Susitna-Watana Hydroelectric Project
(FERC No. 14241)

Mercury Assessment and
Potential for Bioaccumulation

Prepared for

Alaska Energy Authority

SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

Prepared by

URS Corporation

Tetratech Inc.

February 2013

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LIST OF ACRONYMS AND SCIENTIFIC LABELS

Abbreviation	Definition
ADEC	Alaska Department of Environmental Conservation
AEA	Alaska Energy Authority
APA	Alaska Power Authority
^{o}C	degrees Celsius
FERC	Federal Energy Regulatory Commission
g	Gram
Hg	Mercury
ILP	Integrated Licensing Process
MeHg	Methylmercury
mm	Millimeter
MS	matrix spike
MSD	matrix spike duplicate
NEPA	National Environmental Policy Act
ng/g	nanograms per gram
Project	Susitna-Watana Hydroelectric Project
RM	River mile(s) referencing those of the 1980s APA Project.
SRM	standard reference materiel
USEPA (or EPA)	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
µg/L	micrograms per liter

SUMMARY

This report provides the results of the 2012 Mercury Assessment and Potential for Bioaccumulation. The purpose of this study was to begin assessing the occurrence of methylmercury in fish within the proposed Project area. This study represents the first phase of the work, and additional sampling of soil, sediment, water, and fish tissue is planned for 2013.

Samples of adult arctic grayling, burbot, and resident rainbow trout were collected from Sally Lake, the mainstem Susitna River, and Watana Creek. Field procedures were consistent with those outlined in applicable sampling regulatory protocols. Samples were analyzed for total solids, total mercury, and methylmercury using SM 2540G, EPA Method 1631 Appendix, and EPA Method 1630, respectively. Both wet and dry samples were analyzed to allow for comparison with other data sources. Duplicates, matrix spikes, and matrix spike duplicates were also analyzed.

Concentrations of total mercury in the lake trout were significantly higher than in the other fish, ranging from 181 to 201 nanograms per gram (ng/g) wet weight. Burbot were found to have total mercury concentrations ranging from 39.6 to 54.7 ng/g wet weight, while artic grayling had total mercury concentrations ranging from 19.3 to 38.1 ng/gm wet weight. Piscivorous species such as adult lake trout showed significantly higher concentrations of methylmercury than non-piscivorous species such as arctic grayling. The age of the lake trout is unknown, and the arctic grayling and burbot ranged in age from 4 to 8 years. There appears to be a correlation between the age of the fish and the methylmercury concentrations observed.

Both methylmercury and total mercury were analyzed for each fish sampled. Total and methylated mercury concentrations were virtually identical within each individual fish tested, suggesting that a majority of the mercury in the fish is methylmercury.

Total mercury concentrations in fish of the Study Area appear to be below mean concentrations of samples collected in other parts of the Susitna River drainage by the Alaska Department of Environmental Conservation (ADEC).

1. INTRODUCTION

This report provides the results of the 2012 Mercury Assessment and Potential for Bioaccumulation, based on the work outlined in the Mercury Assessment and Potential for Bioaccumulation Study plan (AEA 2012). The Alaska Energy Authority (AEA) is preparing a License Application that will be submitted to the Federal Energy Regulatory Commission (FERC) for the Susitna-Watana Hydroelectric Project (Project) using the Integrated Licensing Process (ILP). The Project is located on the Susitna River, an approximately 300-mile-long river in Southcentral Alaska. The Project's dam site will be located at river mile (RM) 184. This study provided information that will inform the 2013–2014 formal study program, Exhibit E of the License Application, and FERC's National Environmental Policy Act (NEPA) analysis for the Project license.

Many studies have documented mercury concentrations in wildlife. While the bioaccumulation of mercury occurs all over the world in natural wetlands, it can be especially acute in newly formed reservoirs. The purpose of this study is to begin assessment of the potential for such an occurrence in the proposed Project area.

Organic-rich soils can absorb mercury from the atmosphere over decades, and their degradation at the bottom of the reservoir will generate methylmercury (Hydro-Quebec 2003). Many studies have documented increased mercury levels in fish following the flooding of terrestrial areas to create hydroelectric reservoirs (Bodaly et al. 1997; Bodaly et al. 2004; Bodaly et al. 2007; Rylander et al. 2006; Lockhart et al. 2005; Johnston et al. 1991; Kelly et al. 1997; Morrison and Thérien 1991). Increased mercury concentrations have also been noted at other trophic levels within aquatic food chains of reservoirs, such as aquatic invertebrates (Hall et al. 1998).

These problems have been particularly acute in hydropower projects from northern climates including Canada and Finland (Rosenberg et al. 1997). When boreal forests with large surface-area-to-volume ratios are flooded, substantial quantities of organic carbon and mercury stored in vegetation biomass and soils become inputs to the newly formed reservoir (Bodaly et al. 1984; Grigal 2003; Kelly et al. 1997). This flooding accelerates microbial decomposition, causing high rates of microbial methylation of mercury. Studies have shown this increase is temporary, lasting between 10 and 35 years (Hydro-Quebec 2003; Bodaly et al. 2007), whereupon methylmercury concentrations return to background levels.

Methylmercury can be detected in nearly every fish analyzed, from nearly any water body in the world. This is because the primary source of mercury to most aquatic ecosystems is deposition from the atmosphere. Mercury deposition worldwide has been steadily increasing due to the widespread burning of coal. In 2007, an international panel of experts concluded, "remote sites in both the Northern and Southern hemispheres demonstrate about a threefold increase in Hg deposition since preindustrial times" (Lindberg et al. 2007). Lakes at Glacier Bay, Alaska, have shown that current rates of atmospheric mercury deposition are about double what was observed in pre-industrial times (Engstrom and Swain 1997).

Mercury of non-atmospheric origin has been occasionally found in water bodies. The source can be industrial processes, mercury mining, or simply the presence of sulfide-rich mercury ores, which occur in very limited areas. In areas that lack the necessary mercury mineralization, the mercury concentration in parent geologic materials is typically very low, and cannot explain the mercury concentrations observed in sediment in aquatic ecosystems (Fitzgerald et al. 1998; Swain et al. 1992; Wiener et al. 2006).

Historical mercury data from the study area are limited. Some samples were collected during previous studies of the Alaska Power Authority (APA) Susitna Hydroelectric Project in the 1980s (AEA 2011). This consisted of the collection of water samples at Gold Creek (RM 136) in 1982. Total mercury was found to be 0.12 micrograms per liter (µg/L) in turbid, summer water, and 0.04 µg/L in the clear, winter water (AEA 2011). The same results were found downriver at Susitna Station (RM 26).

Frenzel (2000) collected sediment samples from the Deshka River and Talkeetna River, as well as from Colorado Creek and Costello Creek, which are tributaries to the Chulitna River (Table 1). Based on these results, mercury concentrations in the drainage appear to be elevated over the national median, and appear to vary significantly by drainage. The report indicated that both Colorado and Costello Creeks appear to drain a portion of Denali National Park and Preserve that is highly mineralized, which likely causes the higher than background mercury concentrations. Previous studies (St. Louis et al. 1994) have shown that methylmercury occurrence is positively correlated with wetland density, and the Deshka River has significantly more wetlands in the drainage than other tributaries to the Susitna River.

Additional samples were collected by Frenzel (2000) of slimy sculpin from the Deshka River, Talkeetna River, and Costello Creek (Table 2). Whole fish samples tend to report lower concentrations of methylmercury, given that this compound concentrates in muscle tissue.

Samples of fish tissue and sediment from the Deshka River and Costello Creek were speciated for metallic mercury and methylmercury (Table 3). As anticipated, the ratio of methylmercury to inorganic mercury in the Deshka River is relatively high due to extensive wetlands in the drainage area. Costello Creek was found to have a higher inorganic mercury component due to possible mineralogical sources of mercury in the drainage area.

Overall mercury concentrations in water were also found to be positively correlated with the turbidity of the water. Very little mercury was found in filtered water samples (Frenzel 2000). This is consistent with methylmercury being strongly bound to organic particles.

These results are in agreement with the results from Krabbenhoft et al. (1999). In nationwide mercury sampling, in a wide array of hydrological basins and environmental settings, wetland density was found to be the most important factor controlling methylmercury production. It was also found that methylmercury production appears proportional to total mercury concentrations only at low total mercury levels. Once total mercury concentrations exceed 1,000 nanograms per gram (ng/g), little additional methylmercury was observed to be produced. Atmospheric deposition was found to be the predominant source for most mercury. Subbasins characterized as mixed agriculture and forested had the highest methylation efficiency, whereas areas affected by mining were found to be the lowest.

A more recent study has been done by the Alaska Department of Environmental Conservation's Department of Environmental Health (ADEC 2012). ADEC is currently analyzing salmon (all five species) as well as other freshwater species for total mercury in the Susitna River drainages (Table 4). These results appear to be consistent with those in other areas of the state.

2. STUDY OBJECTIVES

The objectives of the 2012 Mercury Assessment and Potential for Bioaccumulation study were as follows:

1. Begin documenting the available information on mercury concentrations in various media (soil, water, fish tissue) in the Susitna drainage by other studies, and;
2. Collection of fish tissue samples from the Upper Susitna basing for analyses.

The 2012 study represents the first phase of this investigation. Additional phases of this work in 2013 will include sampling of soil, vegetation, water, sediment, and other media, in addition to fish tissue, to establish background mercury concentrations.

3. STUDY AREA

The study area for this phase of the study was the Susitna River upstream from Devils Canyon, including Watana Creek, the mainstem Susitna River, Kosina Creek, Jay Creek, Tsusena Creek, and unnamed tributaries of the Susitna (Figure 1). It is understood that the species collected in the area may not be representative of species that will be present after construction of the dam. Specifically, lake trout may be present in the reservoir, but do not occur within the Susitna River. To help characterize methylmercury concentrations in this species, additional samples were collected from lake trout in nearby Sally Lake, an isolated lake within the proposed reservoir inundation zone.

4. METHODS

There is a well-known positive correlation between fish size (length and weight) and mercury concentration in muscle tissue (Bodaly et al. 1984; Somers and Jackson 1993). Targeting adult fish is a good way of monitoring methylmercury migration to the larger environment, as adult fish represent a worst case scenario for methylmercury bioaccumulation.

Fish tissue samples were collected in late August and early September. Field procedures were consistent with those outlined in applicable U.S. Environmental Protection Agency (USEPA [or EPA]) sampling protocols (USEPA 2000). Clean nylon nets and polyethylene gloves were used during fish tissue collection. Species identification, measurement of total length (mm), and weight (g) were recorded.

Samples were placed in labeled zip-lock bags and placed in coolers and packed with gel ice after sampling. These samples were later transferred to a freezer for storage. The samples were placed in coolers, sealed, and remained chilled to 4°C (±2°C) during transportation to the contract laboratory (Brooks and Rand). All samples were accompanied with completed chain-of-custody forms when shipped.

Samples were analyzed for total solids, total mercury, and methylmercury using SM 2540G, EPA Method 1631 Appendix, and EPA Method 1630, respectively (Table 5). Analyzing for both wet and dry samples allows comparison with both ADEC and U.S. Geological Survey (USGS) data. Duplicates, matrix spikes, and matrix spike duplicates were also analyzed.

5. DEVIATIONS FROM STUDY PLAN

During analyses, the average of the method blanks exceeded the detection limit; however, the standard deviation was low (0.03 µg/L). As the contamination was consistent between the method blank samples analyzed, sample results were corrected to remove the interference.

Sample 2012 VSM GRB 02 had a concentration less than 10x the highest method blank. Any laboratory contamination was considered minimal and no further action was required.

The analysis of matrix spike (MS) performed on sample 2012 VSM GRB 02 produced a recovery above the acceptance criteria (139%). The associated matrix spike duplicate (MSD) recovered within acceptance limits.

The methylmercury (MeHg) result for sample 2012 VSM GRB 02 was qualified. This is because the standard reference material (SRM) recovery was low in this batch and in all other batches analyzed in the same time frame. The SRM (NIST 1946), was re-analyzed along with other SRMs. All other SRMs met recovery criteria while SRM NIST 1946 was again recovered low. Therefore, the low recovery for this SRM appears to be a problem with the standard reference sample supplied to the analytical laboratory, and not a problem with the methods or instrumentation. SRM NIST 1946 was set to “not reportable” and data integrity was based on the other quality control results.

All other data were reported without further qualification and all other associated quality control sample results met the acceptance criteria.

6. RESULTS

The analytical results are summarized in Table 5, and the complete laboratory results are available in Appendix 1.

In summary, six samples (two each) were collected of lake trout, burbot, and artic grayling. The sample locations include Sally Lake, which is in the proposed inundation zone for the reservoir, Watana Creek, and the mainstem Susitna River (Figure 1).

Concentrations of total mercury in the lake trout were significantly higher than the other fish, ranging from 181 to 201 nanograms per gram (ng/g) wet weight. Arctic grayling and burbot were found to have total mercury concentrations ranging from 19.3 to 54.7 ng/g wet weight. The age of the lake trout is unknown, and the arctic grayling and burbot ranged in age from 4 to 8 years (adult fish).

7. DISCUSSION AND CONCLUSION

In summary, the limited sampling of fish in the area show several things:

- Wet and dry results for mercury were collected for each sample, and as expected, the dry results were found to have consistently higher mercury concentrations. This is explained by the lack of dilution from the water present in the tissue samples.

- Piscivorous adult lake trout showed significantly higher concentrations of methylmercury than non-piscivorous species such as arctic grayling.
- Burbot, while classified as piscivorous, is more of a scavenger than a predator, which may explain its lower concentrations compared with adult lake trout.
- There appears to be a correlation between the age of the fish and the methylmercury concentrations observed. This correlation appears to be more prevalent between piscivorous species than non-piscivorous species.
- Fish collected from Sally Lake had a much higher methylmercury concentration than those collected from streams and rivers. This may be due to variations in the methylation rate within the lake.
- Total and methylated mercury concentrations were virtually identical within each individual fish tested, suggesting that inorganic mercury sources in the study area are negligible.
- Data from ADEC (Table 4) suggests that total mercury concentrations in the Study Area appear to be below mean concentrations of samples collected in other parts of the Susitna River drainage.

It should be noted that a limited number of samples were collected from a relatively small area, and the conclusion may change with additional sample collection.

8. REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2012. Mercury concentration in fresh water fish Southcentral Susitna Watershed. Personal communication with Bob Gerlach, VMD, State Veterinarian. June 2012.

AEA (Alaska Energy Authority). 2011. Pre-Application Document: Susitna-Watana Hydroelectric Project FERC Project No. 14241. Volume I of II. Alaska Energy Authority, Anchorage, AK. 395p.Arctic Environmental Information and Data Center (AEIDC), 1985. Preliminary draft impact assessment technical memorandum, Volume 1. Main text.

AEA. 2012. Mercury Assessment and Potential for Bioaccumulation Study. Revised Study Plan: Susitna-Watana Hydroelectric Project FERC Project No. 14241, Section 5.7. December 2012. Prepared for the Federal Energy Regulatory Commission by the Alaska Energy Authority, Anchorage, Alaska. http://www.susitna-watanahydro.org/wp-content/uploads/2012/12/01-RSP-Dec2012_1of8-Sec-1-5-IntrothroughWaterQuality-v2.pdf.

Bodaly, R.A., Hecky, R.E., and Fudge, R.J.P. 1984. Increases in fish mercury levels in lakes flooded by the Churchill River diversion, northern Manitoba. *Can. J. Fish. Aquat. Sci.* 41: 682–691.

Bodaly, R.A., St. Louis, V.L., Paterson, M.J., Fudge, R.J.P., Hall, B.D., Rosenberg, D.M., and Rudd, J.W.M. 1997. Bioaccumulation of mercury in the aquatic food chain in newly flooded areas, *in* Sigel, A., and Sigel, H., eds., *Metal ions in biological systems: Mercury and its effects on environment and biology*. New York: Marcel Decker, Inc., p. 259-287.

Bodaly, R.A., Beaty K.G., Hendzel L.H., Majewski A.R., Paterson M.J., Rolfhus K.R., Penn A.F., St. Louis V.L., Hall B.D., Matthews C.J.D., Cherewyk K.A., Mailman M., Hurley, J.P., Schiff S.L., Venkiteswaran J.J. 2004. Experimenting with hydroelectric reservoirs. *Environmental Science & Technology*. American Chemical Society. pp. 346A-352A.

Bodaly, R.A., Jansen W.A., Majewski A.R., Fudge R.J.P., Strange N.E., Derksen A.J., Green D.J. 2007. Post impoundment time course of increased mercury concentrations in fish in hydroelectric reservoirs of Northern Manitoba, Canada. *Arch. Environ. Con tam. Toxicol.* 53:379-389.

Engstrom, D.R., and Swain, E.B. 1997. Recent declines in atmospheric mercury deposition in the Upper Midwest. *Environmental Science and Technology*, v. 31, no. 4, p. 960-967.

Fitzgerald, W.F., Engstrom, D.R., Mason, R.P., and Nater, E.A. 1998. The case for atmospheric mercury contamination in remote areas. *Environmental Science and Technology*, v. 32, no. 1, p. 1-7.

Frenzel, S.A. 2000. Selected Organic Compounds and Trace Elements in Streambed Sediments and Fish Tissues, Cook Inlet Basin, Alaska. USGS Water-Resources Investigations Report 00-4004. Prepared as part of the National Water-Quality Assessment Program.

Grigal, D.F., 2003. Mercury sequestration in forests and peatlands: a review. *Journal of Environmental Quality* 32:393-405.

Hall, B.D., Rosenberg D.M., Wiens A.P. 1998. Methylmercury in aquatic insects from an experimental reservoir. *Can. J. Fish. Aquat. Sci.* 55:2036-2047.

Hydro-Quebec. 2003. Environmental Monitoring at the La Grande Complex Summary Report 1978–2000: Evolution of Fish Mercury Levels. *Joint Report: Direction Barrages et Environment Hydro-Quebec Production and Groupe Conseil, Genivar Inc*. December 2003.

Johnston, T.A., Bodaly R.A., Mathias J.A. 1991. Predicting fish mercury levels from physical characteristics of boreal reservoirs. *Can. J. Fish. Aquat. Sci.* 48:1468-1475.

Kelly, C.A., Rudd J.W.M., Bodaly R.A., Roulet N.P., St. Louis V.L., Heyes A., Moore T.R., Schiff S., Aravena R., Scott K.J., Dyck B., Harris R., Warner B., Edwards G. 1997. Increases in fluxes of greenhouse gases and methylmercury following flooding of an experimental reservoir. *Environmental Science and Technology* 31:1334-1344.

Krabbenhoft, D.P., Wiener, J.G., Brumbaugh, W.G., Olson, M.L., DeWild, J.F., and Sabin, T.J. 1999. A national pilot study of mercury contamination of aquatic ecosystems along multiple gradients, *in* Morganwalp, D.W., and Buxton, H.T., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Charleston, South Carolina, March 8-12, 1999— Volume 2, Contamination of hydrologic systems and related ecosystems: U.S. Geological Survey Water-Resources Investigations Report 99-4018B, p. 147-162.

Lindberg, S., Bullock, R., Ebinghaus, R., Engstrom, D., Feng, X., Fitzgerald, W., Pirrone, N., Prestbo, E., and Seigneur, C. 2007. A synthesis of progress and uncertainties in attributing the sources of mercury in deposition. *Ambio*, v. 36, no. 1, p. 19-32.

Lockhart, W.L., Stem G.A., Low G., Hendzel M., Boila G., Roach P., Evans M.S., Billeck B.N., DeLaronde J., Friesen S., Kidd K.A., Atkins S., Muir D.C.G., Stoddart M., Stephens G., Stephenson S., Harbicht S., Snowshoe N., Grey B., Thompson S., DeGraff N. 2005. A history of total mercury in edible muscle of fish from lakes in northern Canada. *Science of the Total Environment* 351-352:427-463.

Morrison, K. and Thérien, N. 1991. Influence of Environmental Factors on Mercury Release in Hydroelectric Reservoirs, Montréal, Quebec, Canadian Electrical Association, 122 p.

Rosenberg, D.M., Berkes F., Bodaly R.A., Hecky R.E., Kelly C.A., Rudd J.W.M. 1997. Large scale impacts of hydroelectric development. *Environ. Rev.* 5:27-54.

Rylander, L.D., Grohn J., Tropp M., Vikstrom A., Wolpher H., De Castro e Silva E., Meili M., Oliveira L.J. 2006. Fish mercury increase in Lago Manso, a new hydroelectric reservoir in tropical Brazil. *Journal of Environmental Management* 81:155-166.

Somers, K.M. and D.A. Jackson. 1993. Adjusting mercury concentration for fish-size covariation: a multivariate alternative to bivariate regression. *Can. J. Fish. Aquat. Sci.* 50: 2388-2396.

St. Louis, V. L., Rudd, J.W.M, Kelly, C.A., Beaty, K.G., Bloom, N.S. and Flett, R.J. 1994. The importance of wetlands as sources of methylmercury to boreal forest ecosystems. *Can. J. Fish. Aquat. Sci.* 51: 1065–1076.

Swain, E.B., Engstrom, D.R., Brigham, M.E., Henning, T.A., and Brezonik, P.L. 1992. Increasing rates of atmospheric mercury deposition in midcontinental North America: *Science*, v. 257, p. 784-787.

USEPA (U.S. Environmental Protection Agency). 2000. Guidance for Assessing Chemical Contaminant Data for use in Fish Advisories: Volume 1 Fish Sampling and Analysis, 3rd Edition. EPA-823-B-00-007. United States Environmental Protection Agency, Office of Water. Washington, D.C. 485p.

Wiener, J.G., Knights, B.C., Sandheinrich, M.B., Jeremiason, J.D., Brigham, M.E., Engstrom, D.R., Woodruff, L.G., Cannon, W.F., and Balogh, S.J. 2006. Mercury in soils, lakes, and fish in Voyageurs National Park (Minnesota)—Importance of atmospheric deposition and ecosystem factors. *Environmental Science and Technology*, v. 40, p. 6261-6268.

9. TABLES

Table 1. Sediment Results from the Susitna River Drainage

Location	Mercury (ng/g dry weight)
Talkeetna River	40
Deshka River	460
Colorado Creek	180
Costello Creek	230
National median value	60

From Frenzel (2000)

Table 2. Whole Body Slimy Sculpin Results from the Susitna River Drainage

Location	Mercury (ng/g dry weight)
Talkeetna River	80
Deshka River	110
Costello Creek	80

From Frenzel (2000)

Table 3. Speciated Mercury Results from Susitna River Drainage (ng/g dry weight)

Location	Sediment		Fish	Water	
	Inorganic mercury	Methylmercury	Inorganic mercury	Inorganic mercury	Methylmercury
Deshka River	21	5.10	246 (SS)	Not sampled	Not sampled
Costello Creek	169	0.04	101 (DV)	4.97	0.02

SS = whole slimy sculpin
DV = Dolly Varden fillet

From Frenzel (2000)

Table 4. ADEC Results for Total Mercury in Fish Tissue Samples (wet, ng/g)

Susitna Drainage			
Species	**No. of Samples**	**Mean**	**Standard Deviation (+/-)**
Burbot	1	94	NA
Arctic Grayling	18	102.4	33.5
Lake Trout	3	380	320
All Alaska Drainages			
Species	**No. of Samples**	**Mean**	**Standard Deviation (+/-)**
Burbot	27	330	280
Arctic Grayling	44	84	32
Lake Trout	18	300	170

NA= Not applicable – only one sample

Table 5. Summary of Analytical Results

Sample ID	Species	Fish Length (mm)	Fish Weight (gm)	Estimated Age (yr.)	River Mile	Subdrainage	Sample Date	% Total Solids	Total Hg (dry ng/g)	Total Hg (wet ng/g)	Total MeHg (dry ng/g)	Total MeHg (Wet ng/g)
2012VSMCLK01	Lake trout	510	NM	NM	194.1	Sally Lake	08/03/2012	22.08	912	201	1,000	222
2012VSMCLK02	Lake trout	430	NM	NM	194.1	Sally Lake	08/03/2012	28.66	633	181	631	181
2012VSMGRA06	Arctic grayling	248	148	4	194.1	Watana Creek	08/11/2012	24.72	78.1	19.3	102	25.1
2012VSMGRA07	Arctic grayling	340	385	8	194.1	Watana Creek	08/11/2012	26.54	143	38.1	117	31.0
2012VSMGRB02	Burbot	410	NM	4	186.8	Susitna River	08/05/2012	19.85	200	39.6	207	41.1
2012VSMGRB03	Burbot	410	NM	5	192.6	Susitna River	08/05/2012	18.56	297	54.7	321	59.5

NM = Not measured.

10. FIGURES

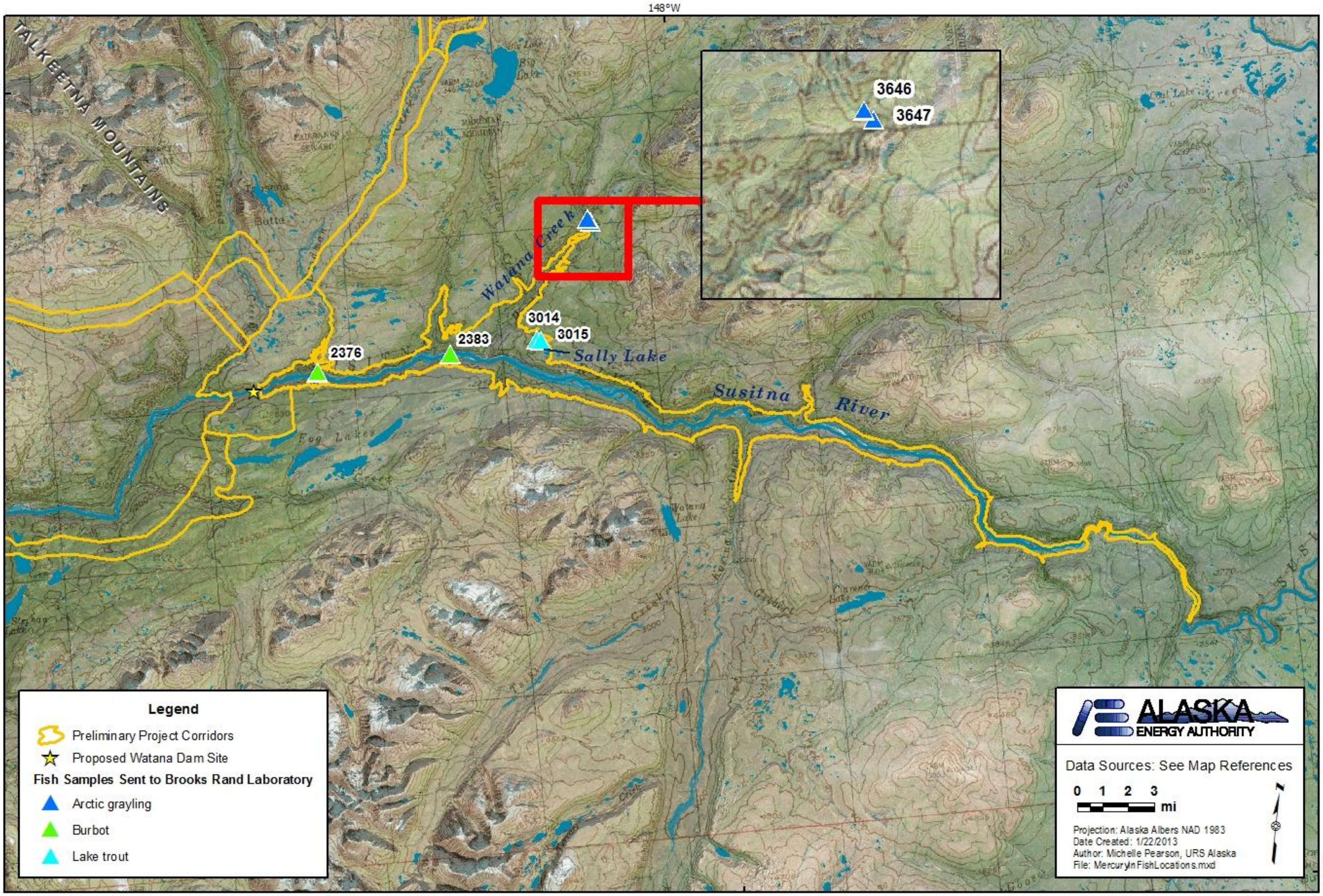

Figure 1. Map showing location of sample collection.

APPENDIX 1. ANALYTICAL DATA

BRL Report 1237029

November 12, 2012

URS Corp. - Anchorage
ATTN: Paul Dworian
560 East 34th Avenue
Anchorage, AK 99503
paul_dworian@urs.com

RE: Project URS-AN1201 Client Project: AEA Sustina – Watana

Dear Mr. Dworian,

On September 13, 2012, Brooks Rand Labs (BRL) received six (6) tissue samples. The samples were logged-in for the analyses total mercury (Hg), methyl mercury (MeHg), and percent total solids (%TS) according to the contract. All samples were received, prepared, analyzed, and stored according to BRL SOPs and EPA methodology.

The results were method blank corrected as described in the calculations section of the relevant BRL SOP(s) and may have been evaluated using reporting limits that have been adjusted to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific MDLs, MRLs, and other details. Sample results have been reported on a wet-weight and dry-weight basis.

Hg Sequence 1200755, Batch B121720

The average of the method blanks (BLKs) exceeded the limit; however, the standard deviation of the BLKs was low (0.03 µg/L). As the contamination was consistent, the method blank-correcting of sample results was appropriate and accounted for the observed contamination. At the instrument, sample *2012 VSM GRB 02* (1237029-01) had a concentration less than 10x the highest method blank. Any contamination was considered minimal and no further action was required.

MeHg Sequence 1200819, Batch B121914

The analysis of matrix spike (MS) performed on sample *2012 VSM GRB 02* (1237029-01) produced a recovery above the acceptance criteria (139%). The associated matrix spike duplicate (MSD) recovered within acceptance limits. The MeHg result for sample *2012 VSM GRB 02* (1237029-01) was qualified **N** for accuracy imprecision.

The standard reference material (SRM) recovered low in this batch and in all other batches analyzed in the same time frame. The SRM, NIST 1946, was analyzed along with other SRMs in another sequence. All other SRMs met recovery criteria while NIST 1946 recovered low. NIST 1946 was taken out use. The SRM was set to not reportable and data integrity is based on the other quality control results.

All data was reported without further qualification and all other associated quality control sample results met the acceptance criteria.

BRL, an accredited laboratory, certifies that the reported results of all analyses for which BRL is NELAP accredited meet all NELAP requirements. For more information please see the *Report Information* page in your report. Please feel free to contact us if you have any questions regarding this report.

Sincerely,

Lydia Greaves
Project Manager
lydia@brooksrand.com

Tiffany Stilwater
Project Manager
tiffany@brooksrand.com

Project ID: URS-AN1201
PM: Lydia Greaves

BRL Report 1237029
Client PM: Paul Dworian
Client PO: MSA

Report Information

Laboratory Accreditation

BRL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BRL is also certified by many other states to perform environmental analyses. For a current list of our accreditations /certifications, please visit our website at <http://www.brooksrand.com/default.asp?contentID=586>. Results reported relate only to the samples listed in the report.

Field Quality Control Samples

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

Common Abbreviations

BLK	method blank	**MS**	matrix spike
BRL	Brooks Rand Labs	**MSD**	matrix spike duplicate
BS	laboratory fortified blank	**ND**	non-detect
CAL	calibration standard	**NR**	non-reportable
CCV	continuing calibration verification	**PS**	post preparation spike
COC	chain of custody record	**REC**	percent recovery
CRM	certified reference material	**RPD**	relative percent difference
D	dissolved fraction	**RSD**	relative standard deviation
DUP	duplicate	**SCV**	secondary calibration verification
ICV	initial calibration verification	**SOP**	standard operating procedure
MDL	method detection limit	**SRM**	standard reference material
MRL	method reporting limit	**T**	total recoverable fraction

Definition of Data Qualifiers

(Effective 9/23/09)

B	Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
E	An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
H	Holding time and/or preservation requirements not met. Result is estimated.
J	Estimated value. A full explanation is presented in the narrative.
J-M	Duplicate precision (RPD) for associated QC sample was not within acceptance criteria. Result is estimated.
J-N	Spike recovery for associated QC sample was not within acceptance criteria. Result is estimated.
M	Duplicate precision (RPD) was not within acceptance criteria. Result is estimated.
N	Spike recovery was not within acceptance criteria. Result is estimated.
R	Rejected, unusable value. A full explanation is presented in the narrative.
U	Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
X	Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.

These qualifiers are based on those previously utilized by Brooks Rand Labs, those found in the EPA SOW ILM03.0, Exhibit B, Section III, pg. B-18, and the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review; USEPA; January 2010. These supersede all previous qualifiers ever employed by BRL.

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Project ID: URS-AN1201
PM: Lydia Greaves

BRL Report 1237029
Client PM: Paul Dworian
Client PO: MSA

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
2012 VSM GRB 02	1237029-01	Fish	Sample	08/05/2012	09/13/2012
2012 VSM CLK 01 (510mm)	1237029-02	Fish	Sample	08/05/2012	09/13/2012
2012 VSM CLK 02 (430mm)	1237029-03	Fish	Sample	08/05/2012	09/13/2012
2012 VSM GRB 03	1237029-04	Fish	Sample	08/03/2012	09/13/2012
2012 VSM GRA 06	1237029-05	Fish	Sample	08/11/2012	09/13/2012
2012 VSM GRA 07	1237029-06	Fish	Sample	08/11/2012	09/13/2012

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
%TS	Biota	SM 2540G	11/06/2012	11/08/2012	B122067	N/A
Hg	Biota	EPA 1631 Appendix	09/13/2012	10/02/2012	B121720	1200755
MeHg	Biota	EPA 1630	10/15/2012	10/25/2012	B121914	1200819

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Project ID: URS-AN1201
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BRL Report 1237029
Client PM: Paul Dworian
Client PO: MSA

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
2012 VSM CLK 01 (510mm)										
1237029-02	%TS	Fish	NA	22.08		0.17	0.57	%	B122067	N/A
1237029-02	Hg	Fish	dry	912		10.4	34.6	ng/g	B121720	1200755
1237029-02	Hg	Fish	wet	201		2.29	7.64	ng/g	B121720	1200755
1237029-02	MeHg	Fish	dry	1000		4.4	13.2	ng/g	B121914	1200819
1237029-02	MeHg	Fish	wet	222		1.0	2.9	ng/g	B121914	1200819
2012 VSM CLK 02 (430mm)										
1237029-03	%TS	Fish	NA	28.66		0.17	0.57	%	B122067	N/A
1237029-03	Hg	Fish	dry	633		8.09	27.0	ng/g	B121720	1200755
1237029-03	Hg	Fish	wet	181		2.32	7.73	ng/g	B121720	1200755
1237029-03	MeHg	Fish	dry	631		3.3	9.9	ng/g	B121914	1200819
1237029-03	MeHg	Fish	wet	181		0.9	2.8	ng/g	B121914	1200819
2012 VSM GRA 06										
1237029-05	%TS	Fish	NA	24.72		0.17	0.57	%	B122067	N/A
1237029-05	Hg	Fish	dry	78.1		0.48	1.60	ng/g	B121720	1200755
1237029-05	Hg	Fish	wet	19.3		0.12	0.39	ng/g	B121720	1200755
1237029-05	MeHg	Fish	dry	102		3.9	11.7	ng/g	B121914	1200819
1237029-05	MeHg	Fish	wet	25.1		1.0	2.9	ng/g	B121914	1200819
2012 VSM GRA 07										
1237029-06	%TS	Fish	NA	26.54		0.17	0.57	%	B122067	N/A
1237029-06	Hg	Fish	dry	143		8.80	29.3	ng/g	B121720	1200755
1237029-06	Hg	Fish	wet	38.1		2.33	7.78	ng/g	B121720	1200755
1237029-06	MeHg	Fish	dry	117		3.7	11.1	ng/g	B121914	1200819
1237029-06	MeHg	Fish	wet	31.0		1.0	2.9	ng/g	B121914	1200819
2012 VSM GRB 02										
1237029-01	%TS	Fish	NA	19.85		0.17	0.57	%	B122067	N/A
1237029-01	Hg	Fish	dry	200		11.9	39.6	ng/g	B121720	1200755
1237029-01	Hg	Fish	wet	39.6		2.36	7.87	ng/g	B121720	1200755
1237029-01	MeHg	Fish	dry	207	N	4.7	14.2	ng/g	B121914	1200819
1237029-01	MeHg	Fish	wet	41.1	N	0.9	2.8	ng/g	B121914	1200819
2012 VSM GRB 03										
1237029-04	%TS	Fish	NA	18.56		0.17	0.57	%	B122067	N/A
1237029-04	Hg	Fish	dry	295		12.4	41.4	ng/g	B121720	1200755
1237029-04	Hg	Fish	wet	54.7		2.31	7.69	ng/g	B121720	1200755
1237029-04	MeHg	Fish	dry	321		5.3	15.9	ng/g	B121914	1200819
1237029-04	MeHg	Fish	wet	59.5		1.0	2.9	ng/g	B121914	1200819

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Project ID: URS-AN1201
PM: Lydia Greaves

BRL Report 1237029
Client PM: Paul Dworian
Client PO: MSA

Accuracy & Precision Summary

Batch: B121720
Lab Matrix: Biota
Method: EPA 1631 Appendix

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B121720-SRM1	**Certified Reference Material (1219049, DORM-3)**						
	Hg		382.0	405.8	ng/g	106% 75-125	
B121720-DUP2	**Duplicate (1237029-03)**						
	Hg	633.0		634.9	ng/g dry		0.3% 30
B121720-MS2	**Matrix Spike (1237029-03)**						
	Hg	633.0	1710	2376	ng/g dry	102% 70-130	
B121720-MSD2	**Matrix Spike Duplicate (1237029-03)**						
	Hg	633.0	1710	2260	ng/g dry	95% 70-130	5% 30

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Project ID: URS-AN1201
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BROOKS RAND LABS
MEANINGFUL METALS DATA

BRL Report 1237029
Client PM: Paul Dworian
Client PO: MSA

Accuracy & Precision Summary

Batch: B121914
Lab Matrix: Biota
Method: EPA 1630

Sample	Analyte	Native	Spike	Result	Units	REC & Limits		RPD & Limits	
B121914-DUP1	**Duplicate (1237029-01)**								
	MeHg	207.2		203.7	ng/g dry			2%	35
B121914-MS1	**Matrix Spike (1237029-01)**								
	MeHg	207.2	953.2	1531	ng/g dry	*139%*	65-135		
B121914-MSD1	**Matrix Spike Duplicate (1237029-01)**								
	MeHg	207.2	973.5	1448	ng/g dry	127%	65-135	6%	35

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Project ID: URS-AN1201
PM: Lydia Greaves

BRL Report 1237029
Client PM: Paul Dworian
Client PO: MSA

Accuracy & Precision Summary

Batch: B122067
Lab Matrix: Biota
Method: SM 2540G

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B122067-DUP1	Duplicate (1237029-01)						
	%TS	19.85		19.78	%		0.4% 15

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Project ID: URS-AN1201
PM: Lydia Greaves

BRL Report 1237029
Client PM: Paul Dworian
Client PO: MSA

Method Blanks & Reporting Limits

Batch: B121720
Matrix: Biota
Method: EPA 1631 Appendix
Analyte: Hg

Sample	Result	Units
B121720-BLK1	0.32	ng/g
B121720-BLK2	0.30	ng/g
B121720-BLK3	0.24	ng/g
B121720-BLK4	0.28	ng/g

Average: 0.29 **Standard Deviation:** 0.03 **MDL:** 0.12
Limit: 0.24 **Limit:** 0.08 **MRL:** 0.40

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Project ID: URS-AN1201
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BRL Report 1237029
Client PM: Paul Dworian
Client PO: MSA

Method Blanks & Reporting Limits

Batch: B121914
Matrix: Biota
Method: EPA 1630
Analyte: MeHg

Sample	Result	Units
B121914-BLK1	-0.03	ng/g
B121914-BLK2	0.04	ng/g
B121914-BLK3	0.02	ng/g
B121914-BLK4	-0.05	ng/g

Average: 0.0 **Limit:** 2.0

Standard Deviation: 0.0 **Limit:** 0.7

MDL: 1.0 **MRL:** 3.0

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Project ID: URS-AN1201
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BRL Report 1237029
Client PM: Paul Dworian
Client PO: MSA

Method Blanks & Reporting Limits

Batch: B122067
Matrix: Biota
Method: SM 2540G
Analyte: %TS

Sample	Result	Units
B122067-BLK1	0.00	%
B122067-BLK2	0.00	%

Average: 0.00
Limit: 0.57

MDL: 0.17
MRL: 0.57

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Project ID: URS-AN1201
PM: Lydia Greaves

BRL Report 1237029
Client PM: Paul Dworian
Client PO: MSA

Sample Containers

Lab ID: 1237029-01
Sample: 2012 VSM GRB 02
Report Matrix: Fish
Sample Type: Sample
Collected: 08/05/2012
Received: 09/13/2012

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided			none	n/a		Cooler

Lab ID: 1237029-02
Sample: 2012 VSM CLK 01 (510mm)
Report Matrix: Fish
Sample Type: Sample
Collected: 08/05/2012
Received: 09/13/2012

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided			none	n/a		Cooler

Lab ID: 1237029-03
Sample: 2012 VSM CLK 02 (430mm)
Report Matrix: Fish
Sample Type: Sample
Collected: 08/05/2012
Received: 09/13/2012

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided			none	n/a		Cooler

Lab ID: 1237029-04
Sample: 2012 VSM GRB 03
Report Matrix: Fish
Sample Type: Sample
Collected: 08/03/2012
Received: 09/13/2012

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided			none	n/a		Cooler

Lab ID: 1237029-05
Sample: 2012 VSM GRA 06
Report Matrix: Fish
Sample Type: Sample
Collected: 08/11/2012
Received: 09/13/2012

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided			none	n/a		Cooler

Lab ID: 1237029-06
Sample: 2012 VSM GRA 07
Report Matrix: Fish
Sample Type: Sample
Collected: 08/11/2012
Received: 09/13/2012

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided			none	n/a		Cooler

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Project ID: URS-AN1201
PM: Lydia Greaves

BRL Report 1237029
Client PM: Paul Dworian
Client PO: MSA

Shipping Containers

Cooler

Received: September 13, 2012 9:00
Tracking No: 8005 6118 3349 via FedEx
Coolant Type: Dry Ice
Temperature: -2.3 °C

Description: Cooler
Damaged in transit? No
Returned to client? No

Custody seals present? No
Custody seals intact? No
COC present? Yes

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BRL Report 1237029

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Chain of Custody Record

1237029

Page 1 of 1

White: LAB COPY
Yellow: CUSTOMER COPY

Client: URS	Address: 700 G Street, Suite 500 Anchorage, AK 99501	COC receipt confirmation? (Y) N If so, by: (email) fax (circle one)
Contact: Paul Dworian		Email: paul-dorian@urs.com
Client project ID: AEA Susitna-Watana		
PO #:	Phone #: 907-261-6735	Fax #: 907-562-1297

Requested TAT in business days:
☐ 20 (standard)
☐ 15
☐ 10
☐ 5
☐ Other ____

Surcharges apply for expedited turn around times.

	Sample ID	Collection: Date	Collection: Time	Misc.: Sampler (initials)	Misc.: Matrix type	Misc.: # of containers	Misc.: Field filtered? (Y/N)	Field Preservation: Unpreserved / ice only	Field Preservation: HCl / HNO_3 (circle one)	Field Preservation: Other (specify)	Total Hg, EPA 1631	Methyl Hg, EPA 1630	ICP-MS Metals (specify)	As / Se species (specify)	% Solids	Filtration	Other (specify)	Other (specify)	Comments
1	2012 VSMGRB02	8/5/12		SP		1		✓											Contact Paul at URS for analysis instructions. Alternative contact - James Brady HDR Alaska 907-644-2011
2	2012 VSMCLK01 (510mm)	8/5/12		SP		1		✓											
3	2012 VSMCLK02 (430mm)	8/5/12		SP		1		✓											
4	2012 VSM GRB03	8/3/12		SP		1		✓											
5	2012 VSM GRA06	8/1/12		PB		1		✓											
6	2012 VSM GRA 07	8/1/12		PB		1		✓											
7																			
8																			
9																			
10																			

Relinquished by: Scott Prevatte	Date: 9/12/12	Time: 13:45	Relinquished by:	Date:	Time:
Received by:	Date:	Time:	Received at BRL by: [signature]	Date: 9/13/12	Time: 0900
Shipping carrier: Fed Ex	# of coolers: 1		BRL work order ID:	BRL project ID:	

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Sample_Tag	Lab ID	Sample Date	Result Dry	Result Wet	MDL Dry	MRL Dry	MDL Wet	MRL Wet	Units	Qualifiers	Dilution Factor	Anaylsis Method	Spike Level	% Recovery	Upper Control Limit	Lower Control Limit	RPD	Upper RPD Limit
2012 VSM CLK 01 (510mm)	1237029-02	08/05/2012	22.08	22.08	0.17	0.57	0.17	0.57	%		1	SM 2540G						
2012 VSM CLK 01 (510mm)	1237029-02	08/05/2012	912	201	10.4	34.6	2.29	7.64	ng/g		19	EPA 1631 Appendix						
2012 VSM CLK 01 (510mm)	1237029-02RE3	08/05/2012	1000	222	4.4	13.2	1.0	2.9	ng/g		1	EPA 1630						
2012 VSM CLK 02 (430mm)	1237029-03	08/05/2012	28.66	28.66	0.17	0.57	0.17	0.57	%		1	SM 2540G						
2012 VSM CLK 02 (430mm)	1237029-03	08/05/2012	633	181	8.09	27.0	2.32	7.73	ng/g		19	EPA 1631 Appendix						
2012 VSM CLK 02 (430mm)	1237029-03RE3	08/05/2012	631	181	3.3	9.9	0.9	2.8	ng/g		1	EPA 1630						
2012 VSM GRA 06	1237029-05	08/11/2012	24.72	24.72	0.17	0.57	0.17	0.57	%		1	SM 2540G						
2012 VSM GRA 06	1237029-05RE1	08/11/2012	78.1	19.3	0.48	1.60	0.12	0.39	ng/g		1	EPA 1631 Appendix						
2012 VSM GRA 06	1237029-05RE3	08/11/2012	102	25.1	3.9	11.7	1.0	2.9	ng/g		1	EPA 1630						
2012 VSM GRA 07	1237029-06	08/11/2012	26.54	26.54	0.17	0.57	0.17	0.57	%		1	SM 2540G						
2012 VSM GRA 07	1237029-06	08/11/2012	143	38.1	8.80	29.3	2.33	7.78	ng/g		19	EPA 1631 Appendix						
2012 VSM GRA 07	1237029-06RE3	08/11/2012	117	31.0	3.7	11.1	1.0	2.9	ng/g		1	EPA 1630						
2012 VSM GRB 02	1237029-01	08/05/2012	19.85	19.85	0.17	0.57	0.17	0.57	%		1	SM 2540G						
2012 VSM GRB 02	1237029-01	08/05/2012	200	39.6	11.9	39.6	2.36	7.87	ng/g		20	EPA 1631 Appendix						
2012 VSM GRB 02	1237029-01RE3	08/05/2012	207	41.1	4.7	14.2	0.9	2.8	ng/g	N	1	EPA 1630						
2012 VSM GRB 03	1237029-04	08/03/2012	18.56	18.56	0.17	0.57	0.17	0.57	%		1	SM 2540G						
2012 VSM GRB 03	1237029-04	08/03/2012	295	54.7	12.4	41.4	2.31	7.69	ng/g		19	EPA 1631 Appendix						
2012 VSM GRB 03	1237029-04RE3	08/03/2012	321	59.5	5.3	15.9	1.0	2.9	ng/g		1	EPA 1630						
Method Blank	B121720-BLK1		0.32	0.32	0.12	0.40	0.12	0.40	ng/g	B	1	EPA 1631 Appendix						
Method Blank	B121720-BLK2		0.30	0.30	0.12	0.40	0.12	0.40	ng/g	B	1	EPA 1631 Appendix						
Method Blank	B121720-BLK3		0.24	0.24	0.12	0.40	0.12	0.40	ng/g	B	1	EPA 1631 Appendix						
Method Blank	B121720-BLK4		0.28	0.28	0.12	0.40	0.12	0.40	ng/g	B	1	EPA 1631 Appendix						
DORM-3	B121720-SRM1		405.8	405.8	0.58	1.94	0.58	1.94	ng/g		5	EPA 1631 Appendix	382.0	106	125	75		
Method Blank	B121914-BLK1		1.0	1.0	1.0	3.0	1.0	3.0	ng/g	U	1	EPA 1630						
Method Blank	B121914-BLK2		1.0	1.0	1.0	3.0	1.0	3.0	ng/g	U	1	EPA 1630						
Method Blank	B121914-BLK3		1.0	1.0	1.0	3.0	1.0	3.0	ng/g	U	1	EPA 1630						
Method Blank	B121914-BLK4		1.0	1.0	1.0	3.0	1.0	3.0	ng/g	U	1	EPA 1630						
Method Blank	B122067-BLK1		0.17	0.17	0.17	0.57	0.17	0.57	%	U	1	SM 2540G						
Method Blank	B122067-BLK2		0.17	0.17	0.17	0.57	0.17	0.57	%	U	1	SM 2540G						
2012 VSM CLK 02 (430mm)	B121720-DUP2	08/05/2012	634.9	182.0	8.04	26.8	2.31	7.68	ng/g		19	EPA 1631 Appendix					0	30
2012 VSM CLK 02 (430mm)	B121720-MS2	08/05/2012	2376	681.0	8.21	27.4	2.35	7.84	ng/g		20	EPA 1631 Appendix	1710	102	130	70		
2012 VSM CLK 02 (430mm)	B121720-MSD2	08/05/2012	2260	647.8	8.21	27.4	2.35	7.84	ng/g		20	EPA 1631 Appendix	1710	95	130	70	5	30
2012 VSM GRB 02	B121914-DUP1	08/05/2012	203.7	40.4	5.0	14.9	1.0	3.0	ng/g		1	EPA 1630					2	35
2012 VSM GRB 02	B121914-MS1	08/05/2012	1531	304.0	4.8	14.3	0.9	2.8	ng/g		1	EPA 1630	953.2	139	135	65		
2012 VSM GRB 02	B121914-MSD1	08/05/2012	1448	287.5	4.9	14.6	1.0	2.9	ng/g		1	EPA 1630	973.5	127	135	65	6	35
2012 VSM GRB 02	B122067-DUP1	08/05/2012	19.78	19.78	0.17	0.57	0.17	0.57	%		1	SM 2540G					0	15