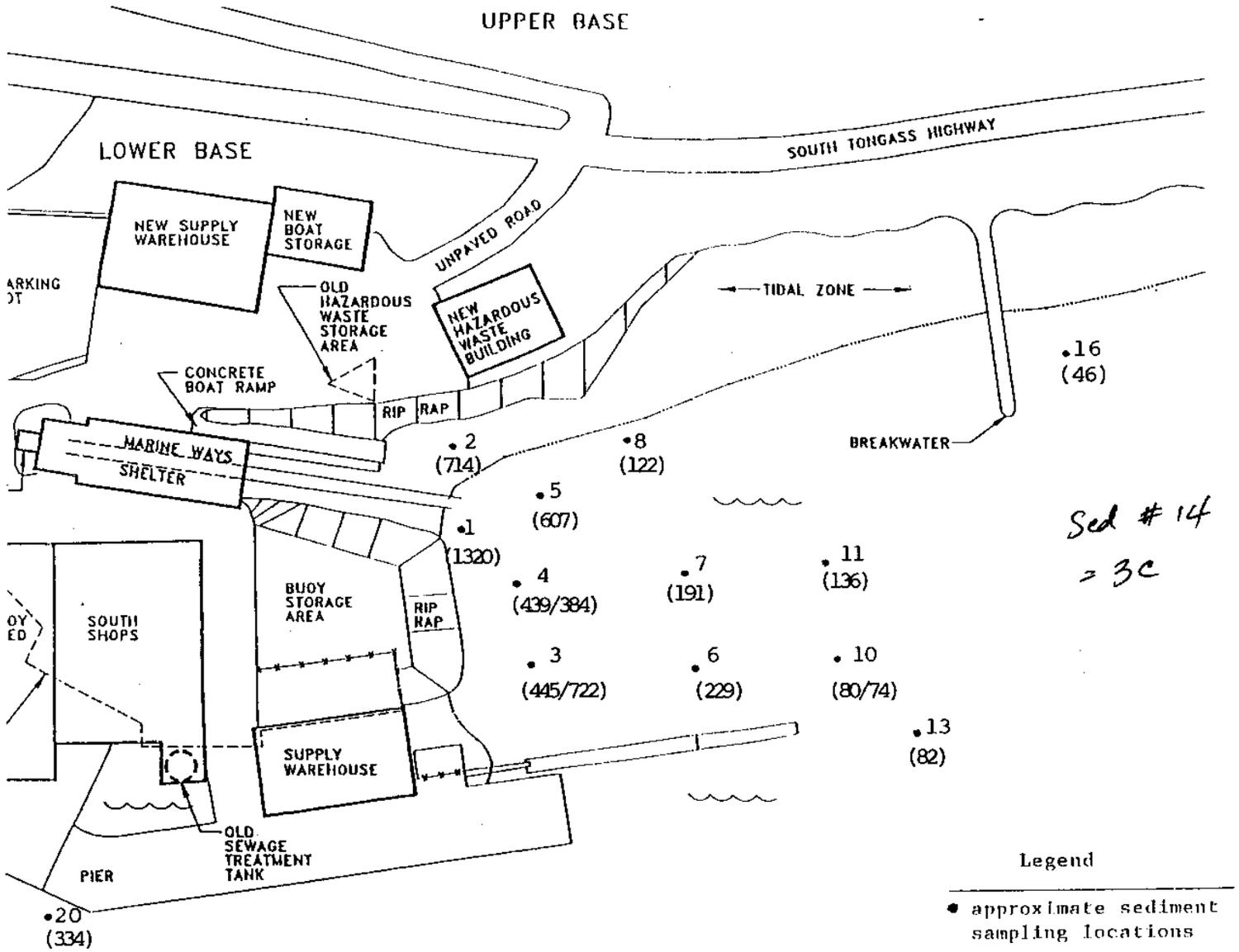

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Fig. 5 Copper concentrations (ppm dry weight) in sediments at USCG Base Ketchikan

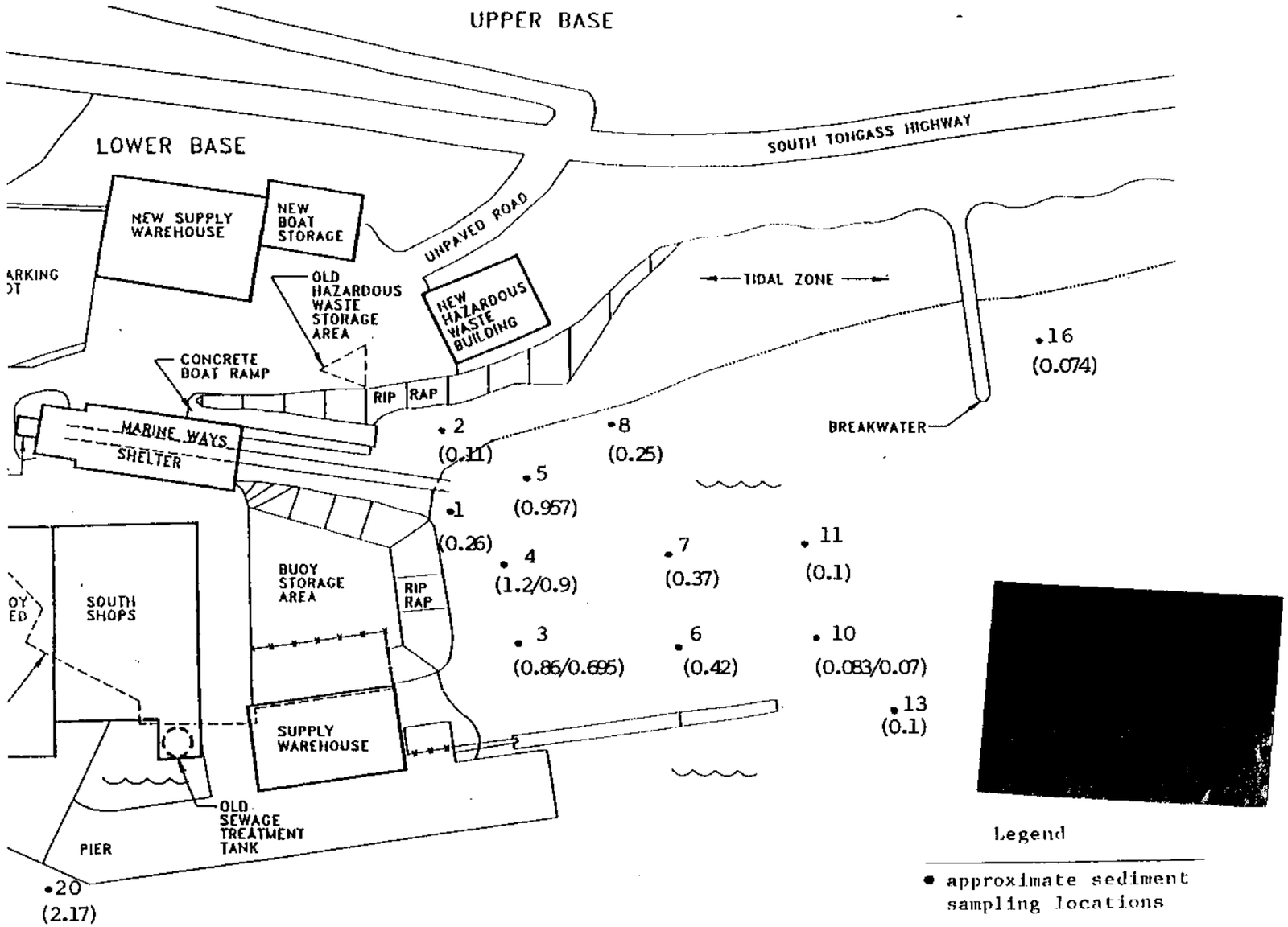


Fig. 6. Mercury concentrations (ppm dry weight) in sediments at USCG Base Ketchikan

NICKEL (Ni)

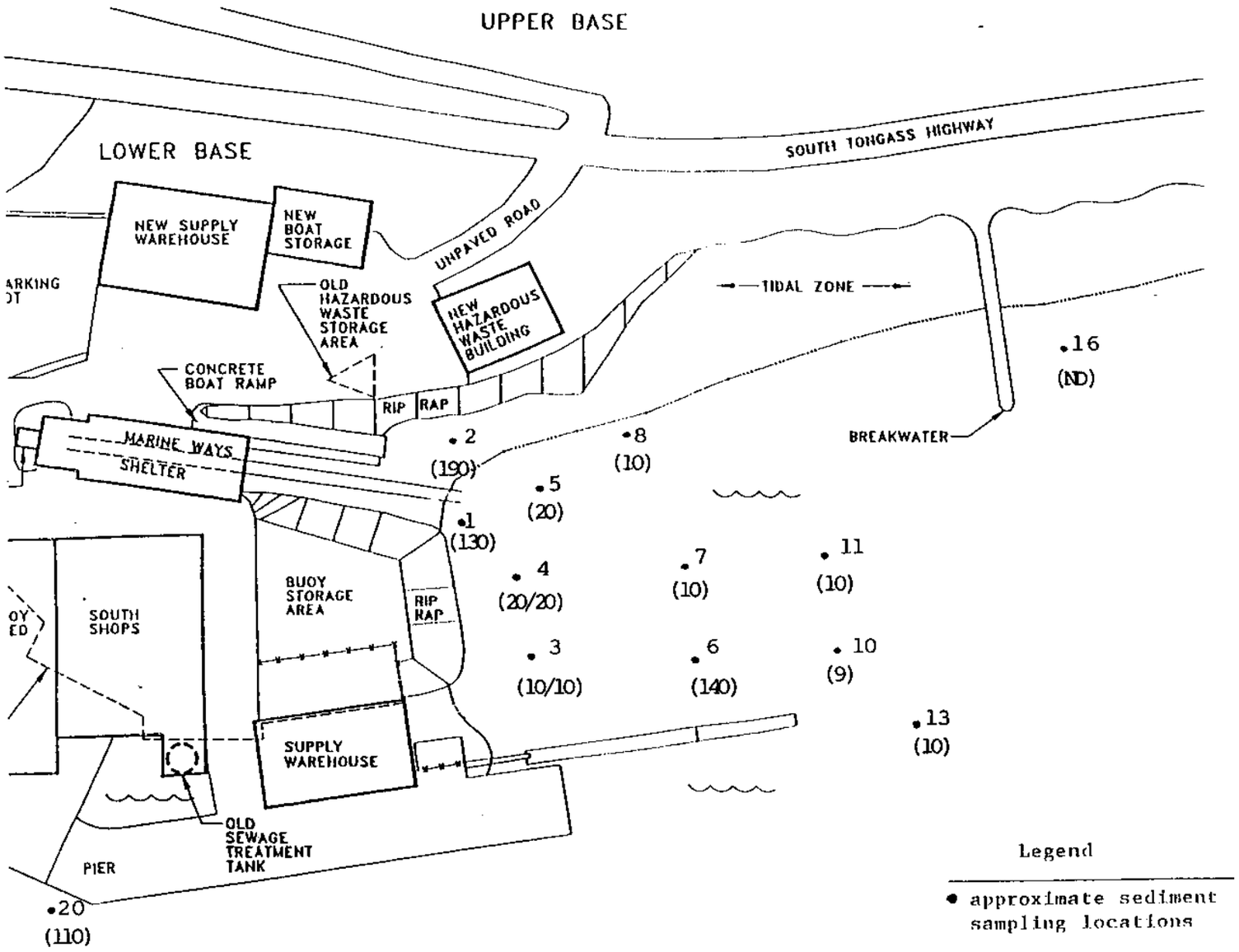


Fig. 7. Nickel concentrations (ppm dry weight) in sediments at USCG Base Ketchikan

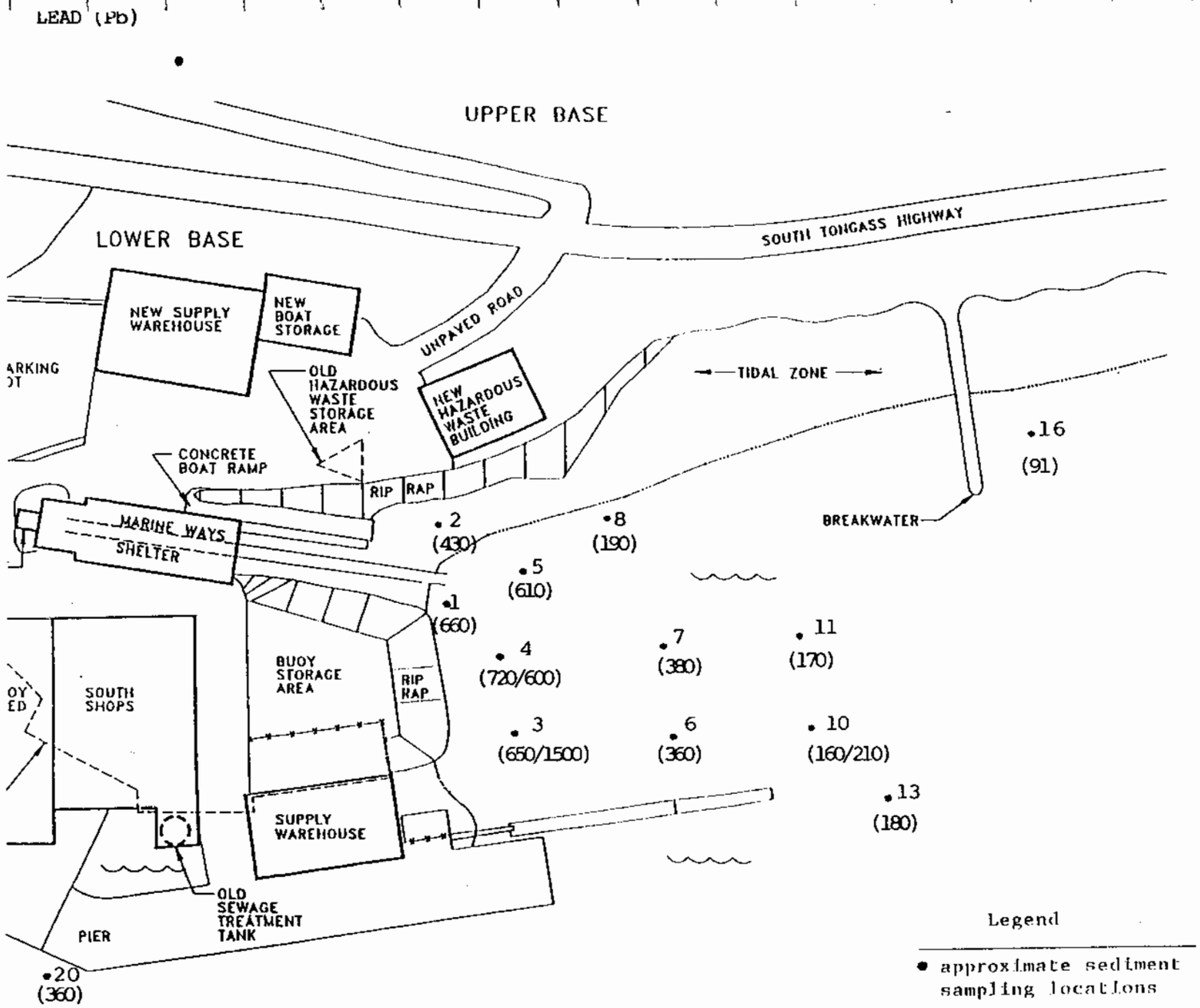


Fig. 8 Lead Concentrations (ppm dry weight) in sediments at USCG Base Ketchikan

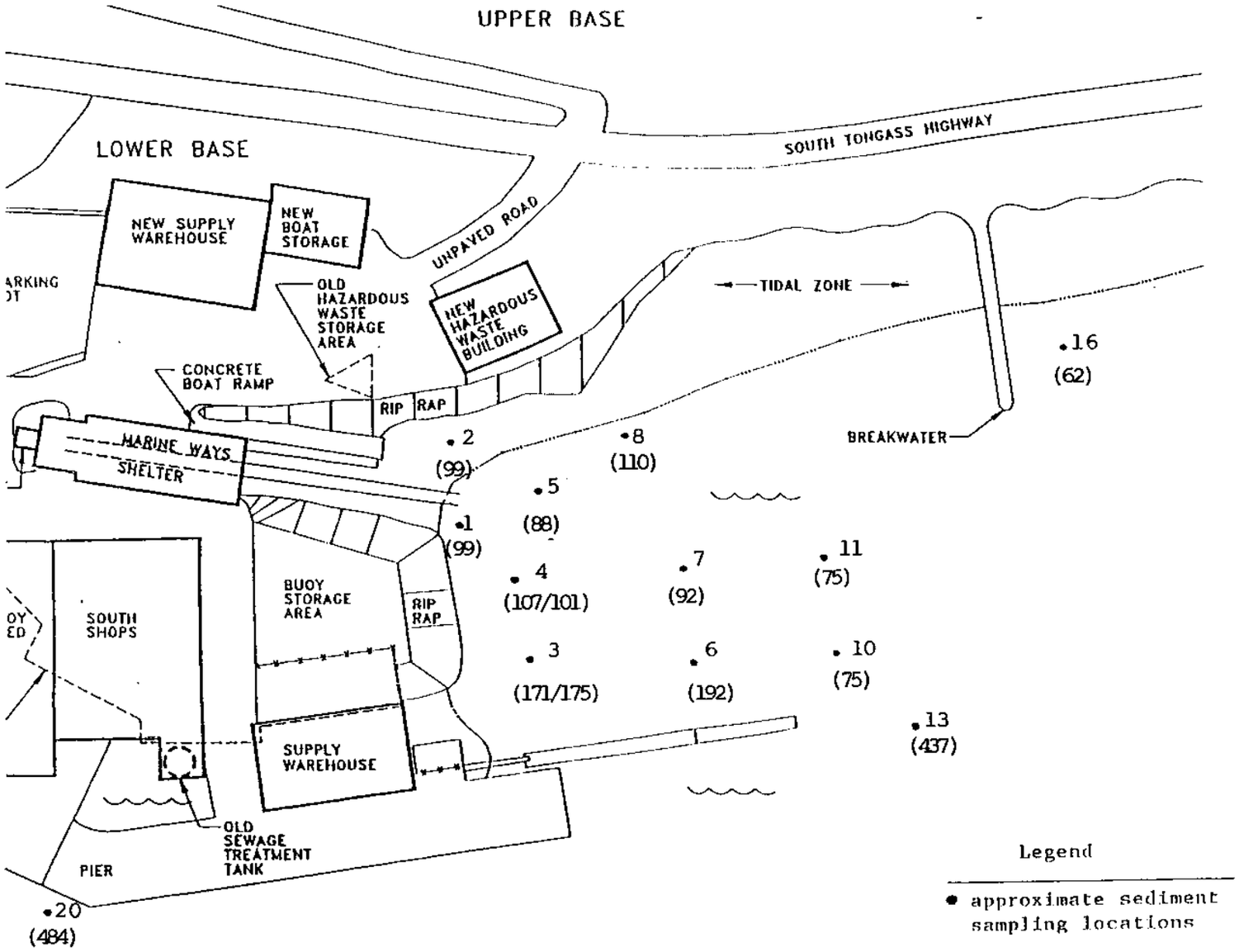


Fig. 9. Strontium concentrations (ppm dry weight) in sediments at USCG Base Ketchikan

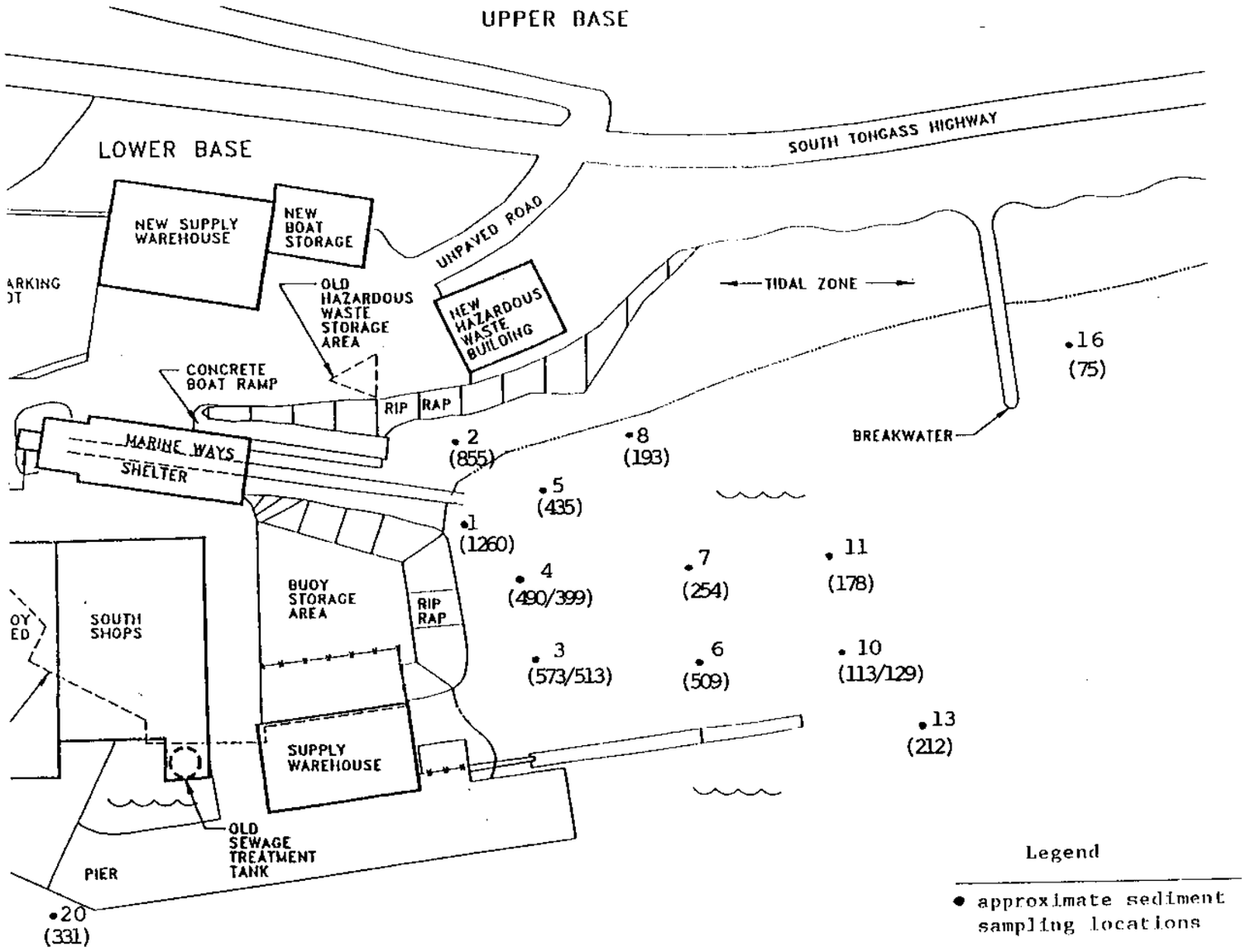


Fig. 10. Zinc concentrations (ppm dry weight) in sediments at USCG Base Ketchikan

Table 1. Metal concentrations (ppm DW) in sediments.

	As	Cd[2]	Cr	Cu	Hg	Ni	Pb	Sr	Zn
Base Ketchikan[1] (n=12)									
Low	15	<0.91	15	74	0.07	8	170	72	113
High	257	3.4	410	1320	2.17	190	1500	484	1260
Mean[3]	69.75	1.56	53.57	296.45	0.32	26.66	366.62	134.65	356.59
Biorka Inlet (n=3)									
Low	1.9	<1	24	12	<0.005	10	20	34	69
High	8.24	2	31	32	0.066	20	30	74.7	87
Mean[3]	4.67	1.26	26.14	20.37	0.019	15.87	22.89	55.88	77.98
WA State Marine Sediment Quality Standard[4]	57	5.1	260	390	0.41	-----	450	-----	410

[1] includes samples: 1, 2, 3 + 14, 4A + C, 5, 6, 7, 8, 10A + C, 11, 13, 20

[2] less than detection limit values calculated at 50% detection limit in determining geometric mean.

[3] geometric mean.

[4] Washington State Department of Ecology, 1991.

maliger), and red Irish Lord (Hemilepidotus hemilepidotus). Rock sole (Lepidopsetta bilineata), English sole (Parophrys vetulus), and great sculpin (Myoxocephalus polyacanthocephalus), smoothhead sculpin (Artedius lateralis), and Pacific staghorn sculpin (Leptocottus armatus), were collected from the reference location. Metal concentrations detected in fish and mussel samples from both locations were similar for arsenic, cadmium, and mercury (Table 2). One fish sample, a composite of three red Irish Lords from Base Ketchikan, had a high strontium value (314 ppm). Chromium, copper, lead, nickel, and zinc concentrations in mussels were higher (double) in samples collected from Base Ketchikan compared to Bostwick Inlet samples (Table 3). Copper, lead, and zinc concentrations were also higher (double) in Base Ketchikan mussels in comparison to mussels from Klag Bay, an area with a historic source of heavy metal pollution from mine tailings.

DISCUSSION

Sediments

A high concentration of organic matter (TOC) could reflect a reduced bioavailability of chemical contaminants due to binding of metals to organic carbon. TOC values for sediment samples from both locations were very low - at less than 6 percent for all samples and most were between one and four percent (Table 4). These data can be interpreted to mean that metals detected in the sediment samples were bioavailable to marine organisms.

Fine grained sediments (typically silts in a marine environment), accumulate higher concentrations of toxicants. These fine sediments have a relatively large surface area to volume ratio and are more chemically and biologically reactive than coarser sands. Sediment samples from both locations had a very high sand component, averaging approximately 78 percent for Base sediments and 70 percent for the reference location. However, metal concentrations were not neccessarily lower in samples 1A and 2A with 85 to 88 percent sand versus sample 3A with 64 percent sand.

Metals analyses of sediments from Marine Ways Bay indicate that the highest concentrations of arsenic, chromium, copper, nickel, lead, and zinc, occur within Marine Ways Bay in the area between the boat ramp rails and the dock. Sediments from sample sites 1, 2, 3, 4, and 5 were elevated for all of these metals. Sample site 6 also had elevated arsenic, mercury, nickel, strontium and zinc. The sample taken in close proximity to the pier had the highest concentrations of strontium (484 ppm) and mercury (2.17 ppm). Strontium was also detected at at a high concentration (437 ppm) in sediments at sample site 13; mercury concentrations were also high in the Bay.

These data indicate that the areas in need of clean-up actions are the pier and Marine Ways Bay. Sediment samples analyzed from

Table 2. Metal concentrations (ppm DW) in whole fish from USCG Base Ketchikan and Bostwick Inlet.

	As	Cd	Cr	Cu	Hg	Ni	Pb	Sr	Zn
USCG Base Ketchikan									
KF 01 CORO (2)[1]	3.1	0.98	0.2	4.0	0.31	<0.1	<0.4	76.4	50.6
KF 03 QURO (2)	3.2	0.15	0.2	2.1	0.27	<0.1	<0.4	96	42.4
KF 05 RILO (3)	2.8	0.087	0.49	4.4	0.35	0.3	1.0	314	58.8
KF 06 RILO (3)	2.6	0.12	0.6	4.7	0.23	0.37	0.4	204	58.8
Mean[2]	2.9	0.20	0.33	3.6	0.29	0.13	0.4	147.2	52.2
Bostwick Inlet									
BF 04 ROSO (2)	13.0	0.11	0.59	2.5	0.079	0.4	<0.4	54.9	56.1
BF 06 ENSO (3)	14.0	0.062	0.46	6.6	0.035	0.3	<0.4	110	46.6
BF 07 GRSC (1), SMSC (1)	6.7	0.12	0.35	3.9	0.24	0.1	<0.4	157	57.6
BF 08 PSSC (2)	2.6	0.1	0.3	3.1	0.039	0.2	<0.4	55.8	56.5
Mean[2]	7.5	0.10	0.42	3.8	0.03	0.2	<0.4	85.3	54.0

[1] number in parantheses represents number in composite

[2] geometric mean

CORO = copper rockfish
QURO = quillback rockfish
RILO = red Irish Lord
ROSO = rock sole
ENSO = English sole
GRSC = great sculpin
SMSC = smoothhead sculpin
PSSC = Pacific staghorn sculpin

Table 3. Metal concentrations (ppm DW) in blue mussels from USCG Base Ketchikan and Bostwick Inlet.

	As	Cd	Cr	Cu	Hg	Ni	Pb	Sr	Zn
Base Ketchikan									
KM 01	11.0	5.98	5.0	24.8	0.047	3.0	11.0	36.7	198
Km 02	11.0	6.60	1.6	20.1	0.05	1.2	5.9	81.8	160
KM 03	11.0	6.68	2.1	14.0	0.046	1.3	3.9	43.4	192
KM 04	7.5	4.57	0.4	36.9	0.02	1.1	2.8	26.0	222
Mean[1]	9.9	5.89	1.6	22.5	0.038	1.5	5.2	42.9	191.7
Bostwick Inlet									
BM 01	9.2	5.08	1.1	17.0	0.064	0.96	0.5	115	92.3
BM 02	7.9	7.35	0.46	5.5	0.029	0.58	<0.4	34.5	78.7
Mean[1]	8.5	6.11	0.71	9.7	0.043	0.75	0.3	63.0	85.2

[1] geometric mean

Table 4. Total organic carbon (TOC) and grain size - sediment samples.

Sample Number	Percent TOC	Particle Size - %Sand	Particle Size - %Silt	Particle Size - %Clay
Base Ketchikan				
K93s01A	1.5	85.5	9.8	4.7
K93s02A	1.6	88.2	6.3	5.5
K93s03A[1]	5.4	64.4	24.4	11.2
K93s04C	3.4	69	21.8	9.2
K93s05A	3.3	68.9	20.5	10.6
K93s06A	2.8	62.7	24.6	12.7
K93s07A	1.9	83.6	8.8	7.6
K93s08A	2.5	77.7	14.5	7.8
K93s10A	1.6	84.1	8.8	7.1
K93s10C	1.2	87.7	6.7	5.6
K93s11A	2.1	88.7	5.1	6.2
K93s13A	1.3	87.7	6.5	5.8
K93s14[1]	1	91	5	4
K93s16A	4.2	65.4	24.3	10.3
K93s20A	1.5	86.8	7.3	5.9
	3.9	53.5	28.4	18.1
Bostwick Inlet				
B93s01A	.5	95.9	1.5	2.6
B93s02A	2.6	72.9	17.4	9.7
B93s03A	4.6	49.5	37.6	12.9

[1] sample 14 duplicate of K93s03A

stations 11, 10, and 13 had lower metal concentrations, with the exception of strontium from site 13. Sample site 16 located outside of the Bay past the breakwater (Fig.2) had low concentrations of all metals.

Tissue

Fish tissue metal residues did not differ between the two locations with the exception of strontium, which was higher from a composite fish sample from Base Ketchikan. These results indicate that most metals are not bioaccumulating in fish tissue from metal contaminated sediments. The composite sample of Irish Lords with the high strontium value is indicative that these bottom-feeders could be consuming sediment along with prey items. There was no literature located on effects of strontium to fish.

Blue mussels, filter-feeders that live in the intertidal zone, are more likely than fish to take in sediment. Mussels are commonly used in assessing contamination in coastal and estuarine sites, such as the NOAA Mussel Watch Project (O'Connor 1992). Mussels collected from Base Ketchikan did have elevated concentrations of chromium, copper, lead, nickel, and zinc (Table 2), when compared to concentrations in Bostwick Inlet mussel samples. Concentrations were highest in mussels taken from the rail area or closest to the rails (Fig. 2). These tissue concentrations confirm sediment contamination in Marine Ways Bay.

RECOMMENDATIONS

In order to avoid furthur contamination to aquatic marine life, contaminated sediments should be removed from Marine Ways Bay and the area adjacent to the pier. There may be other areas under the pier that have sediments with elevated metal concentrations, based on the data in the Engineering-Science report (1992). Removal techniques should be employed that prevent sediment from moving off-site. Additional sediment sampling for metals analyses is recommended after remediation.

LITERATURE CITED

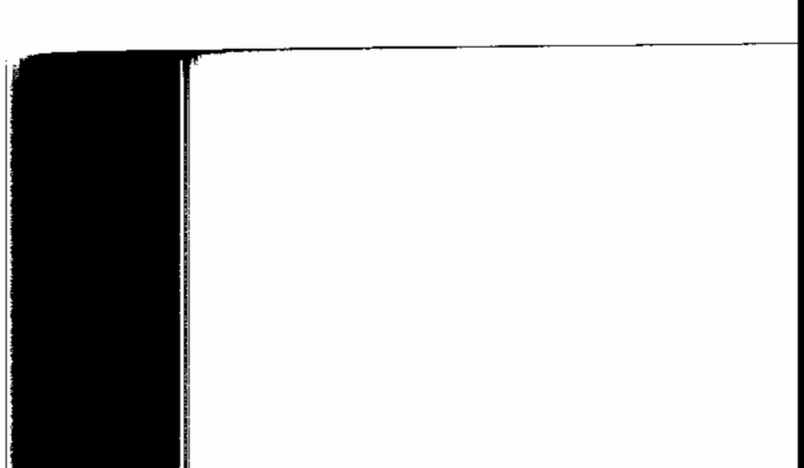
Engineering-Science, Inc. Feb. 1992. Site Investigation Report U.S. Coast Guard Base Ketchikan.

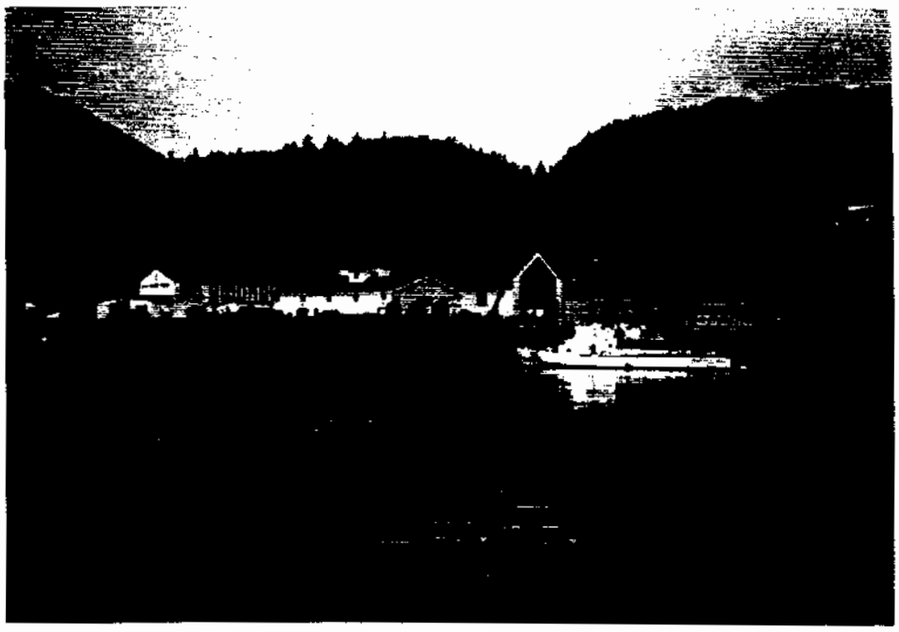
Washington State Department of Ecology. April 1991. Sediment Management Standards. Chapter 173-204 WAC. 61 pp.

O'Connor, T.P. 1992. Mussel Watch Recent Trends in Coastal Environmental Quality. U.S. Dept. of Comm. NOAA. 46 pp.

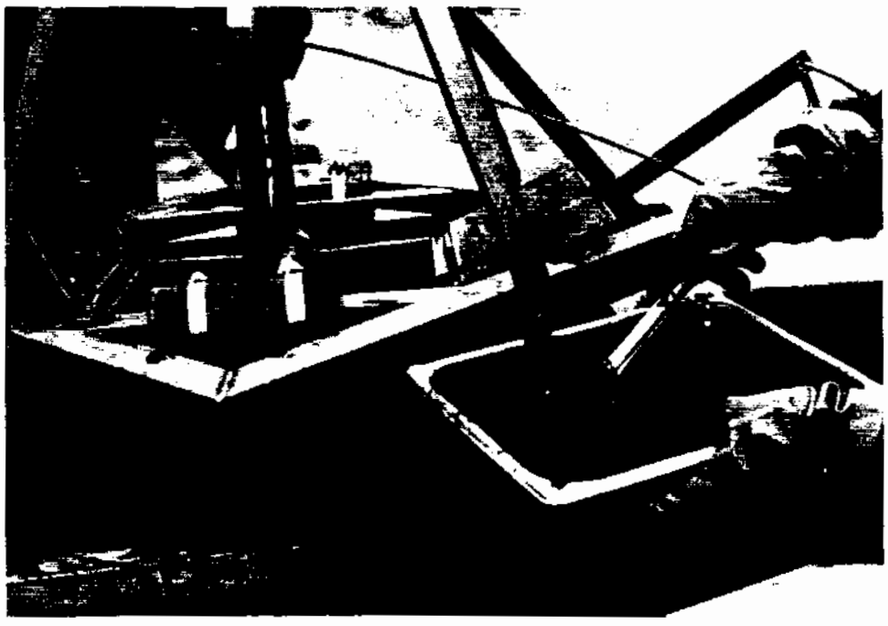
APPENDIX A

PHOTOGRAPHS

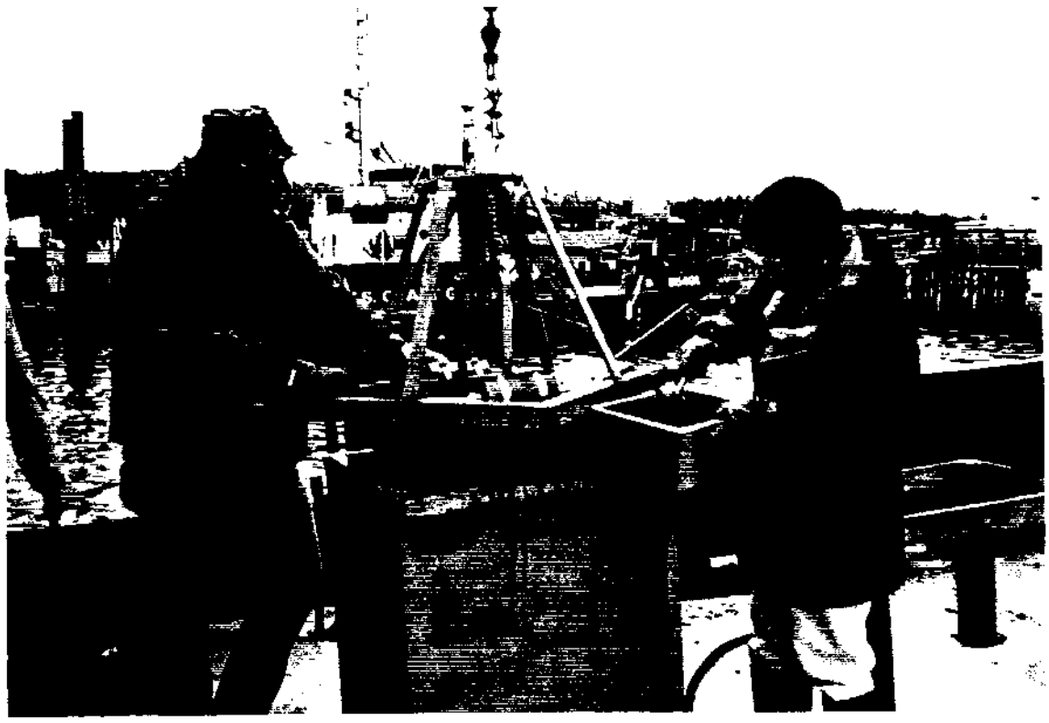




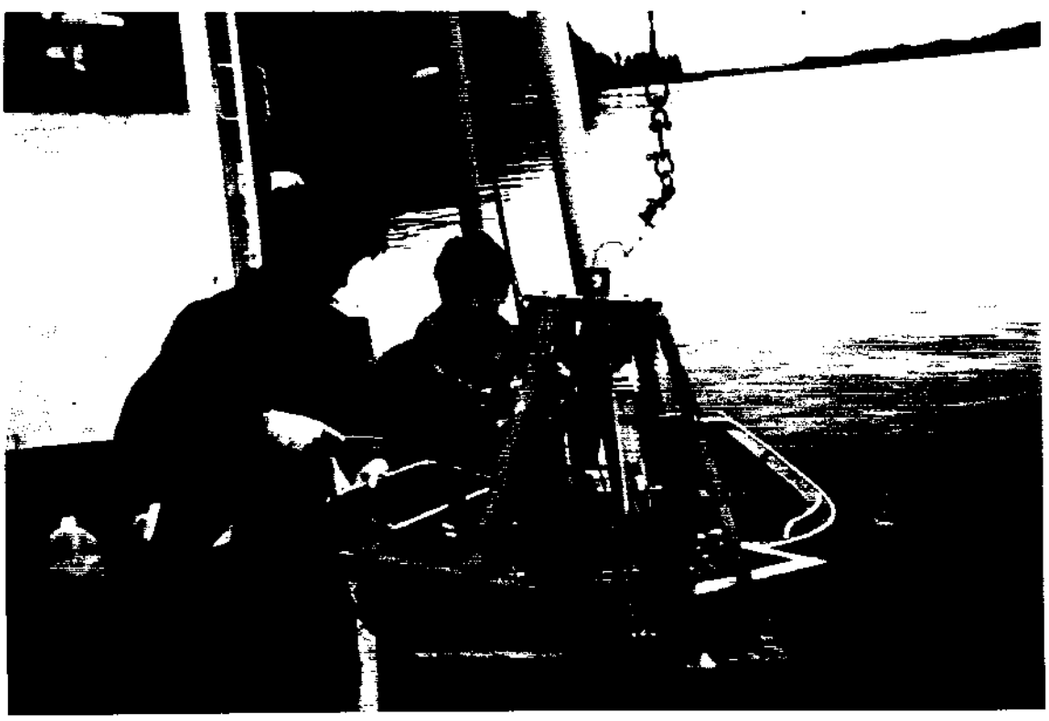
1. U.S. Coast Guard Base Ketchikan - pier and Marine Ways Bay.



2. Collecting sediment sample.

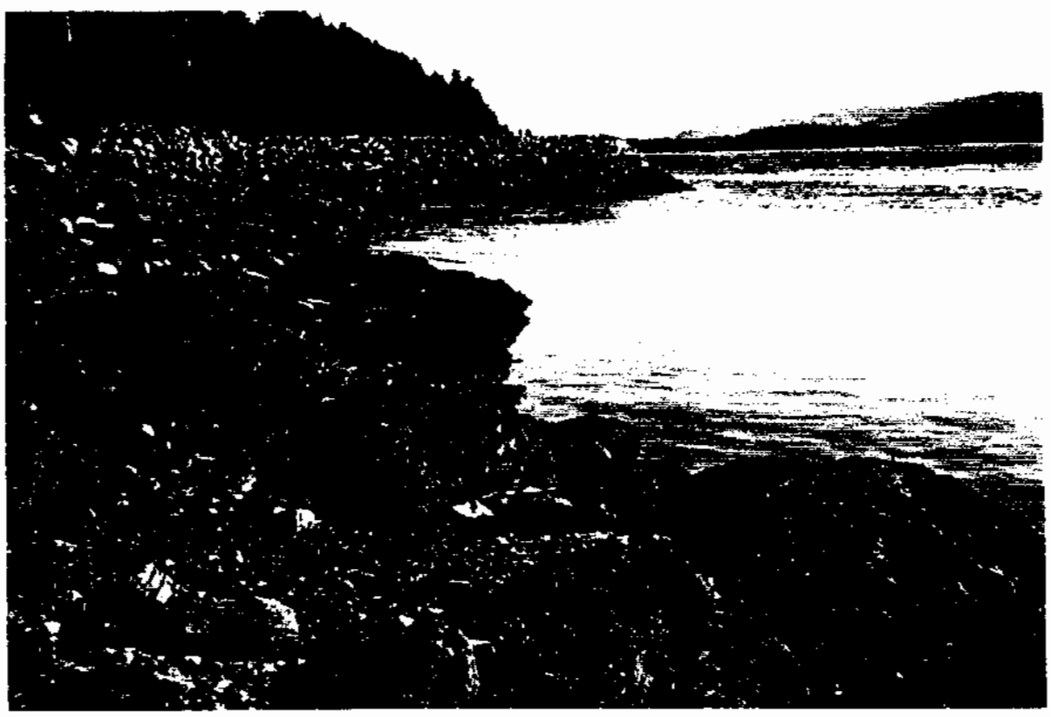


3. Mixing sediment sample, (F. Madison and L. Meyer).



4. Collecting sediment sample, (D. Rudis and L. Meyer).

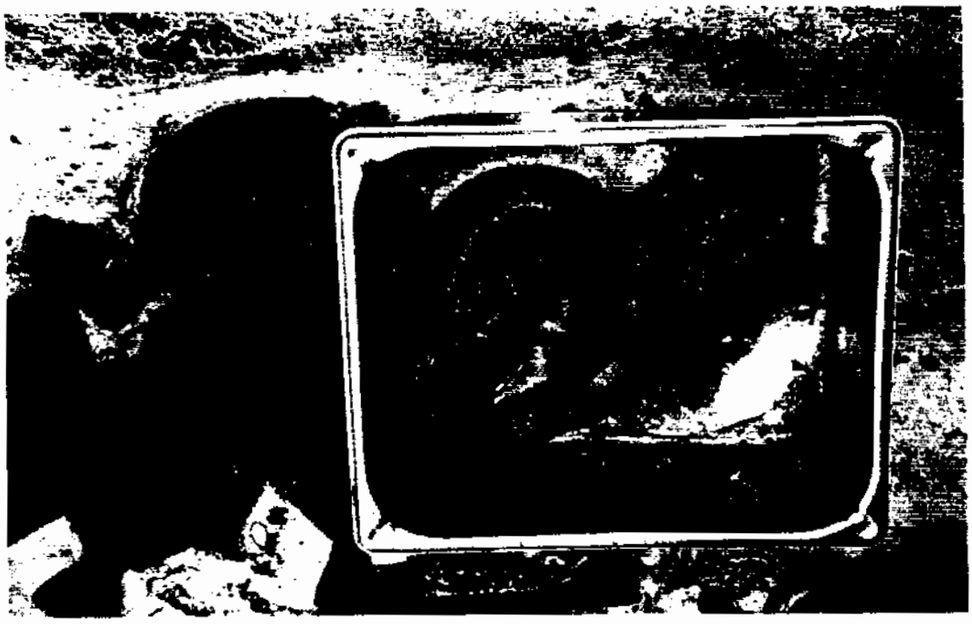
5. Boat ramp at Marine Ways Bay - mussel collection area.



6. Shoreline - Marine Ways Bay mussel collection area.

7. Bostwick Inlet, Gravina Island shoreline.

8. Bostwick Inlet, Gravina Island.



9. Sculpin sampled for tissue residue analysis.

10. Sole sampled for tissue residue analysis.

APPENDIX B

FIELD NOTES

SEDIMENT

SAMPLE PTS OCT. 11 ②

			TIME
✓1	55° 19' 57"	131° 37' 23"	09:00
✓2	55 19 56	131 37 23	8:25
✓3	19 55	37 25	10:20
✓4	19 55	37 25	10:00
✓5	19 56	37 23	9:30
✓6	19'54'	37 23	14:00
✓7	19 51	37 21	13:15
✓8	19 56	37 21	10:55
—9	19 54	37 23	16:07
✓10	19 54	37 22	15:45
✓11	19 54	37 21	15:25
—12	19 56	37 20	11:13
✓13	19 54	37 20	10:15
—14	—	—	—
—15	—	—	—
16	19 51	37 14	11:00
20	19 54	31 27	12:56

(end of pier 58° 19 52"N 131° 37' 27"W)

@ stations 9/12/14/15 - no sediment could be found w/ 3+ grabs
∴ no samples @ these pts.

SUN. OCT. 10 ③

D. Rudis
E. Madison
T. Estrada
B. Hughes
L. Meyer
R. Rice

Lv Juneau 10:20am
Ar Ketch 5:00 PM
MON am 7:30 - 7:55
① clean dredge w/acetone / dist. water
② clean trowels " / " "
③ jars
marking pen
④ clean basins w/ dist. water

Lv for Base Ketchikan on M/V Curlew
⑤ rinse all equipment w/ ambient sea water

8:20
8:31 } 3 grabs sample # 2
8:39

K93502
K93502 DUP
{ Sediment, Mussels, Fish }

3 samples taken from composite
Small crabs
mussel shells
sm [small] clams
Very black sediment - fine sand

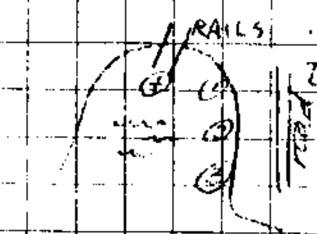
sample 1
1st grab all [illegible], glass, [illegible]

(4)

9:56 2nd grab mostly grass, organic · discard
9:00 5th grab ok - not much volume silt sand
9:08 " " " " " · · eel grass
9:05 trip blank taken
these sed samples also black/gray
9:13 5th grab OK eelgrass
9:30 5 ... location - 1st empty, gravel } 05A
9:40 ✓ ... 1 ... } 05B
9:45 ✓ ok
... ✓ ...
9:55 LOCATION 4 1st grab excellent
10:03 2nd OK
core showed no layers } 04A
10:13 3rd great } 04B
04C
10:23 loc. 3 1st grab lots of shell fragments
1 clam
10:28 2nd ... kelp 3A B C
10:35 3rd
10:49 LOC 8 small sample } some ... mostly silt
11:02 2nd grab " " " "
11:06 3rd grab
11:10 - LOC 12 NO SEDIMENT - 3 grabs rock bottom
11:26 LOC 14 1st grab ... 2+3 no

(5)

11:28 boom stopped functioning
lunch break
this location apparently all rock bottom
12:50 resumed ... boom malfunction again
LOC. 6 attempt
1:05 grab sample 1+2 very small samples
samples higher sand content, more gravel, shells
1:30 2-3 more grabs to get adequate sediment K9315O6A, B
this sample includes sediment
from inside bottle very black material
1:40 boom breakdown
2:3pm mussel collection from E side of harbor - 4 locations < 3 bags per location (Whirl-paks)



3:00
put into Whirl-paks (12)
& 1 gal. bags to separate in ambient water
1 scallop collected
3:15 sediment sampling continued w/ boom repair LOC 7 1st grab
3:18 2nd grab all sediment
3:21 3rd "

(6)

3:33 LOC.11 1st grab / 3:36 2nd

3:40 3rd grab 11A, 11B, & C

not as black as other samples

3:47 LOC10 1st 2 grabs good

3rd rocks 4 ok

4:430 LOC 9 no sediment (end of pier)

4 grabs debris only + kelp

4:50 end sampling

deck gear organization

5:10pm completed chain of custody forms for 1st case

4/4 125g empty 4oz jar

308g full jar

~180g sed/per jar } weight

3 jars 10A, 10B, 10C frozen in galley case - sealed frozen ops top freezer

w/chain custody forms from EPA

and ch.cust slips (2) on box

sealed w/duct tape

3 clams & sculpin left in cooler w/ ambient water on deck.

continue w/ sampling Tues. am in harbor.

(7)

TUES. OCT. 12, 1993

9:00 1st grab on LOC 15 - kelp probably indicative of rock bottom; next 2 grabs also kelp + rocks, sea urchin & rock bottom w/ sediment NO SED. @ this LOC

STOP SAMPLING - EAT BREAK

10:20 LOC 13

1 grab w/ small & ½ vol sediment

2nd - less sediment - lots of shell hash

3rd H2O only 4 Pycnopodia only

2 red Irish lord (1 from 10/11)

1 kelp greenling & gravel

Last grab 5 tbl. sed/ shell hash brown-tan color

10:49 Last LOC16

1st grab shells, some fine sediment among shells

move to front of dock - area A

11:20 LOC 17 sediment shell hash

rockfish - caught by Randy

no apparent layers of sediment

1 haul only

11:50 3-4 other grabs no sediment

∴ LOC 17 1 grab only sample

11:54 LOC 18 near end of dock

LUNCH

(8)

12:55 @ Loc 20 3 grabs all full of sediment
end @ 1:15 covered by shell frag mostly
photos
1:30 1st 2 grabs @ Loc 19 unwrapped
all 3 grabs → no grab caught
sand pit - not used
1:45 end of dredging - @ Loc 20
start mussel prep
1) mussels measured length
2) cleaned out of shell into jars

MUSSELS	MEASURES (cm) from harbor
M03	5.0, 3.7, 4.1, 4.7, 4.2, 4.5, 4.6, 3.8, 4.5, 4.0, 3.8
	3.7, 5.0, 4.8, 5.4, 5.2, 4.5, 3.8, 3.5, 5.5, 4.7, 4.5, 4.0
	4.9, 5.0, 4.5, 5.4, 4.7, 4.2, 4.5, 5.4, 4.4, 4.5, 5.2, 4.2
	4.2, 4.3), 4.2, 4.0, 5.0, 5.0, 4.2, 3.6, 3.8,
	4.4, 4.5, 4.6, 4.0, 4.1, 4.5, 4.8, 5.2, 4.3,
	4.0, 4.5, 3.8, 3.4, 3.3, X=
	170 B -125 = 75g. K93M03B
	173 A -125 = 48g. M03A
M01	4.8, 3.2, 3.3, 4.7, 4.0, 4.0, 4.0, 3.7,
	3.8, 3.7, 3.7, 3.6, 3.6, 3.1, 3.8, 3.4, 3.4,
	2.9, 3.1, 2.7, 2.6, 2.2, 2.5, 2.7, 4.3, 4.5, 4.5

(9)

(cont) M01
3.7, 4.0, 3.8, 4.3, 3.8, 4.5, 4.7, 4.7, 4.1,
3.7, 3.6, 3.6, 4.2, 4.2, 3.7, 4.5, 3.8, 4.5,
4.6, 4.5, 4.3, 4.5, 4.3, 3.9, 4.6, 3.9,
4.9, 4.3, 4.5, 4.3, 4.0, 4.5, 4.7, 3.7,
3.7, 4.1
A 179g -125g = 54g X=
B 193g -125g = 78g

M04 (RAILS)
3.7, 3.7, 2.9, 3.3, 3.9, 3.1, 3.6, 3.4, 2.9, 3.2,
3.0, 3.1, 2.7, 2.2, 3.6, 3.6, 3.3, 3.2, 3.0,
2.9, 2.8, 4.6, 3.7, 3.7, 4.3, 3.5, 3.5, 4.0,
3.5, 4.6, 3.5, 4.0, 4.3, 4.0, 5.0, 4.1, 4.1, 3.6,
3.7, 3.3, 3.8, 3.8, 3.8, 3.8, 3.8, 3.6, 3.2
3.6, 3.0, 3.1, 3.0, 2.8, 3.4, 3.2, 3.2, 3.8
3.5, 3.8, 3.7, 3.5, 3.5
A 187 - 125 = 62g n61 X=
B 172 - 125 = 47g

M02 4.1, 4.1, 3.2, 2.8
4.7, 4.5, 5.1, 3.8, 2.5, 3.0, 4.4, 4.6, 4.6, 5.2, 4.3, 4.3, 3.3
5.0, 4.0, 4.7, 4.1, 4.8, 3.9, 4.5, 6.0, 4.2, 4.1, 4.0, 3.1, 3.6
5.1, 4.4, 4.4, 2.4, 4.0, 3.7, 3.9, 3.3, 4.5, 4.2, 4.5, 4.2
3.7, 4.2, 4.3, 3.5, 4.2, 4.3, 3.8, 3.8, 4.0, 4.0, 4.2, 5.0, 4.2
A 173 - 125 = 48g X=

end @ 4:30

(10)

4.50pm FISH - collected @ Base Ketchikan
Hook + line

SPECIES	LENGTH (TL)	WGHT. (GR)	+ SAMPLE #
CORO	36.7 cm.	855	93KF01
CORO	27.1	319	93KF02
QBRO	29.4	547	93KF03
QBRO ?	31.9	502	93KF04
REIR	35.0	751	93KF05
REIR	24.7	225	93KF06
REIR	29.3	429	93KF07
REIR	27.5	319	93KF08
REIR	26.0	~~26~~ 255	93KF09
REIR	22.7	171	93KF10
KEGR	29.0	314(F)	93KF11
ROSP	25.4	271	93KF12

all fish indiv. wrapped + labeled
Al-foil used - Al conc. not a problem here
all fish frozen on board M/V Contour - 5:30pm

CORO - copper rockfish
QBRO - quillback " "
QBRO? - " " " "
REIR - red irish lord
KEGR - kelp greenling
ROSP - rockfish species (id unknown)

(11)

OCT. 13, 93 travel to Gravina Is, Bostwick Inlet

Calm, ~60°+

@ 9:56 1st grab. B93S01 A+B+C 3 grabs all
done @ 10:13 - good full samples
grey - mx sand + fines

10:17 B93S02A+B.
all 3 grabs @ 70' fine sediments
few worms + ducari wrymouth - red color
Lyconectes aleutensis

10:45/03A+B
11:00 complete - fine sediments -
twigs, sticks, no fauna
high SO_2 odor

2 TRAWLS - 1-3:30
~~3:00 YELLOWFIN SOLE (YFSO)~~
~~22.4~~

COMPOSITE SAMPLES

SPECIES	LENGTH (TL)	WEIGHT (g)	#
YFSO	22.4	169.0	93BF01
YFSO	25.4	192.0	
YFSO	26.0	238.0	
YFSO	32.2	458.0	93BF02
YFSO	24.2	210.0	
YFSO	22.7	143.0	
ROSO	27.0	243.0	93BF03
ROSO	24.0	188.0	

(12)

Species	Length (cm)	Weight (g)	
ROSO	26.4	228.0	938F04
ROSO	26.0	199.0	
ENSO	25.3	135.0	938F05
ENSO	26.5	170.0	
ENSO	26.0	153.0	
ENSO	25.5	198.0	938F06
ENSO	27.0	156.0	
ENSO	26.4	180.0	
GRSC	40.0	1005.0	938F07
SHSC	38.4	828.0	
PSSC	19.3	120.0	938F08*
PSSC	21.2	105.0	

SHSC - Smooth Head sculpin Artedius lateralis p491
ROSO - rock sole YFSO - yellowfin sole
ENSO - English sole
GRSC - great sculpin p. 518
PSSC - Pacific Staghorn sculpin Leptocottus armatus

Fish completed @ 4:00pm
Sediment sealed bag @ 4:20pm

Return to Ketchikan ~ 5:40pm

* wrapped individually + taped together

(13)

Thurs 10/14

to Base Ketchikan - briefing w/ CO + staff
tour of soil burner

mussels from Bostwick Inlet
B93M01-A + B
B93M029 + B

	mussel lengths (cm)
B93M01	3.7, 3.5, 3.2, 3.9, 4.2, 3.6, 4.1, 3.5, 3.9, 4.0, 3.7
	3.5, 3.9, 3.2, 3.9, 3.8, 3.4, 3.8, 4.3, 3.3, 3.5, 3.7, 4.2, 3.4, 3.6, 3.5
	3.6, 3.4, 3.3, 3.6, 3.7, 3.3, 3.7, 4.0, 2.7, 3.7, 3.4, 4.3, 3.8, 3.6, 3.5,
	3.3, 3.5, 3.0, 3.4, 4.0, 3.6, 3.5, 3.9, 3.8, 3.7, 3.6, 4.5, 3.6, 3.6, 3.5
	4.0, 4.5, 4.1, 4.5, 3.4, 3.9, 3.5, 3.3, 3.1, 3.5, 3.2, 3.6, 3.0, 5.4, 5.1
	4.2, 4.3, 4.7, 4.0, 4.2, 4.3, 4.5, 4.2, 3.6, 3.8, 3.6, 3.8, 3.9, 4.0, 4.3

wt - jar wt = sample wt. x̄ =

01A	167 - 120 = 47g	01B
	191 - 125 = 66g	

B93M02

5.3,	5.1,	5.0,	4.6,	4.5,	5.2,	4.7,	4.7,	5.1,	4.9,	5.1,	5.0,	4.8,	4.8,	
5.9,	4.5,	4.8,	5.4,	4.7,	5.7,	4.7,	5.0,	4.8,	5.1,	5.0,	4.6,	5.0,	4.9,	5.0,
4.6,	4.2,	5.0,	6.0,	5.4,	4.8,	4.5,	5.4,	5.0,	4.8,	4.7,	5.0,	4.4,	4.9	
4.4,	4.2,	3.9,	4.9,	5.1,	5.3,	4.8,	5.2,	5.8,	4.1,	4.7,	4.2,			

x̄ =

02A	216 - 125 = 91g	
02B	193 - 125 = 68g	

all mussels samples frozen on Curleur

Bostwick Inlet trawl data + sediment sample locations

sed. stns.					time	depth
1	55°	14' 30"	131°	44' 16"	~9:50	34'
2		14 18		44 27	~10:20	46'
3		14 47		45 00	~10:45	41'
4		14 54		44 47	~11:10	30'

trawl					
1	55 13 53	131 43 47	@17:59	11 fath.	
bottom	14 05	44 02	@13:02	13 fath	
	14 19	44 16	@13:07	16 fath	
up@	14 34	44 35	@13:12	12 fath	
2	55 14 21	131 44 24	@13:57	15 f.	
bottom	14 31	44 34	@14:01	13 f.	
up@	14 54	45 02	@14:10	2 f.	

trawl 1 - heavy >150# stump, starfish, 2 large sea cucumbers, > 30 sole, various sp., small sculpin, shrimp

2 - wood debris major component, estimate few trees; > 30 fish, many very small

fish collected from trawl to keep for analysis → largest fish from trawls, representative of species in Bostwick. (No sole in Base Ketch samples for comparison but there is other SE data on these flatfish species)

All fish wrapped in foil as composites except FOB# - wrapped individually due to large size + taped together.

All id done thru Pac. Fish. of Canada → id by Hughes + Rudes.

All samples frozen on M/V Curleur

— end of field notes for Base Kotelnikan metals study.

Deborah Rudes
Oct 14, 1993

4-1-2-3

12/16 fish combined for analysis

93KF01 = F01 + F02 · copper rock
93KF03 = F03, 04, 12 · ? quillback, lingcod
93KF05 = F05, 07, 08 · Red Irish Lord
93KF06 = F06, 09, 10 " " "

K9331A = duplicate of 93S03A + B
= 03C

933F04 = 2 rock sole
06 = 3 English sole
07 = 'great sculpin' & 'smoothhead sculpin'
08 = 2 pacific staghorn sculpin

END

D. Rudis

APPENDIX C

CHAIN OF CUSTODY FORMS

CONTAINER 1 of 2

PG 1 of 2

FISH SAMPLES

FILE NO.

INV.

CHAIN OF CUSTODY RECORD

ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	DELIVERED
93BF04	DEBORAH RUDIS USFISH & WILDLIFE SERV. JUNEAU, AK	Deborah D. Rudis	12/20/93	☒ US REGISTERE MAIL ☐ PERSONAL DELIVERY ☐ OTHER:
	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR - Columbia, MO	RECEIPT SIGNATURE: Marilyn Hughes	RECEIPT DATE 12/21/93	Fed Ex 816912638
ITEMS:	FROM: (PRINT NAME, AGENCY) D. Rudis USFWS Juneau, AK	RELEASE SIGNATURE: Deborah D. Rudis	RELEASE DATE 12/20/93	DELIVERED VIA: ☒ US REGISTERE MAIL ☐ PERSONAL DELIVERY ☐ OTHER:
93BF06	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR - Columbia, MO	RECEIPT SIGNATURE: Marilyn Hughes	RECEIPT DATE 12/21/93	Fed Ex 816912638
ITEMS:	FROM: (PRINT NAME, AGENCY) D. Rudis USFWS Juneau, AK	RELEASE SIGNATURE: Deborah D. Rudis	RELEASE DATE 12/20/93	DELIVERED VIA: ☒ US REGISTERE MAIL ☐ PERSONAL DELIVERY ☒ OTHER:
93BF07	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR - Columbia, MO	RECEIPT SIGNATURE: Marilyn Hughes	RECEIPT DATE 12/21/93	Fed Ex 816912638
ITEMS:	FROM: (PRINT NAME, AGENCY) D. Rudis USFWS Juneau, AK	RELEASE SIGNATURE: Deborah D. Rudis	RELEASE DATE 12/20/93	DELIVERED ☒ US REGIS... MAIL ☐ PERSONAL DELIVERY ☐ OTHER:
93BF08	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR - Columbia, MO	RECEIPT SIGNATURE: Marilyn Hughes	RECEIPT DATE 12/21/93	Fed Ex 816912638
ITEMS:	FROM: (PRINT NAME, AGENCY) D. Rudis USFWS Juneau, AK	RELEASE SIGNATURE: Deborah D. Rudis	RELEASE DATE 12/20/93	DELIVERED VIA: ☒ US REGISTERI MAIL ☐ PERSONAL DELIVERY ☐ OTHER:
93KF01	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR - Columbia, MO	RECEIPT SIGNATURE: Marilyn Hughes	RECEIPT DATE 12/21/93	Fed Ex 816912638
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS Juneau AK	RELEASE SIGNATURE: Deborah D. Rudis	RELEASE DATE 12/20/93	DELIVERED VIA: ☒ US REGISTERI MAIL ☐ PERSONAL DELIVERY ☐ OTHER:
93KF03	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR - Columbia, MO	RECEIPT SIGNATURE: Marilyn Hughes	RECEIPT DATE 12/21/93	Fed Ex 816912638
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS Juneau AK	RELEASE SIGNATURE: Deborah D. Rudis	RELEASE DATE 12/20/93	DELIVERED VIA: ☒ US REGIS... MAIL ☐ PERSONAL DELIVERY ☐ OTHER:
93KF05	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR - Columbia, MO	RECEIPT SIGNATURE: Marilyn Hughes	RECEIPT DATE 12/21/93	Fed Ex 816912638

[redacted]

pg 2 of 2

CHAIN OF CUSTODY

FILE NO.

INV.

ITEMS:	FROM / TO: (PRINT NAME, AGENCY)	SIGNATURE	DATE	DELIVERED VIA:
93K F06	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis US Fish + Wildlife Ser. Juneau AK	RELEASE SIGNATURE: Deborah D. Rudis	RELEASE DATE 12/20/93	[x] US REGISTERED MAIL
	TO: (PRINT NAME, AGENCY) Lynn Hartman ESSR - Columbia, MO	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	[ ] PERSONAL DELIVERY [ ] OTHER: 8 Feb 94 12:58
ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	[ ] US REGISTERED MAIL
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE	[ ] PERSONAL DELIVERY [ ] OTHER:
ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	[ ] US REGISTERED MAIL
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE	[ ] PERSONAL DELIVERY [ ] OTHER:
ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	[ ] US REGISTERED MAIL
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE	[ ] PERSONAL DELIVERY [ ] OTHER:
ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	[ ] US REGISTERED MAIL
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE	[ ] PERSONAL DELIVERY [ ] OTHER:
ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	[ ] US REGISTERED MAIL
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE	[ ] PERSONAL DELIVERY [ ] OTHER:
ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	[ ] US REGISTERED MAIL
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE	[ ] PERSONAL DELIVERY [ ] OTHER:

end of entries for this container

container 2 of 2

FILE NO.

INV.

CHAIN OF CUSTODY RECORD

PG 1 of 7

ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	DELIVERED
B93M01A	Deborah D. Rudis USFWS	Deborah Rudis	12-20-93	☐ US REGISTERE MAIL
	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hayden ETSR	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☒ OTHER: 819912639 4 Fed Exp
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL
B93M01B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hayden	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL
B93M02A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hayden	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED ☐ US REGIS... MAIL
B93M02B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hayden	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERI MAIL
B93S01A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hayden	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERI MAIL
B93S01B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hayden	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGIS... MAIL
B93S02A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hayden	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp

CHAIN OF CUSTODY Pg 2 of 7

FILE NO.

INV.

ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	DELIVERED
B93502B	Deborah D. Rudis USFWS	Deborah Rudis	12-20-93	☐ US REGISTERE MAIL
	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: 8116912639 4 (Fed Ex)
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL
B93503A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Ex
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL
B93503B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Ex
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED ☐ US REGIS... MAIL
K93M01A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Ex
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERI MAIL
K93M01B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Ex
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERI MAIL
K93M02A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Ex
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGIS... MAIL
K93M02B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Ex

CHAIN OF CUSTODY PG 3 of 7

FILE NO.

INV.

ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	DELIVERED
K93M03A	Deborah D. Rudis USFWS	Deborah Rudis	12-20-93	☐ US REGISTERE MAIL ☐ PERSONAL DELIVERY ☐ OTHER: 8169126394 FEXP
	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93M03B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93H04A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED ☐ US REGIS... MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93M04B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93S01A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL ☐ PERSONAL DELIVERY ☐ OTHER:
K93501B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGIS... MAIL ☐ PERSONAL DELIVERY ☐ OTHER:
K93502A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	

CHAIN OF CUSTODY Pg 4 of 7

FILE NO.
INV.

ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	DELIVERED
K93502B	Deborah D. Rudis USFWS	Deborah Rudis	12-20-93	☐ US REGISTERE MAIL ☐ PERSONAL DELIVERY ☐ OTHER: 8169126394 Fed Exp
	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hegdal	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93503A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hegdal	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah D. Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93503B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hegdal	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED ☐ US REGIS... MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93504A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hegdal	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERI MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93504B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hegdal	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERI MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93504C	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hegdal	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGIS... MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93505A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hegdal	RECEIPT DATE 12/21/93	

CHAIN OF CUSTODY Pg 5 of 7

FILE NO.
INV.

ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	DELIVERED
K93505B	Deborah D. Rudis USFWS	Deborah Rudis	12/20/93	☐ US REGISTERE MAIL
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE	☐ PERSONAL DELIVERY ☐ OTHER: 8163126394 Fed Exp
	Lynn Hartman ETSR	Marilyn Higdon	12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	DELIVERED VIA:
K93506A	Deborah D. Rudis USFWS	Deborah Rudis	12/20/93	☐ US REGISTERE MAIL
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
	Lynn Hartman ETSR	Marilyn Higdon	12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	DELIVERED VIA:
K93506B	Deborah D. Rudis USFWS	Deborah Rudis	12/20/93	☐ US REGISTERE MAIL
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
	Lynn Hartmom ETSR	Marilyn Higdon	12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	DELIVERED
K93507A	USFWS	Deborah Rudis	12-20-93	☐ US REGIS... MAIL
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
	Lynn Hartman ETSR	Marilyn Higdon	12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	DELIVERED VIA:
K93507B	USFWS	Deborah Rudis	12-20-93	☐ US REGISTERI MAIL
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
	Lynn Hartman ETSR	Marilyn Higdon	12/21/93	
TEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	DELIVERED VIA:
K93508A	USFWS	Deborah Rudis	12-20-93	☐ US REGISTERI MAIL
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
	Lynn Hartman ETSR	Marilyn Higdon	12/21/93	
TEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	DELIVERED VIA:
K93508B	USFWS	Deborah Rudis	12-20-93	☐ US REGIS... MAIL
	TO: (PRINT NAME, AGENCY)	RECEIPT SIGNATURE:	RECEIPT DATE	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp.
	Lynn Hartman ETSR	Marilyn Higdon	12/21/93	

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FILE NO.

INV.

ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	DELIVERED
K93S10A	Deborah D. Rudis USFWS	Deborah Rudis	12-20-93	☐ US REGISTERE MAIL ☐ PERSONAL DELIVERY ☐ OTHER: 816912639 Fed Exp
	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hayden	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93S10B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hayden	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93S10C	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hayden	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED ☐ US REGIS... MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93S11.A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hayden	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERI MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93S11.B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hayden	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERI MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93S13.A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hayden	RECEIPT DATE 12/21/93	
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGIS... MAIL ☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
K93S13B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Hayden	RECEIPT DATE 12/21/93	

CHAIN OF CUSTODY PG 7 of 7

FILE NO.

INV.

ITEMS:	FROM: (PRINT NAME, AGENCY)	RELEASE SIGNATURE:	RELEASE DATE	DELIVERED
K93S14	Deborah D. Rudis USFWS	Deborah Rudis	12-20-93	☐ US REGISTERE MAIL
	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: 8169126394 Fed Exp
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL
K93S16A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL
K93S16B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED ☐ US REGIS... MAIL
K93S20A	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL
K93S20B	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis USFWS	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGISTERE MAIL
K Blank	TO: (PRINT NAME, AGENCY) Lynn Hartman ETSR	RECEIPT SIGNATURE: Marilyn Higdon	RECEIPT DATE 12/21/93	☐ PERSONAL DELIVERY ☐ OTHER: Fed Exp
ITEMS:	FROM: (PRINT NAME, AGENCY) Deborah D. Rudis	RELEASE SIGNATURE: Deborah Rudis	RELEASE DATE 12-20-93	DELIVERED VIA: ☐ US REGIS... MAIL
	TO: (PRINT NAME, AGENCY) Last sample	RECEIPT SIGNATURE: DDR 12-20-93	RECEIPT DATE	☐ PERSONAL DELIVERY ☐ OTHER:

C-9

APPENDIX D

ANALYTICAL RESULTS

US Coast Guard -
BASE KETCHIKAN

ECDMS ANALYTICAL REPORT (6)

26-May-94

Catalog: 7040020 Regional Study Id: 93-JFO-CG Purchase Order: 84055-4-0845

User Id: R7JFO Submitter: Deborah Rudis - Juneau, AK

Lab Name: Environmental Trace Substances Research Center (ETSR)

Report Includes the Following Sections:

- Weight, % Moisture, % Lipid, Total Suspended Solids
- Soil / Sediment Parameters
- Contaminant Concentrations
- Procedural Blanks
- Duplicates
- Reference Materials
- Spike Recoveries
- Comments (Result Modifers and QA/QC Comments)
- Analytical Methods

14 = 3 14 is blind duplicate

SOIL / SEDIMENT PARAMETERS

Sample Number	Percent TVS	Percent TOC	Particle Size %Sand	%Silt	%Clay
B93S01A		.5	95.9	1.5	2.6
B93S02A		2.6	72.9	17.4	9.7
B93S03A		4.6	49.5	37.6	12.9
K93S01A		1.5	85.5	9.8	4.7
K93S02A		1.6	88.2	6.3	5.5
K93S03A		(5.4) 4.76	(64.4)	24.4	11.2
K93S04A		3.4	69	21.8	9.2
K93S04C		3.3 3.35	68.9 68.95	20.5	10.6
K93S05A		2.8	62.7	24.6	12.7
K93S06A		1.9	83.6	8.8	7.6
K93S07A		2.5	77.7	14.5	7.8
K93S08A		1.6	84.1	8.8	7.1
K93S10A		1.2	87.7	6.7	5.6
K93S10C		2.1 1.68	88.7 88.2	5.1	6.2
K93S11A		1.3	87.7	6.5	5.8
K93S13A		1	91	5	4
K93S14		(4.2)	(65.4	24.3	10.3
K93S16A		1.5	86.8	7.3	5.9
K93S20A		3.9	53.5	28.4	18.1

Sample 514 dup of 3F (Blind dup)

Catalog: 7040020 Lab Name: ETSR 26-May-94 Purchase Order: 84055-4-0845 Page: 1

WEIGHT, % MOISTURE, % LIPID, TOTAL SUSPENDED SOLIDS

Sample Number	Sample Matrix	Sample Weight (g)	Percent Moisture	Percent Lipid	Total Suspended Solids (%)
B93S01A	Sediments	212.42	23.8		
B93S02A	Sediments	172.67	50.8		
B93S03A	Sediments	147.22	71.2		
K93S01A	Sediments	180.77	31.8		
K93S02A	Sediments	177.76	33.6		
K93S03A	Sediments	132.97	58.6		
K93S04A	Sediments	140.35	57		
K93S04C	Sediments	150.47	59.3		
K93S05A	Sediments	157.26	57		
K93S06A	Sediments	157.85	43.9		
K93S07A	Sediments	153.71	56.2		
K93S08A	Sediments	188.13	32.6		
K93S10A	Sediments	188.01	38.5		
K93S10C	Sediments	187.93	38.3		
K93S11A	Sediments	179.91	41.2		
K93S13A	Sediments	198.04	34.2		
K93S14	Sediments	140.16	56.1		
K93S16A	Sediments	188.82	40.7		
K93S20A	Sediments	160	55.6		
93BF04	Whole Body	409.7	78.8		
93BF06	Whole Body	435.7	77.6		
93BF07	Whole Body	1742.2	77.8		
93BF08	Whole Body	195.7	78.8		
93KF01	Whole Body	1160.3	73.4		
93KF03	Whole Body	1287.4	69.7		
93KF05	Whole Body	1435.8	75.5		
93KF06	Whole Body	626	78.1		
B93M01A	Whole Body	44.906	80.9		
B93M02A	Whole Body	96.23	80.5		
K93M01A	Whole Body	51.607	83.8		
K93M02A	Whole Body	47.434	83.3		
K93M03A	Whole Body	50.668	81.1		
K93M04A	Whole Body	64.166	82.3		

CONTAMINANT CONCENTRATIONS

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Al	B93S01A	Sediments	15700	10	12000	8
	B93S02A	Sediments	17400	10	8560	5
	B93S03A	Sediments	15500	10	4460	3
	K93S01A	Sediments	13700	10	9340	7
	K93S02A	Sediments	10900	10	7230	7
	K93S03A	Sediments	13000	10	5380	4
	K93S04A	Sediments	11200	10	4820	4
	K93S04C	Sediments	12200	10	4960	4
	K93S05A	Sediments	12700	10	5460	4
	K93S06A	Sediments	8350	10	4680	6
	K93S07A	Sediments	11600	10	5080	4
	K93S08A	Sediments	10800	10	7280	7
	K93S10A	Sediments	9500	10	5840	6
	K93S10C	Sediments	8520	10	5260	6
	K93S11A	Sediments	9570	10	5630	6
	K93S13A	Sediments	6390	10	4210	7
	K93S14	Sediments	11100	10	4880	4
	K93S16A	Sediments	8420	10	4990	6
	K93S20A	Sediments	10900	10	4840	4
	KBlank	Sediments	< 8	8	< 8	8
	93BF04	Whole Body	140	3	30	.6
	93BF06	Whole Body	160	3	36	.7
	93BF07	Whole Body	84	3	19	.7
	93BF08	Whole Body	39	3	8.3	.6
	93KF01	Whole Body	24	3	6.4	.8
	93KF03	Whole Body	13	3	3.9	.9
	93KF05	Whole Body	38	3	9.3	.7
	93KF06	Whole Body	34	3	7.4	.7
	B93M01A	Whole Body	130	3	25	.6
	B93M02A	Whole Body	19	3	3.7	.6
	K93M01A	Whole Body	398	3	64.3	.5
	K93M02A	Whole Body	80	3	13	.5
	K93M03A	Whole Body	46	3	8.7	.6
	K93M04A	Whole Body	41	3	7.3	.5

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
As	B93S01A	Sediments	1.9	.08	1.4	.06
	B93S02A	Sediments	6.5	.08	3.2	.04
	B93S03A	Sediments	8.24	.08	2.37	.02
	K93S01A	Sediments	257	2	175	1
	K93S02A	Sediments	160	2	110	1
	K93S03A	Sediments	130	2	54	.8
	K93S04A	Sediments	90.3	.4	38.8	.2
	K93S04C	Sediments	77.9	.4	31.7	.2
	K93S05A	Sediments	89.1	.4	38.3	.2
	K93S06A	Sediments	110	2	62	1
	K93S07A	Sediments	44.4	.4	19.4	.2
	K93S08A	Sediments	45.4	.4	30.6	.3
	K93S10A	Sediments	27	.4	17	.2
	K93S10C	Sediments	15	.2	9.3	.1
	K93S11A	Sediments	29	.9	17	.5
	K93S13A	Sediments	57	.9	38	.6
	K93S14	Sediments	100	2	44	.9
	K93S16A	Sediments	7.1	.2	4.2	.1
	K93S20A	Sediments	54	.9	24	.4
	KBlank	Sediments	< .09	.09	< .09	.09
	93BF04	Whole Body	13	.2	2.8	.04
	93BF06	Whole Body	14	.2	3.1	.04
	93BF07	Whole Body	6.7	.2	1.5	.04
	93BF08	Whole Body	2.6	.2	.55	.04
	93KF01	Whole Body	3.1	.2	.82	.05
	93KF03	Whole Body	3.2	.2	.97	.06
	93KF05	Whole Body	2.8	.2	.69	.05
	93KF06	Whole Body	2.6	.2	.57	.04
	B93M01A	Whole Body	9.2	.2	1.8	.04
	B93M02A	Whole Body	7.9	.2	1.5	.04
	K93M01A	Whole Body	11	.2	1.8	.03
	K93M02A	Whole Body	11	.2	1.8	.03
	K93M03A	Whole Body	11	.2	2.1	.04
	K93M04A	Whole Body	7.5	.2	1.3	.04

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
B	B93S01A	Sediments	< 10	10	< 8	8
	B93S02A	Sediments	35	10	17	5
	B93S03A	Sediments	75	10	22	3
	K93S01A	Sediments	30	10	20	7
	K93S02A	Sediments	20	10	10	7
	K93S03A	Sediments	38	10	16	4
	K93S04A	Sediments	45	10	19	4
	K93S04C	Sediments	42	10	17	4
	K93S05A	Sediments	38	10	16	4
	K93S06A	Sediments	30	9	17	5
	K93S07A	Sediments	32	10	14	4
	K93S08A	Sediments	20	10	10	7
	K93S10A	Sediments	10	10	6	6
	K93S10C	Sediments	10	9	6	6
	K93S11A	Sediments	20	9	10	5
	K93S13A	Sediments	10	9	7	6
	K93S14	Sediments	43	10	19	4
	K93S16A	Sediments	20	10	10	6
	K93S20A	Sediments	55	10	24	4
	KBlank	Sediments	< 5	5	< 5	5
	93BF04	Whole Body	2	2	.4	.4
	93BF06	Whole Body	2	2	.4	.4
	93BF07	Whole Body	3	2	.7	.4
	93BF08	Whole Body	< 2	2	< .4	.4
	93KF01	Whole Body	< 2	2	< .5	.5
	93KF03	Whole Body	< 2	2	< .6	.6
	93KF05	Whole Body	2	2	.5	.5
	93KF06	Whole Body	2	2	.4	.4
	B93M01A	Whole Body	23	2	4.4	.4
	B93M02A	Whole Body	20	2	3.9	.4
	K93M01A	Whole Body	23	2	3.7	.3
	K93M02A	Whole Body	21	2	3.5	.3
	K93M03A	Whole Body	20	2	3.8	.4
	K93M04A	Whole Body	20	2	3.5	.4

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Ba	B93S01A	Sediments	9.4	.5	7.2	.4
	B93S02A	Sediments	51	.5	25.1	.2
	B93S03A	Sediments	23	.5	6.6	.1
	K93S01A	Sediments	126	.5	85.9	.3
	K93S02A	Sediments	93	.5	61.7	.3
	K93S03A	Sediments	73.4	.5	30.4	.2
	K93S04A	Sediments	68.1	.5	29.3	.2
	K93S04C	Sediments	66	.5	26.8	.2
	K93S05A	Sediments	71.2	.5	30.6	.2
	K93S06A	Sediments	93	.5	52.2	.3
	K93S07A	Sediments	98.3	.5	43	.2
	K93S08A	Sediments	32	.5	22	.3
	K93S10A	Sediments	31	.5	19	.3
	K93S10C	Sediments	28	.5	17	.3
	K93S11A	Sediments	34	.5	20	.3
	K93S13A	Sediments	36	.5	24	.3
	K93S14	Sediments	58.5	.5	25.7	.2
	K93S16A	Sediments	31	.5	18	.3
	K93S20A	Sediments	79	.5	35.1	.2
	KBlank	Sediments	< .2	.2	< .2	.2
	93BF04	Whole Body	1.5	.09	.32	.02
	93BF06	Whole Body	2	.1	.45	.02
	93BF07	Whole Body	1.2	.1	.27	.02
	93BF08	Whole Body	.58	.1	.12	.02
	93KF01	Whole Body	.31	.09	.082	.02
	93KF03	Whole Body	.36	.1	.11	.03
	93KF05	Whole Body	1.1	.09	.27	.02
	93KF06	Whole Body	.78	.09	.17	.02
	B93M01A	Whole Body	1.4	.1	.27	.02
	B93M02A	Whole Body	.52	.1	.1	.02
	K93M01A	Whole Body	4.8	.1	.78	.02
	K93M02A	Whole Body	1.1	.1	.18	.02
	K93M03A	Whole Body	.88	.1	.17	.02
	K93M04A	Whole Body	.6	.1	.11	.02

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Be	B93S01A	Sediments	< .5	.5	< .4	.4
	B93S02A	Sediments	< .5	.5	< .2	.2
	B93S03A	Sediments	< .5	.5	< .1	.1
	K93S01A	Sediments	< .5	.5	< .3	.3
	K93S02A	Sediments	< .5	.5	< .3	.3
	K93S03A	Sediments	< .5	.5	< .2	.2
	K93S04A	Sediments	< .5	.5	< .2	.2
	K93S04C	Sediments	< .5	.5	< .2	.2
	K93S05A	Sediments	< .5	.5	< .2	.2
	K93S06A	Sediments	< .5	.5	< .3	.3
	K93S07A	Sediments	< .5	.5	< .2	.2
	K93S08A	Sediments	< .5	.5	< .3	.3
	K93S10A	Sediments	< .5	.5	< .3	.3
	K93S10C	Sediments	< .5	.5	< .3	.3
	K93S11A	Sediments	< .5	.5	< .3	.3
	K93S13A	Sediments	< .5	.5	< .3	.3
	K93S14	Sediments	< .5	.5	< .2	.2
	K93S16A	Sediments	< .5	.5	< .3	.3
	K93S20A	Sediments	< .5	.5	< .2	.2
	KBlank	Sediments	< .2	.2	< .2	.2
	93BF04	Whole Body	< .01	.01	< .002	.002
	93BF06	Whole Body	< .01	.01	< .002	.002
	93BF07	Whole Body	< .01	.01	< .002	.002
	93BF08	Whole Body	< .01	.01	< .002	.002
	93KF01	Whole Body	< .01	.01	< .003	.003
	93KF03	Whole Body	< .01	.01	< .003	.003
	93KF05	Whole Body	< .01	.01	< .002	.002
	93KF06	Whole Body	< .009	.009	< .002	.002
	B93M01A	Whole Body	< .01	.01	< .002	.002
	B93M02A	Whole Body	< .01	.01	< .002	.002
	K93M01A	Whole Body	< .01	.01	< .002	.002
	K93M02A	Whole Body	.02	.01	.003	.002
	K93M03A	Whole Body	< .01	.01	< .002	.002
	K93M04A	Whole Body	< .01	.01	< .002	.002

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Cd	B93S01A	Sediments	< 1	1	< .8	.8
	B93S02A	Sediments	1	1	.5	.5
	B93S03A	Sediments	2	1	.6	.3
	K93S01A	Sediments	3.3	1	2.3	.7
	K93S02A	Sediments	3	1	2	.7
	K93S03A	Sediments	2	1	.8	.4
	K93S04A	Sediments	2	1	.9	.4
	K93S04C	Sediments	2	1	.8	.4
	K93S05A	Sediments	2	1	.9	.4
	K93S06A	Sediments	2	.9	1	.5
	K93S07A	Sediments	3.4	1	1.5	.4
	K93S08A	Sediments	1	1	.7	.7
	K93S10A	Sediments	< 1	1	< .6	.6
	K93S10C	Sediments	< .9	.9	< .6	.6
	K93S11A	Sediments	< .9	.9	< .5	.5
	K93S13A	Sediments	< .9	.9	< .6	.6
	K93S14	Sediments	2	1	.9	.4
	K93S16A	Sediments	< 1	1	< .6	.6
	K93S20A	Sediments	2	1	.9	.4
	KBlank	Sediments	< .5	.5	< .5	.5
	938F04	Whole Body	.11	.02	.023	.004
	938F06	Whole Body	.062	.02	.014	.004
	938F07	Whole Body	.12	.02	.027	.004
	938F08	Whole Body	.1	.02	.021	.004
	93KF01	Whole Body	.098	.02	.026	.005
	93KF03	Whole Body	.15	.02	.046	.006
	93KF05	Whole Body	.087	.02	.021	.005
	93KF06	Whole Body	.12	.02	.026	.004
	B93M01A	Whole Body	5.08	.02	.972	.004
	B93M02A	Whole Body	7.35	.02	1.43	.004
	K93M01A	Whole Body	5.98	.02	.966	.003
	K93M02A	Whole Body	6.6	.02	1.1	.003
	K93M03A	Whole Body	6.68	.02	1.26	.004
	K93M04A	Whole Body	4.57	.02	.811	.004

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Cr	B93S01A	Sediments	24	5	18	4
	B93S02A	Sediments	24	5	12	2
	B93S03A	Sediments	31	5	8.9	1
	K93S01A	Sediments	410	5	280	3
	K93S02A	Sediments	410	5	270	3
	K93S03A	Sediments	38	5	16	2
	K93S04A	Sediments	42	5	18	2
	K93S04C	Sediments	37	5	15	2
	K93S05A	Sediments	48	5	21	2
	K93S06A	Sediments	55	5	31	3
	K93S07A	Sediments	34	5	15	2
	K93S08A	Sediments	19	5	13	3
	K93S10A	Sediments	26	5	16	3
	K93S10C	Sediments	15	5	9.3	3
	K93S11A	Sediments	21	5	12	3
	K93S13A	Sediments	32	5	21	3
	K93S14	Sediments	38	5	17	2
	K93S16A	Sediments	10	5	6	3
	K93S20A	Sediments	98	5	44	2
	KBlank	Sediments	< 2	2	< 2	2
	93BF04	Whole Body	.59	.1	.12	.02
	93BF06	Whole Body	.46	.1	.1	.02
	93BF07	Whole Body	.35	.1	.078	.02
	93BF08	Whole Body	.3	.1	.06	.02
	93KF01	Whole Body	.2	.1	.05	.03
	93KF03	Whole Body	.2	.1	.06	.03
	93KF05	Whole Body	.49	.1	.12	.02
	93KF06	Whole Body	.6	.1	.13	.02
	B93M01A	Whole Body	1.1	.1	.21	.02
	B93M02A	Whole Body	.46	.1	.09	.02
	K93M01A	Whole Body	5	.1	.81	.02
	K93M02A	Whole Body	1.6	.1	.27	.02
	K93M03A	Whole Body	2.1	.1	.4	.02
	K93M04A	Whole Body	.4	.1	.071	.02

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Cu	B93S01A	Sediments	12	1	9.1	.8
	B93S02A	Sediments	22	1	11	.5
	B93S03A	Sediments	32	1	9.2	.3
	K93S01A	Sediments	1320	1	900	.7
	K93S02A	Sediments	714	1	474	.7
	K93S03A	Sediments	445	1	184	.4
	K93S04A	Sediments	439	1	189	.4
	K93S04C	Sediments	384	1	156	.4
	K93S05A	Sediments	607	1	261	.4
	K93S06A	Sediments	229	.9	128	.5
	K93S07A	Sediments	191	1	83.6	.4
	K93S08A	Sediments	122	1	82.2	.7
	K93S10A	Sediments	80	1	49	.6
	K93S10C	Sediments	74	.9	46	.6
	K93S11A	Sediments	136	.9	80	.5
	K93S13A	Sediments	82	.9	54	.6
	K93S14	Sediments	722	1	317	.4
	K93S16A	Sediments	46	1	27	.6
	K93S20A	Sediments	334	1	148	.4
	KBlank	Sediments	< .5	.5	< .5	.5
	93BF04	Whole Body	2.5	.2	.53	.04
	93BF06	Whole Body	6.6	.2	1.5	.04
	93BF07	Whole Body	3.9	.2	.87	.04
	93BF08	Whole Body	3.1	.2	.66	.04
	93KF01	Whole Body	4	.2	1.1	.05
	93KF03	Whole Body	2.1	.2	.64	.06
	93KF05	Whole Body	4.4	.2	1.1	.05
	93KF06	Whole Body	4.7	.2	1	.04
	B93M01A	Whole Body	17	.2	3.3	.04
	B93M02A	Whole Body	5.5	.2	1.1	.04
	K93M01A	Whole Body	24.8	.2	4.01	.03
	K93M02A	Whole Body	20.1	.2	3.35	.03
	K93M03A	Whole Body	14	.2	2.6	.04
	K93M04A	Whole Body	36.9	.2	6.55	.04

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Fe	B93S01A	Sediments	25400	5	19400	4
	B93S02A	Sediments	28800	5	14200	2
	B93S03A	Sediments	31900	5	9180	1
	K93S01A	Sediments	47000	5	32000	3
	K93S02A	Sediments	40900	5	27100	3
	K93S03A	Sediments	32900	5	13600	2
	K93S04A	Sediments	29400	5	12600	2
	K93S04C	Sediments	27900	5	11300	2
	K93S05A	Sediments	27700	5	11900	2
	K93S06A	Sediments	33900	5	19000	3
	K93S07A	Sediments	24200	5	10600	2
	K93S08A	Sediments	21500	5	14500	3
	K93S10A	Sediments	17500	5	10800	3
	K93S10C	Sediments	16300	5	10100	3
	K93S11A	Sediments	18600	5	10900	3
	K93S13A	Sediments	20000	5	13200	3
	K93S14	Sediments	35800	5	15700	2
	K93S16A	Sediments	15100	5	8960	3
	K93S20A	Sediments	31300	5	13900	2
	KBlank	Sediments	5	2	5	2
	93BF04	Whole Body	214	.9	45.3	.2
	93BF06	Whole Body	226	1	50.7	.2
	93BF07	Whole Body	159	1	35.3	.2
	93BF08	Whole Body	135	1	28.7	.2
	93KF01	Whole Body	60	.9	16	.2
	93KF03	Whole Body	58	1	18	.3
	93KF05	Whole Body	113	.9	27.7	.2
	93KF06	Whole Body	179	.9	39.2	.2
	B93M01A	Whole Body	287	1	54.9	.2
	B93M02A	Whole Body	120	1	23.4	.2
	K93M01A	Whole Body	3100	1	501	.2
	K93M02A	Whole Body	468	1	78	.2
	K93M03A	Whole Body	194	1	36.6	.2
	K93M04A	Whole Body	159	1	28.2	.2

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Hg	B93S01A	Sediments	< .005	.005	< .004	.004
	B93S02A	Sediments	.044	.005	.022	.002
	B93S03A	Sediments	.066	.005	.019	.001
	K93S01A	Sediments	.26	.005	.18	.003
	K93S02A	Sediments	.11	.005	.073	.003
	K93S03A	Sediments	.861 ÷ .695 = 0.77	.005	.356	.002
	K93S04A	Sediments	1.2 ÷ 1.98	.02	.52	.009
	K93S04C	Sediments	.9	.005	.366	.002
	K93S05A	Sediments	.957	.005	.411	.002
	K93S06A	Sediments	.42	.03	.24	.02
	K93S07A	Sediments	.37	.005	.16	.002
	K93S08A	Sediments	.25	.005	.17	.003
	K93S10A	Sediments	.083	.005	.051	.003
	K93S10C	Sediments	.07 ÷ .17	.005	.043	.003
	K93S11A	Sediments	.1	.005	.059	.003
	K93S13A	Sediments	.1	.005	.066	.003
	K93S14	Sediments	.695	.005	.305	.002
	K93S16A	Sediments	.074	.005	.044	.003
	K93S20A	Sediments	2.17	.02	.964	.009
	KBlank	Sediments	< .0002	.0002	< .0002	.0002
	93BF04	Whole Body	.079	.005	.017	.001
	93BF06	Whole Body	.035	.005	.0079	.001
	93BF07	Whole Body	.24	.005	.053	.001
	93BF08	Whole Body	.039	.005	.0083	.001
	93KF01	Whole Body	.31	.005	.082	.001
	93KF03	Whole Body	.27	.005	.082	.002
	93KF05	Whole Body	.35	.005	.086	.001
	93KF06	Whole Body	.23	.005	.05	.001
	B93M01A	Whole Body	.064	.009	.012	.002
	B93M02A	Whole Body	.029	.009	.0056	.002
	K93M01A	Whole Body	.047	.009	.0076	.001
	K93M02A	Whole Body	.05	.009	.0083	.001
	K93M03A	Whole Body	.046	.009	.0087	.002
	K93M04A	Whole Body	.02	.009	.004	.002

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Mg	B93S01A	Sediments	12600	.6	9610	.5
	B93S02A	Sediments	12900	.6	6350	.3
	B93S03A	Sediments	13400	.6	3860	.2
	K93S01A	Sediments	20400	.6	13900	.4
	K93S02A	Sediments	18300	.6	12100	.4
	K93S03A	Sediments	9870	.6	4090	.2
	K93S04A	Sediments	9080	.6	3900	.3
	K93S04C	Sediments	9340	.6	3800	.2
	K93S05A	Sediments	10000	.6	4300	.3
	K93S06A	Sediments	6910	.6	3880	.3
	K93S07A	Sediments	9220	.6	4040	.3
	K93S08A	Sediments	8290	.6	5590	.4
	K93S10A	Sediments	7230	.6	4450	.4
	K93S10C	Sediments	6530	.6	4030	.4
	K93S11A	Sediments	7610	.6	4480	.4
	K93S13A	Sediments	5340	.6	3520	.4
	K93S14	Sediments	9110	.6	4000	.3
	K93S16A	Sediments	6310	.6	3740	.4
	K93S20A	Sediments	10100	.6	4490	.3
	KBlank	Sediments	1.4	.3	1.4	.3
	93BF04	Whole Body	1430	.1	303	.02
	93BF06	Whole Body	1460	.1	328	.02
	93BF07	Whole Body	1520	.1	337	.02
	93BF08	Whole Body	1460	.1	310	.02
	93KF01	Whole Body	1160	.1	308	.03
	93KF03	Whole Body	1060	.1	322	.03
	93KF05	Whole Body	2090	.1	512	.02
	93KF06	Whole Body	1910	.1	418	.02
	B93M01A	Whole Body	3360	.1	643	.02
	B93M02A	Whole Body	3070	.1	598	.02
	K93M01A	Whole Body	4580	.1	740	.02
	K93M02A	Whole Body	3100	.1	517	.02
	K93M03A	Whole Body	3090	.1	583	.02
	K93M04A	Whole Body	3310	.1	587	.02

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Mn	B93S01A	Sediments	716	1	546	.8
	B93S02A	Sediments	476	1	234	.5
	B93S03A	Sediments	396	1	114	.3
	K93S01A	Sediments	654	1	446	.7
	K93S02A	Sediments	573	1	380	.7
	K93S03A	Sediments	308	1	127	.4
	K93S04A	Sediments	263	1	113	.4
	K93S04C	Sediments	279	1	113	.4
	K93S05A	Sediments	325	1	140	.4
	K93S06A	Sediments	232	.9	130	.5
	K93S07A	Sediments	271	1	119	.4
	K93S08A	Sediments	310	1	209	.7
	K93S10A	Sediments	254	1	156	.6
	K93S10C	Sediments	248	.9	153	.6
	K93S11A	Sediments	266	.9	156	.5
	K93S13A	Sediments	200	.9	132	.6
	K93S14	Sediments	274	1	120	.4
	K93S16A	Sediments	194	1	115	.6
	K93S20A	Sediments	323	1	144	.4
	KBlank	Sediments	< .5	.5	< .5	.5
	93BF04	Whole Body	4.7	.2	1	.04
	93BF06	Whole Body	5	.2	1.1	.04
	93BF07	Whole Body	3.3	.2	.73	.04
	93BF08	Whole Body	5.5	.2	1.2	.04
	93KF01	Whole Body	.99	.2	.26	.05
	93KF03	Whole Body	1.1	.2	.33	.06
	93KF05	Whole Body	3.9	.2	.96	.05
	93KF06	Whole Body	3.8	.2	.83	.04
	B93M01A	Whole Body	9.5	.2	1.8	.04
	B93M02A	Whole Body	6	.2	1.2	.04
	K93M01A	Whole Body	38.7	.2	6.25	.03
	K93M02A	Whole Body	9	.2	1.5	.03
	K93M03A	Whole Body	8.3	.2	1.6	.04
	K93M04A	Whole Body	7.1	.2	1.3	.04

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Mo	B93S01A	Sediments	< 5	5	< 4	4
	B93S02A	Sediments	< 5	5	< 2	2
	B93S03A	Sediments	< 5	5	< 1	1
	K93S01A	Sediments	10	5	7	3
	K93S02A	Sediments	10	5	7	3
	K93S03A	Sediments	10	5	4	2
	K93S04A	Sediments	10	5	4	2
	K93S04C	Sediments	8	5	3	2
	K93S05A	Sediments	10	5	4	2
	K93S06A	Sediments	6	5	3	3
	K93S07A	Sediments	< 5	5	< 2	2
	K93S08A	Sediments	< 5	5	< 3	3
	K93S10A	Sediments	< 5	5	< 3	3
	K93S10C	Sediments	< 5	5	< 3	3
	K93S11A	Sediments	< 5	5	< 3	3
	K93S13A	Sediments	< 5	5	< 3	3
	K93S14	Sediments	9	5	4	2
	K93S16A	Sediments	< 5	5	< 3	3
	K93S20A	Sediments	6	5	3	2
	KBlank	Sediments	< 2	2	< 2	2
	93BF04	Whole Body	< .9	.9	< .2	.2
	93BF06	Whole Body	< 1	1	< .2	.2
	93BF07	Whole Body	< 1	1	< .2	.2
	93BF08	Whole Body	< 1	1	< .2	.2
	93KF01	Whole Body	< .9	.9	< .2	.2
	93KF03	Whole Body	< 1	1	< .3	.3
	93KF05	Whole Body	< .9	.9	< .2	.2
	93KF06	Whole Body	< .9	.9	< .2	.2
	B93M01A	Whole Body	< 1	1	< .2	.2
	B93M02A	Whole Body	< 1	1	< .2	.2
	K93M01A	Whole Body	< 1	1	< .2	.2
	K93M02A	Whole Body	1	1	.2	.2
	K93M03A	Whole Body	< 1	1	< .2	.2
	K93M04A	Whole Body	< 1	1	< .2	.2

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Ni	B93S01A	Sediments	10	7	8	5
	B93S02A	Sediments	20	7	10	3
	B93S03A	Sediments	20	7	6	2
	K93S01A	Sediments	130	7	89	5
	K93S02A	Sediments	190	7	130	5
	K93S03A	Sediments	10	7	4	3
	K93S04A	Sediments	20	7	9	3
	K93S04C	Sediments	20	7	8	3
	K93S05A	Sediments	20	7	9	3
	K93S06A	Sediments	140	7	79	4
	K93S07A	Sediments	10	7	4	3
	K93S08A	Sediments	10	7	7	5
	K93S10A	Sediments	9	7	6	4
	K93S10C	Sediments	8	7	5	4
	K93S11A	Sediments	10	7	6	4
	K93S13A	Sediments	10	7	7	5
	K93S14	Sediments	10	7	4	3
	K93S16A	Sediments	< 7	7	< 4	4
	K93S20A	Sediments	110	7	49	3
	KBlank	Sediments	< 4	4	< 4	4
	93BF04	Whole Body	.4	.1	.085	.02
	93BF06	Whole Body	.3	.1	.067	.02
	93BF07	Whole Body	.1	.1	.02	.02
	93BF08	Whole Body	.2	.1	.04	.02
	93KF01	Whole Body	< .1	.1	< .03	.03
	93KF03	Whole Body	< .1	.1	< .03	.03
	93KF05	Whole Body	.3	.1	.07	.02
	93KF06	Whole Body	.37	.1	.081	.02
	B93M01A	Whole Body	.96	.1	.18	.02
	B93M02A	Whole Body	.58	.1	.11	.02
	K93M01A	Whole Body	3	.1	.48	.02
	K93M02A	Whole Body	1.2	.1	.2	.02
	K93M03A	Whole Body	1.3	.1	.25	.02
	K93M04A	Whole Body	1.1	.1	.2	.02

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Pb	B93S01A	Sediments	20	20	20	20
	B93S02A	Sediments	20	20	10	10
	B93S03A	Sediments	30	20	9	6
	K93S01A	Sediments	660	20	450	10
	K93S02A	Sediments	430	20	290	10
	K93S03A	Sediments	650 + 1500 = 987.4	20	270	8
	K93S04A	Sediments	720] 657.27	20	310	9
	K93S04C	Sediments	600	20	240	8
	K93S05A	Sediments	610	20	260	9
	K93S06A	Sediments	360	20	200	10
	K93S07A	Sediments	380	20	170	9
	K93S08A	Sediments	190	20	130	10
	K93S10A	Sediments	160	20	98	10
	K93S10C	Sediments	210	20	130	10
	K93S11A	Sediments	170	20	100	10
	K93S13A	Sediments	180	20	120	10
	K93S14	Sediments	1500	20	660	9
	K93S16A	Sediments	91	20	54	10
	K93S20A	Sediments	360	20	160	9
	KBlank	Sediments	< 10	10	< 10	10
	93BF04	Whole Body	< .4	.4	< .08	.08
	93BF06	Whole Body	< .4	.4	< .09	.09
	93BF07	Whole Body	< .4	.4	< .09	.09
	93BF08	Whole Body	< .4	.4	< .08	.08
	93KF01	Whole Body	< .4	.4	< .1	.1
	93KF03	Whole Body	< .4	.4	< .1	.1
	93KF05	Whole Body	1	.4	.2	.1
	93KF06	Whole Body	.4	.4	.09	.09
	B93M01A	Whole Body	.5	.4	.1	.08
	B93M02A	Whole Body	< .4	.4	< .08	.08
	K93M01A	Whole Body	11	.4	1.8	.06
	K93M02A	Whole Body	5.9	.4	.98	.07
	K93M03A	Whole Body	3.9	.4	.74	.08
	K93M04A	Whole Body	2.8	.4	.5	.07

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Se	B93S01A	Sediments	< .1	.1	< .08	.08
	B93S02A	Sediments	.73	.1	.36	.05
	B93S03A	Sediments	1.1	.1	.32	.03
	K93S01A	Sediments	.45	.1	.31	.07
	K93S02A	Sediments	.42	.1	.28	.07
	K93S03A	Sediments	.91	.1	.38	.04
	K93S04A	Sediments	.91	.1	.39	.04
	K93S04C	Sediments	.8	.1	.33	.04
	K93S05A	Sediments	.74	.1	.32	.04
	K93S06A	Sediments	2.5	.1	1.4	.06
	K93S07A	Sediments	1.1	.1	.48	.04
	K93S08A	Sediments	.38	.1	.26	.07
	K93S10A	Sediments	.31	.1	.19	.06
	K93S10C	Sediments	.2	.2	.1	.1
	K93S11A	Sediments	.3	.2	.2	.1
	K93S13A	Sediments	< .2	.2	< .1	.1
	K93S14	Sediments	.76	.2	.33	.09
	K93S16A	Sediments	.3	.2	.2	.1
	K93S20A	Sediments	1.2	.2	.53	.09
	KBlank	Sediments	< .09	.09	< .09	.09
	93BF04	Whole Body	4.3	.2	.91	.04
	93BF06	Whole Body	4.8	.2	1.1	.04
	93BF07	Whole Body	2.4	.2	.53	.04
	93BF08	Whole Body	1.6	.2	.34	.04
	93KF01	Whole Body	1.7	.2	.45	.05
	93KF03	Whole Body	1.8	.2	.55	.06
	93KF05	Whole Body	1.9	.2	.47	.05
	93KF06	Whole Body	2	.2	.44	.04
	B93M01A	Whole Body	3.3	.1	.63	.02
	B93M02A	Whole Body	3	.1	.58	.02
	K93M01A	Whole Body	3	.1	.48	.02
	K93M02A	Whole Body	3.4	.1	.57	.02
	K93M03A	Whole Body	3.1	.1	.58	.02
	K93M04A	Whole Body	3.2	.1	.57	.02

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Sr	B93S01A	Sediments	34	.5	26	.4
	B93S02A	Sediments	74.7	.5	36.7	.2
	B93S03A	Sediments	68.7	.5	19.8	.1
	K93S01A	Sediments	99.2	.5	67.6	.3
	K93S02A	Sediments	99	.5	65.7	.3
	K93S03A	Sediments	171	.5	70.8	.2
	K93S04A	Sediments	107	.5	46	.2
	K93S04C	Sediments	101	.5	41.1	.2
	K93S05A	Sediments	88.5	.5	38	.2
	K93S06A	Sediments	192	.5	108	.3
	K93S07A	Sediments	92	.5	40.3	.2
	K93S08A	Sediments	110	.5	74.1	.3
	K93S10A	Sediments	74.7	.5	45.9	.3
	K93S10C	Sediments	72	.5	44.4	.3
	K93S11A	Sediments	75.4	.5	44.3	.3
	K93S13A	Sediments	437	.5	288	.3
	K93S14	Sediments	175	.5	76.9	.2
	K93S16A	Sediments	61.9	.5	36.7	.3
	K93S20A	Sediments	484	.5	215	.2
	KBlank	Sediments	< .2	.2	< .2	.2
	93BF04	Whole Body	54.9	.09	11.6	.02
	93BF06	Whole Body	110	.1	24.7	.02
	93BF07	Whole Body	157	.1	34.9	.02
	93BF08	Whole Body	55.8	.1	11.9	.02
	93KF01	Whole Body	76.4	.09	20.3	.02
	93KF03	Whole Body	96	.1	29.1	.03
	93KF05	Whole Body	314	.09	77	.02
	93KF06	Whole Body	204	.09	44.6	.02
	B93M01A	Whole Body	115	.1	22	.02
	B93M02A	Whole Body	34.5	.1	6.72	.02
	K93M01A	Whole Body	36.7	.1	5.93	.02
	K93M02A	Whole Body	81.8	.1	13.6	.02
	K93M03A	Whole Body	43.4	.1	8.19	.02
	K93M04A	Whole Body	26	.1	4.61	.02

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
V	B93S01A	Sediments	59	1	45	.8
	B93S02A	Sediments	60	1	30	.5
	B93S03A	Sediments	59	1	17	.3
	K93S01A	Sediments	61	1	42	.7
	K93S02A	Sediments	52	1	35	.7
	K93S03A	Sediments	57	1	24	.4
	K93S04A	Sediments	55	1	24	.4
	K93S04C	Sediments	55	1	22	.4
	K93S05A	Sediments	58	1	25	.4
	K93S06A	Sediments	45	1	25	.6
	K93S07A	Sediments	54	1	24	.4
	K93S08A	Sediments	42	1	28	.7
	K93S10A	Sediments	38	1	23	.6
	K93S10C	Sediments	34	1	21	.6
	K93S11A	Sediments	41	1	24	.6
	K93S13A	Sediments	31	1	20	.7
	K93S14	Sediments	57	1	25	.4
	K93S16A	Sediments	35	1	21	.6
	K93S20A	Sediments	62	1	28	.4
	KBlank	Sediments	< .8	.8	< .8	.8
	93BF04	Whole Body	.6	.3	.1	.06
	93BF06	Whole Body	.6	.3	.1	.07
	93BF07	Whole Body	.3	.3	.07	.07
	93BF08	Whole Body	.4	.3	.08	.06
	93KF01	Whole Body	< .3	.3	< .08	.08
	93KF03	Whole Body	< .3	.3	< .09	.09
	93KF05	Whole Body	< .3	.3	< .07	.07
	93KF06	Whole Body	.5	.3	.1	.07
	B93M01A	Whole Body	.89	.3	.2	.06
	B93M02A	Whole Body	.4	.3	.08	.06
	K93M01A	Whole Body	20	.3	3.2	.05
	K93M02A	Whole Body	1.1	.3	.18	.05
	K93M03A	Whole Body	.7	.3	.1	.06
	K93M04A	Whole Body	< .3	.3	< .05	.05

CONTAMINANT CONCENTRATIONS (Cont.)

Analyte	Sample Number	Sample Matrix	Result (ppm Dry Wt.)	Detection Limit (ppm Dry Wt.)	Result (ppm Wet Wt.)	Detection Limit (ppm Wet Wt.)
Zn	B93S01A	Sediments	69	1	53	.8
	B93S02A	Sediments	79	1	39	.5
	B93S03A	Sediments	87	1	25	.3
	K93S01A	Sediments	1260	1	859	.7
	K93S02A	Sediments	855	1	567	.7
	K93S03A	Sediments	573	1	237	.4
	K93S04A	Sediments	490	1	211	.4
	K93S04C	Sediments	399	1	162	.4
	K93S05A	Sediments	435	1	187	.4
	K93S06A	Sediments	509	.9	286	.5
	K93S07A	Sediments	254	1	111	.4
	K93S08A	Sediments	193	1	130	.7
	K93S10A	Sediments	129	1	79.3	.6
	K93S10C	Sediments	113	.9	69.7	.6
	K93S11A	Sediments	178	.9	105	.5
	K93S13A	Sediments	212	.9	140	.6
	K93S14	Sediments	513	1	225	.4
	K93S16A	Sediments	75	1	44	.6
	K93S20A	Sediments	331	1	147	.4
	KBlank	Sediments	< .5	.5	< .5	.5
	93BF04	Whole Body	56.1	.2	11.9	.04
	93BF06	Whole Body	46.6	.2	10.5	.04
	93BF07	Whole Body	57.6	.2	12.8	.04
	93BF08	Whole Body	56.5	.2	12	.04
	93KF01	Whole Body	50.6	.2	13.5	.05
	93KF03	Whole Body	42.4	.2	12.9	.06
	93KF05	Whole Body	58.8	.2	14.4	.05
	93KF06	Whole Body	58.8	.2	12.9	.04
	B93M01A	Whole Body	92.3	.2	17.7	.04
	B93M02A	Whole Body	78.7	.2	15.3	.04
	K93M01A	Whole Body	198	.2	32	.03
	K93M02A	Whole Body	160	.2	26.7	.03
	K93M03A	Whole Body	192	.2	36.2	.04
	K93M04A	Whole Body	222	.2	39.4	.04

PROCEDURAL BLANKS

Analyte	Lab Sample Number	Result Total UG
Al	4010452	< 8
	4010471	< 8
	4010484	< 2
	4010494	< 2
As	4010452	< .04
	4010471	< .09
	4010484	.2
	4010494	.1
B	4010452	< 5
	4010471	< 5
	4010484	< 1
	4010494	< 1
Ba	4010452	< .2
	4010471	< .2
	4010484	< .05
	4010494	< .05
Be	4010452	< .2
	4010471	< .2
	4010484	< .006
	4010494	< .005
Cd	4010452	< .5
	4010471	< .5
	4010484	< .01
	4010494	< .01
Cr	4010452	< 2
	4010471	< 2
	4010484	.07
	4010494	< .05

PROCEDURAL BLANKS (Cont.)

Analyte	Lab Sample Number	Result Total UG
Cu	4010452	< .5
	4010471	< .5
	4010484	.1
	4010494	< .1
Fe	4010452	< 2
	4010471	< 2
	4010484	< .5
	4010494	< .5
Hg	4010452	< .003
	4010471	< .003
	4010484	< .004
	4010494	.004
Mg	4010452	< .3
	4010471	< .3
	4010484	< .06
	4010494	< .06
Mn	4010452	< .5
	4010471	< .5
	4010484	< .1
	4010494	< .1
Mo	4010452	< 2
	4010471	< 2
	4010484	< .5
	4010494	< .5
Ni	4010452	< 4
	4010471	< 4
	4010484	< .05
	4010494	< .05

PROCEDURAL BLANKS (Cont.)

Analyte	Lab Sample Number	Result Total UG
Pb	4010452	< 10
	4010471	< 10
	4010484	< .2
	4010494	.3
Se	4010452	< .07
	4010471	< .09
	4010484	< .07
	4010494	< .09
Sr	4010452	< .2
	4010471	< .2
	4010484	< .05
	4010494	< .05
V	4010452	< .8
	4010471	< .8
	4010484	< .2
	4010494	< .2
Zn	4010452	< .5
	4010471	< .5
	4010484	.2
	4010494	< .1

DUPLICATES

Analyte	Sample Number	Sample Matrix	Initial Result (ppm / %)	Duplicate Result (ppm / %)	Average	Relative % Difference
% Moisture	B93S02A	Sediments	50.8 %	50.9 %	50.85	0.2
	K93S04A	Sediments	57 %	58.5 %	57.75	2.6
	K93S11A	Sediments	41.2 %	41.4 %	41.3	0.48
	938F06	Whole Body	77.6 %	77.6 %	77.6	0
	B93M02A	Whole Body	80.5 %	81.2 %	80.85	0.87
Al	K93S01A	Sediments	13700 Dry	12700 Dry	13200	7.58
	K93S05A	Sediments	12700 Dry	15000 Dry	13850	16.61
	K93S14	Sediments	11100 Dry	11000 Dry	11050	0.9
	93BF08	Whole Body	39 Dry	34 Dry	36.5	13.7
	K93M02A	Whole Body	80 Dry	90 Dry	85	11.76
As	K93S01A	Sediments	257 Dry	320 Dry	288.5	21.84
	K93S05A	Sediments	89.1 Dry	97.6 Dry	93.35	9.11
	K93S14	Sediments	100 Dry	100 Dry	100	0
	93BF08	Whole Body	2.6 Dry	2.7 Dry	2.65	3.77
	K93M02A	Whole Body	11 Dry	10 Dry	10.5	9.52
B	K93S01A	Sediments	30 Dry	20 Dry	25	40
	K93S05A	Sediments	38 Dry	37 Dry	37.5	2.67
	K93S14	Sediments	43 Dry	48 Dry	45.5	10.99
	938F08	Whole Body	< 2 Dry	< 2 Dry	1	0
	K93M02A	Whole Body	21 Dry	21 Dry	21	0
Ba	K93S01A	Sediments	126 Dry	130 Dry	128	3.12
	K93S05A	Sediments	71.2 Dry	89 Dry	80.1	22.22
	K93S14	Sediments	58.5 Dry	57.3 Dry	57.9	2.07
	93BF08	Whole Body	.58 Dry	.5 Dry	0.54	14.81
	K93M02A	Whole Body	1.1 Dry	1 Dry	1.05	9.52
Be	K93S01A	Sediments	< .5 Dry	< .5 Dry	0.25	0
	K93S05A	Sediments	< .5 Dry	< .5 Dry	0.25	0
	K93S14	Sediments	< .5 Dry	< .5 Dry	0.25	0
	93BF08	Whole Body	< .01 Dry	< .01 Dry	0.005	0

DUPLICATES (Cont.)

Analyte	Sample Number	Sample Matrix	Initial Result (ppm / %)	Duplicate Result (ppm / %)	Average	Relative % Difference
Be	K93M02A	Whole Body	.02 Dry	< .01 Dry	0.0125	120
Cd	K93S01A	Sediments	3.3 Dry	5 Dry	4.15	40.96
	K93S05A	Sediments	2 Dry	2 Dry	2	0
	K93S14	Sediments	2 Dry	2 Dry	2	0
	938F08	Whole Body	.1 Dry	.091 Dry	0.0955	9.42
	K93M02A	Whole Body	6.6 Dry	6.17 Dry	6.385	6.73
Cr	K93S01A	Sediments	410 Dry	320 Dry	365	24.66
	K93S05A	Sediments	48 Dry	45 Dry	46.5	6.45
	K93S14	Sediments	38 Dry	36 Dry	37	5.41
	938F08	Whole Body	.3 Dry	.34 Dry	0.32	12.5
	K93M02A	Whole Body	1.6 Dry	.85 Dry	1.225	61.22
Cu	K93S01A	Sediments	1320 Dry	1310 Dry	1315	0.76
	K93S05A	Sediments	607 Dry	569 Dry	588	6.46
	K93S14	Sediments	722 Dry	470 Dry	596	42.28
	938F08	Whole Body	3.1 Dry	3 Dry	3.05	3.28
	K93M02A	Whole Body	20.1 Dry	20.6 Dry	20.35	2.46
Fe	K93S01A	Sediments	47000 Dry	44000 Dry	45500	6.59
	K93S05A	Sediments	27700 Dry	31600 Dry	29650	13.15
	K93S14	Sediments	35800 Dry	36700 Dry	36250	2.48
	938F08	Whole Body	135 Dry	125 Dry	130	7.69
	K93M02A	Whole Body	468 Dry	330 Dry	399	34.59
Grain Size-Clay	K93S01A	Sediments	4.7 %	4.5 %	4.6	4.35
	K93S05A	Sediments	12.7 %	10.6 %	11.65	18.03
	K93S16A	Sediments	5.9 %	6.4 %	6.15	8.13
Grain Size-Sand	K93S01A	Sediments	85.5 %	86.8 %	86.15	1.51
	K93S05A	Sediments	62.7 %	64.2 %	63.45	2.36
	K93S16A	Sediments	86.8 %	86.4 %	86.6	0.46
Grain Size-Silt	K93S01A	Sediments	9.8 %	8.7 %	9.25	11.89

DUPLICATES (Cont.)

Analyte	Sample Number	Sample Matrix	Initial Result (ppm / %)	Duplicate Result (ppm / %)	Average	Relative % Difference
Grain Size-Silt	K93S05A	Sediments	24.6 %	25.2 %	24.9	2.41
	K93S16A	Sediments	7.3 %	7.2 %	7.25	1.38
Hg	K93S01A	Sediments	.26 Dry	.27 Dry	0.265	3.77
	K93S05A	Sediments	.957 Dry	.711 Dry	0.834	29.5
	K93S14	Sediments	.695 Dry	.742 Dry	0.7185	6.54
	93BF08	Whole Body	.039 Dry	.037 Dry	0.038	5.26
	K93M02A	Whole Body	.05 Dry	.047 Dry	0.0485	6.19
Mg	K93S01A	Sediments	20400 Dry	17100 Dry	18750	17.6
	K93S05A	Sediments	10000 Dry	11100 Dry	10550	10.43
	K93S14	Sediments	9110 Dry	9160 Dry	9135	0.55
	93BF08	Whole Body	1460 Dry	1430 Dry	1445	2.08
	K93M02A	Whole Body	3100 Dry	3200 Dry	3150	3.17
Mn	K93S01A	Sediments	654 Dry	592 Dry	623	9.95
	K93S05A	Sediments	325 Dry	362 Dry	343.5	10.77
	K93S14	Sediments	274 Dry	271 Dry	272.5	1.1
	93BF08	Whole Body	5.5 Dry	5.2 Dry	5.35	5.61
	K93M02A	Whole Body	9 Dry	8.4 Dry	8.7	6.9
Mo	K93S01A	Sediments	10 Dry	10 Dry	10	0
	K93S05A	Sediments	10 Dry	10 Dry	10	0
	K93S14	Sediments	9 Dry	9 Dry	9	0
	93BF08	Whole Body	< 1 Dry	< .9 Dry	0.475	10.53
	K93M02A	Whole Body	1 Dry	< 1 Dry	0.75	66.67
Ni	K93S01A	Sediments	130 Dry	100 Dry	115	26.09
	K93S05A	Sediments	20 Dry	20 Dry	20	0
	K93S14	Sediments	10 Dry	10 Dry	10	0
	93BF08	Whole Body	.2 Dry	.1 Dry	0.15	66.67
	K93M02A	Whole Body	1.2 Dry	1.1 Dry	1.15	8.7
Pb	K93S01A	Sediments	660 Dry	680 Dry	670	2.99
	K93S05A	Sediments	610 Dry	670 Dry	640	9.37

DUPLICATES (Cont.)

Analyte	Sample Number	Sample Matrix	Initial Result (ppm / %)		Duplicate Result (ppm / %)		Average	Relative % Difference
Pb	K93S14	Sediments	1500	Dry	780	Dry	1140	63.16
	938F08	Whole Body	< .4	Dry	.5	Dry	0.35	85.71
	K93M02A	Whole Body	5.9	Dry	6	Dry	5.95	1.68
Se	K93S01A	Sediments	.45	Dry	.79	Dry	0.62	54.84
	K93S05A	Sediments	.74	Dry	.93	Dry	0.835	22.75
	K93S14	Sediments	.76	Dry	.75	Dry	0.755	1.32
	938F08	Whole Body	1.6	Dry	1.7	Dry	1.65	6.06
	K93M02A	Whole Body	3.4	Dry	3.3	Dry	3.35	2.99
Sr	K93S01A	Sediments	99.2	Dry	95.4	Dry	97.3	3.91
	K93S05A	Sediments	88.5	Dry	104	Dry	96.25	16.1
	K93S14	Sediments	175	Dry	173	Dry	174	1.15
	938F08	Whole Body	55.8	Dry	60	Dry	57.9	7.25
	K93M02A	Whole Body	81.8	Dry	67.9	Dry	74.85	18.57
Tot. Organic Carbon								
	K93S01A	Sediments	1.5	%	1.7	%	1.6	12.5
	K93S05A	Sediments	2.8	%	2.3	%	2.55	19.61
	K93S14	Sediments	4.2	%	3.7	%	3.95	12.66
V	K93S01A	Sediments	61	Dry	62	Dry	61.5	1.63
	K93S05A	Sediments	58	Dry	65	Dry	61.5	11.38
	K93S14	Sediments	57	Dry	57	Dry	57	0
	938F08	Whole Body	.4	Dry	< .3	Dry	0.275	90.91
	K93M02A	Whole Body	1.1	Dry	1	Dry	1.05	9.52
Zn	K93S01A	Sediments	1260	Dry	1080	Dry	1170	15.38
	K93S05A	Sediments	435	Dry	662	Dry	548.5	41.39
	K93S14	Sediments	513	Dry	556	Dry	534.5	8.04
	938F08	Whole Body	56.5	Dry	53.7	Dry	55.1	5.08
	K93M02A	Whole Body	160	Dry	165	Dry	162.5	3.08

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REFERENCE MATERIALS

Analyte	Lab Sample Number	S.R.M. ID	S.R.M. Name	* Certified Reference Value (ppm / %)	95% Confidence Interval	Result (ppm / %)	Percent Recovery
Al	4010487	NIST 1566a	Oyster Tissue	202.5 Dry	12.5	120 Dry	59.26
	4010499	NIST 1566a	Oyster Tissue	202.5 Dry	12.5	120 Dry	59.26
	4010456	NIST 2704	Buffalo River Sediment	61100 Dry	1600	16300 Dry	26.68
	4010474	NIST 2704	Buffalo River Sediment	61100 Dry	1600	12100 Dry	19.8
As	4010487	NIST 1566a	Oyster Tissue	14 Dry	1.2	14 Dry	100
	4010499	NIST 1566a	Oyster Tissue	14 Dry	1.2	14 Dry	100
	4010456	NIST 2704	Buffalo River Sediment	23.4 Dry	.8	18.3 Dry	78.21
	4010474	NIST 2704	Buffalo River Sediment	23.4 Dry	.8	18 Dry	76.92
B	4010487	NIST 1566a				7.6 Dry	
	4010499	NIST 1566a				7.3 Dry	
	4010456	NIST 2704				10 Dry	
	4010474	NIST 2704				< 10 Dry	
Ba	4010487	NIST 1566a				1.8 Dry	
	4010499	NIST 1566a				1.7 Dry	
	4010456	NIST 2704	Buffalo River Sediment	414 Dry	12	98 Dry	23.67
	4010474	NIST 2704	Buffalo River Sediment	414 Dry	12	90.2 Dry	21.79
Be	4010487	NIST 1566a				.03 Dry	
	4010499	NIST 1566a				.02 Dry	
	4010456	NIST 2704				.8 Dry	
	4010474	NIST 2704				.7 Dry	
Cd	4010487	NIST 1566a	Oyster Tissue	4.15 Dry	.38	3.88 Dry	93.49
	4010499	NIST 1566a	Oyster Tissue	4.15 Dry	.38	3.5 Dry	84.34
	4010456	NIST 2704	Buffalo River Sediment	3.45 Dry	.22	4.3 Dry	124.64
	4010474	NIST 2704	Buffalo River Sediment	3.45 Dry	.22	4.2 Dry	121.74
Cr	4010487	NIST 1566a	Oyster Tissue	1.43 Dry	.46	1.3 Dry	90.91

* Only certified analytes list a confidence interval - all others are considered reference values.

REFERENCE MATERIALS (Cont.)

Analyte	Lab Sample Number	S.R.M. ID	S.R.M. Name	* Certified Reference Value (ppm / %)	95% Confidence Interval	Result (ppm / %)	Percent Recovery
Cr	4010499	NIST 1566a	Oyster Tissue	1.43 Dry	.46	1.3 Dry	90.91
	4010456	NIST 2704	Buffalo River Sediment	135 Dry	5	76 Dry	56.3
	4010474	NIST 2704	Buffalo River Sediment	135 Dry	5	87 Dry	64.44
Cu	4010487	NIST 1566a	Oyster Tissue	66.3 Dry	4.3	63 Dry	95.02
	4010499	NIST 1566a	Oyster Tissue	66.3 Dry	4.3	58.5 Dry	88.24
	4010456	NIST 2704	Buffalo River Sediment	98.6 Dry	5	92 Dry	93.31
	4010474	NIST 2704	Buffalo River Sediment	98.6 Dry	5	96.3 Dry	97.67
Fe	4010487	NIST 1566a	Oyster Tissue	539 Dry	15	484 Dry	89.8
	4010499	NIST 1566a	Oyster Tissue	539 Dry	15	498 Dry	92.39
	4010456	NIST 2704	Buffalo River Sediment	41100 Dry	1000	33300 Dry	81.02
	4010474	NIST 2704	Buffalo River Sediment	41100 Dry	1000	32500 Dry	79.08
Grain Size-Clay							
	4010464	ETSR SCL-7	Clay	33.8 %	1.4	37.4 %	110.65
	4010480	ETSR SCL-7	Clay	33.8 %	1.4	36.5 %	107.99
Grain Size-Sand							
	4010464	ETSR SCL-7	Sand	34.3 %	1.6	34.6 %	100.87
	4010480	ETSR SCL-7	Sand	34.3 %	1.6	33.7 %	98.25
Grain Size-Silt							
	4010464	ETSR SCL-7	Silt	31.9 %	2.2	28 %	87.77
	4010480	ETSR SCL-7	Silt	31.9 %	2.2	29.8 %	93.42
Hg	4010487	NIST 1566a	Oyster Tissue	.0642 Dry	.0067	.052 Dry	81
	4010499	NIST 1566a	Oyster Tissue	.0642 Dry	.0067	.06 Dry	93.46
	4010456	NIST 2704	Buffalo River Sediment	1.44 Dry	.07	1.3 Dry	90.28
	4010474	NIST 2704	Buffalo River Sediment	1.44 Dry	.07	1.4 Dry	97.22
Mg	4010487	NIST 1566a	Oyster Tissue	1180 Dry	170	1060 Dry	89.83

* Only certified analytes list a confidence interval - all others are considered reference values.

REFERENCE MATERIALS (Cont.)

Analyte	Lab Sample Number	S.R.M. ID	S.R.M. Name	* Certified Reference Value (ppm / %)	95% Confidence Interval	Result (ppm / %)	Percent Recovery
Mg	4010499	NIST 1566a	Oyster Tissue	1180 Dry	170	1060 Dry	89.83
	4010456	NIST 2704	Buffalo River Sediment	12000 Dry	200	9170 Dry	76.42
	4010474	NIST 2704	Buffalo River Sediment	12000 Dry	200	8880 Dry	74
Mn	4010487	NIST 1566a	Oyster Tissue	12.3 Dry	1.5	11 Dry	89.43
	4010499	NIST 1566a	Oyster Tissue	12.3 Dry	1.5	11 Dry	89.43
	4010456	NIST 2704	Buffalo River Sediment	555 Dry	19	501 Dry	90.27
	4010474	NIST 2704	Buffalo River Sediment	555 Dry	19	505 Dry	90.99
Mo	4010487	NIST 1566a				< 1 Dry	
	4010499	NIST 1566a				< 1 Dry	
	4010456	NIST 2704				< 5 Dry	
	4010474	NIST 2704				< 5 Dry	
Ni	4010487	NIST 1566a	Oyster Tissue	2.25 Dry	.44	1.8 Dry	80
	4010499	NIST 1566a	Oyster Tissue	2.25 Dry	.44	1.9 Dry	84.44
	4010456	NIST 2704	Buffalo River Sediment	44.1 Dry	3	40 Dry	90.7
	4010474	NIST 2704	Buffalo River Sediment	44.1 Dry	3	41 Dry	92.97
Pb	4010487	NIST 1566a	Oyster Tissue	.371 Dry	.014	.7 Dry	188.68
	4010499	NIST 1566a	Oyster Tissue	.371 Dry	.014	< .4 Dry	107.82
	4010456	NIST 2704	Buffalo River Sediment	161 Dry	17	170 Dry	105.59
	4010474	NIST 2704	Buffalo River Sediment	161 Dry	17	180 Dry	111.8
Se	4010487	NIST 1566a	Oyster Tissue	2.21 Dry	.24	2.2 Dry	99.55
	4010499	NIST 1566a	Oyster Tissue	2.21 Dry	.24	2.2 Dry	99.55
	4010456	NIST 2704	Buffalo River Sediment	1.1 Dry		1.1 Dry	100
	4010474	NIST 2704	Buffalo River Sediment	1.1 Dry		.89 Dry	80.91
Sr	4010487	NIST 1566a	Oyster Tissue	11.1 Dry	1	10.1 Dry	90.99
	4010499	NIST 1566a	Oyster Tissue	11.1 Dry	1	10 Dry	90.09
	4010456	NIST 2704	Buffalo River Sediment	130 Dry		52.5 Dry	40.38

* Only certified analytes list a confidence interval - all others are considered reference values.

REFERENCE MATERIALS (Cont.)

Analyte	Lab Sample Number	S.R.M. ID	S.R.M. Name	* Certified Reference Value (ppm / %)	95% Confidence Interval	Result (ppm / %)	Percent Recovery
Sr	4010474	NIST 2704	Buffalo River Sediment	130 Dry		37 Dry	28.46
Tot. Organic Carbon							
	4010460	ERA9401DEM				.0032 %	
	4010477	ERA9401DEM				.003 %	
V	4010487	NIST 1566a	Oyster Tissue	4.68 Dry	.15	4.7 Dry	100.43
	4010499	NIST 1566a	Oyster Tissue	4.68 Dry	.15	4.7 Dry	100.43
	4010456	NIST 2704	Buffalo River Sediment	95 Dry	4	34 Dry	35.79
	4010474	NIST 2704	Buffalo River Sediment	95 Dry	4	27 Dry	28.42
Zn	4010487	NIST 1566a	Oyster Tissue	830 Dry	57	805 Dry	96.99
	4010499	NIST 1566a	Oyster Tissue	830 Dry	57	796 Dry	95.9
	4010456	NIST 2704	Buffalo River Sediment	438 Dry	12	416 Dry	94.98
	4010474	NIST 2704	Buffalo River Sediment	438 Dry	12	422 Dry	96.35

* Only certified analytes list a confidence interval - all others are considered reference values.

SPIKE RECOVERIES

Analyte	Sample Number	Sample Matrix	Spike Level (ppm / %)	Amount Recovered (ppm / %)	* Spike / Background	Percent Recovery
Al	K93S02A	Sediments	9652.508 Dry	9400 Dry	0.89	97.38
	K93S06A	Sediments	9861.934 Dry	9650 Dry	1.18	97.85
	K93S16A	Sediments	9803.922 Dry	9280 Dry	1.16	94.66
	93KF03	Whole Body	193.4236 Dry	177 Dry	14.88	91.51
	K93M04A	Whole Body	193.0502 Dry	169 Dry	4.71	87.54
As	K93S02A	Sediments	9.9206 Dry	20 Dry	0.06	201.6
	K93S06A	Sediments	9.8425 Dry	40 Dry	0.09	406.4
	K93S16A	Sediments	9.8039 Dry	10.9 Dry	1.38	111.18
	93KF03	Whole Body	9.7656 Dry	9.8 Dry	3.05	100.35
	K93M04A	Whole Body	9.6339 Dry	9.9 Dry	1.28	102.76
B	K93S02A	Sediments	96.5251 Dry	80 Dry	4.83	82.88
	K93S06A	Sediments	98.6193 Dry	80 Dry	3.29	81.12
	K93S16A	Sediments	98.0392 Dry	78 Dry	4.9	79.56
	93KF03	Whole Body	96.7118 Dry	82 Dry	48.36	84.79
	K93M04A	Whole Body	96.5251 Dry	90 Dry	4.83	93.24
Ba	K93S02A	Sediments	19.305 Dry	12 Dry	0.21	62.16
	K93S06A	Sediments	19.7239 Dry	-25.8 Dry	0.21	130.81
	K93S16A	Sediments	19.6078 Dry	17 Dry	0.63	86.7
	93KF03	Whole Body	4.8356 Dry	4.24 Dry	13.43	87.68
	K93M04A	Whole Body	4.8263 Dry	4.5 Dry	8.04	93.24
Be	K93S02A	Sediments	9.6525 Dry	9.9 Dry	19.3	102.56
	K93S06A	Sediments	9.8619 Dry	10 Dry	19.72	101.4
	K93S16A	Sediments	9.8039 Dry	10 Dry	19.61	102
	93KF03	Whole Body	4.8356 Dry	4.7 Dry	483.56	97.2
	K93M04A	Whole Body	4.9702 Dry	5.37 Dry	497.02	108.04
Cd	K93S02A	Sediments	9.6525 Dry	10 Dry	3.22	103.6
	K93S06A	Sediments	9.8619 Dry	11 Dry	4.93	111.54

* For a spike to be a valid measure of method accuracy, this ratio must be higher than 1.0.

SPIKE RECOVERIES (Cont.)

Analyte	Sample Number	Sample Matrix	Spike Level (ppm / %)	Amount Recovered (ppm / %)	* Spike / Background	Percent Recovery
Cd	K93S16A	Sediments	9.8039 Dry	10 Dry	9.8	102
	93KF03	Whole Body	9.6712 Dry	9.48 Dry	64.47	98.02
	K93M04A	Whole Body	9.9404 Dry	10.53 Dry	2.18	105.93
Cr	K93S02A	Sediments	48.2625 Dry	50 Dry	0.12	103.6
	K93S06A	Sediments	49.3097 Dry	75 Dry	0.9	152.1
	K93S16A	Sediments	49.0196 Dry	49 Dry	4.9	99.96
	93KF03	Whole Body	48.3559 Dry	48.3 Dry	241.78	99.88
	K93M04A	Whole Body	49.7018 Dry	50.2 Dry	124.25	101
Cu	K93S02A	Sediments	96.5251 Dry	202 Dry	0.14	209.27
	K93S06A	Sediments	98.6193 Dry	106 Dry	0.43	107.48
	K93S16A	Sediments	98.0392 Dry	118 Dry	2.13	120.36
	93KF03	Whole Body	9.6712 Dry	8.9 Dry	4.61	92.03
	K93M04A	Whole Body	9.6525 Dry	9.3 Dry	0.26	96.35
Fe	K93S02A	Sediments	9652.508 Dry	8900 Dry	0.24	92.2
	K93S06A	Sediments	9861.934 Dry	14300 Dry	0.29	145
	K93S16A	Sediments	9803.922 Dry	9300 Dry	0.65	94.86
	93KF03	Whole Body	483.5591 Dry	422 Dry	8.34	87.27
	K93M04A	Whole Body	482.6255 Dry	418 Dry	3.04	86.61
Hg	K93S02A	Sediments	.9992 Dry	0.89 Dry	9.08	89.07
	K93S06A	Sediments	.998 Dry	0.98 Dry	2.38	98.2
	K93S16A	Sediments	.9978 Dry	0.916 Dry	13.48	91.8
	93KF03	Whole Body	.496 Dry	0.526 Dry	1.84	106.05
	K93M04A	Whole Body	.4977 Dry	0.51 Dry	24.88	102.47
Mg	K93S02A	Sediments	3861.004 Dry	4200 Dry	0.21	108.78
	K93S06A	Sediments	3944.773 Dry	4790 Dry	0.57	121.43
	K93S16A	Sediments	3921.569 Dry	3990 Dry	0.62	101.74
	93KF03	Whole Body	967.1179 Dry	860 Dry	0.91	88.92
	K93M04A	Whole Body	965.251 Dry	1020 Dry	0.29	105.67

* For a spike to be a valid measure of method accuracy, this ratio must be higher than 1.0.

SPIKE RECOVERIES (Cont.)

Analyte	Sample Number	Sample Matrix	Spike Level (ppm / %)	Amount Recovered (ppm / %)	* Spike / Background	Percent Recovery
Mn	K93S02A	Sediments	1930.502 Dry	1897 Dry	3.37	98.26
	K93S06A	Sediments	1972.387 Dry	1978 Dry	8.5	100.28
	K93S16A	Sediments	1960.784 Dry	1956 Dry	10.11	99.76
	93KF03	Whole Body	19.3424 Dry	16.9 Dry	17.58	87.37
	K93M04A	Whole Body	19.305 Dry	17.7 Dry	2.72	91.69
Mo	K93S02A	Sediments	48.2625 Dry	45 Dry	4.83	93.24
	K93S06A	Sediments	49.3097 Dry	46 Dry	8.22	93.29
	K93S16A	Sediments	49.0196 Dry	46 Dry	9.8	93.84
	93KF03	Whole Body	48.3559 Dry	43 Dry	48.36	88.92
	K93M04A	Whole Body	48.2625 Dry	46 Dry	48.26	95.31
Ni	K93S02A	Sediments	96.5251 Dry	60 Dry	0.51	62.16
	K93S06A	Sediments	98.6193 Dry	20 Dry	0.7	20.28
	K93S16A	Sediments	98.0392 Dry	110 Dry	14.01	112.2
	93KF03	Whole Body	48.3559 Dry	48.8 Dry	483.56	100.92
	K93M04A	Whole Body	49.7018 Dry	50.5 Dry	45.18	101.61
Pb	K93S02A	Sediments	193.0502 Dry	220 Dry	0.45	113.96
	K93S06A	Sediments	197.2387 Dry	390 Dry	0.55	197.73
	K93S16A	Sediments	196.0784 Dry	189 Dry	2.15	96.39
	93KF03	Whole Body	96.7118 Dry	97.8 Dry	241.78	101.13
	K93M04A	Whole Body	99.4036 Dry	102.2 Dry	35.5	102.81
Se	K93S02A	Sediments	9.6525 Dry	8.28 Dry	22.98	85.78
	K93S06A	Sediments	9.8619 Dry	7.6 Dry	3.94	77.06
	K93S16A	Sediments	9.8039 Dry	8.8 Dry	32.68	89.76
	93KF03	Whole Body	9.6712 Dry	8.2 Dry	5.37	84.79
	K93M04A	Whole Body	9.9404 Dry	9.5 Dry	3.11	95.57
Sr	K93S02A	Sediments	48.2625 Dry	51 Dry	0.49	105.67
	K93S06A	Sediments	49.3097 Dry	71 Dry	0.26	143.99

* For a spike to be a valid measure of method accuracy, this ratio must be higher than 1.0.

SPIKE RECOVERIES (Cont.)

Analyte	Sample Number	Sample Matrix	Spike Level (ppm / %)	Amount Recovered (ppm / %)	* Spike / Background	Percent Recovery
Sr	K93S16A	Sediments	49.0196 Dry	47.1 Dry	0.79	96.08
	93KF03	Whole Body	4.8356 Dry	5 Dry	0.05	103.4
	K93M04A	Whole Body	4.8263 Dry	7.9 Dry	0.19	163.69
Tot. Organic Carbon	K93S03A	Sediments	49261.08 %	5.7 %	9122.42	0.01
	K93S06A	Sediments	48780.49 %	5.3 %	25673.94	0.01
	K93S16A	Sediments	33112.58 %	3.4 %	22075.05	0.01
V	K93S02A	Sediments	48.2625 Dry	58 Dry	0.93	120.18
	K93S06A	Sediments	49.3097 Dry	50 Dry	1.1	101.4
	K93S16A	Sediments	49.0196 Dry	48 Dry	1.4	97.92
	93KF03	Whole Body	9.6712 Dry	8.9 Dry	32.24	92.03
	K93M04A	Whole Body	9.6525 Dry	9.4 Dry	32.17	97.38
Zn	K93S02A	Sediments	386.1003 Dry	325 Dry	0.45	84.18
	K93S06A	Sediments	394.4773 Dry	374 Dry	0.78	94.81
	K93S16A	Sediments	392.157 Dry	390 Dry	5.23	99.45
	93KF03	Whole Body	193.4236 Dry	178.6 Dry	4.56	92.34
	K93M04A	Whole Body	193.0502 Dry	188 Dry	0.87	97.38

* For a spike to be a valid measure of method accuracy, this ratio must be higher than 1.0.

Appendix E.

Detection Limits For Elements (ppm) In Metals Analyses.

Element	Sediment	Tissue
Al	10	3
As	0.08 - 2.0	0.2
B	9 - 10	2
Ba	0.5	0.09 - 0.1
Be	0.5	0.01
Cd	0.9 - 1.0	0.02
Cr	5	0.1
Cu	0.9 - 1.0	0.2
Fe	5	0.9 - 1.0
Hg	0.005 - 0.03	0.005 - 0.009
Mg	0.6	0.1
Mn	0.9 - 1.0	0.2
Mo	5	0.9 - 1.0
Ni	7	0.1
Pb	20	0.4
Se	0.1 - 0.2	0.1 - 0.2
Sr	0.5	0.09 - 0.1
V	1	0.3
Zn	0.9 - 1.0	0.2