Fugitive Dust Risk Management Plan
2016 Annual Report

Red Dog Operations
Teck Alaska Incorporated
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Teck

Contents

Acronyms and Abbreviations

CAKR	Cape Krusenstern National Monument
CSB	concentrate storage building
CSP	DEC Contaminated Sites Program
DEC	Alaska Department of Environmental Conservation
DFG	Alaska Department of Fish and Game
DMTS	DeLong Mountain Transportation System
EV	environmental
HE	heavy equipment
MOA	Memorandum of Agreement
MSHA	Mine Safety and Health Administration
NANA	NANA Regional Corporation
NPS	National Park Service
OSHA	Occupational Safety and Health Administration
PAC	Personnel Accommodations Complex
RMP	Fugitive Dust Risk Management Plan
SMK	Seasonal Mann-Kendall
Teck	Teck Alaska Incorporated
Tdam	Main Tailings Dam
TEOM	tapered element oscillating microbalance
TSP	total suspended particulates
VEE	visible emissions evaluation
WAH	Western Arctic Herd
XRF	x-ray fluorescence

Summary

This document presents the Fugitive Dust Risk Management Plan (RMP) Annual Report for 2016. A history of RMP activities was provided in the first (2011) Annual Report (Teck 2012) and will not be repeated here. This report is not intended to provide a complete background of the RMP or the RMP Implementation Plans; if background is needed, the reader is encouraged to review the RMP, Implementation Plans, and previous Annual Reports available at www.RedDogAlaska.com.

This report includes results from efforts related to each of the risk management implementation plans, including the Communication Plan, Dust Emissions Reduction Plan, Remediation Plan, Worker Dust Protection Plan, Uncertainty Reduction Plan, and Monitoring Plan. Activities related to these implementation plans are summarized below.

The Communication Plan contains a description of Red Dog's efforts to maintain clear communication with all interested parties and local communities about current fugitive dust risk management efforts underway at the mine. Communication activities during 2016 included regularly scheduled village visits, meetings with the NANA Regional Corporation (NANA), the Subsistence Committee, and other stakeholders and organizations who expressed an interest in mine operations. A variety of other outreach, engagement, and educational efforts were undertaken in 2016.

The Dust Emissions Reduction Plan describes current dust reduction efforts underway at the mine. Dust emissions reduction activities during included trial of a new dust suppression product for the tailings impoundment. The product was applied via an airplane turbine-powered Thrush crop duster in September 2016. Also, the port road was treated with calcium chloride during the summer months for dust suppression.

In October 2016, the Subsistence Committee expressed concern that water trucks were unavailable due to repairs for port road dust control when needed during summer 2016. In response, Red Dog Operations (RDO) has elevated the importance of how water trucks are serviced, making them a high priority for repairs. This is described in more detail in the below section on dust emissions reduction.

Remediation activities in 2016 included reclamation of a previous zinc concentrate spill at MS-13. Ground cover failed to establish, so additional fresh seeds will be ordered, and the site will be revegetated in summer 2017. Also, as presented in the Fugitive Dust Risk Management Plan 2015 Annual Report, data collected in 2015 showed that lead concentrations exceeded Arctic Zone Industrial Cleanup Levels three consecutive times in 2015 at the port site. Based on these results, the section of the road with elevated metals concentrations was reclaimed and resurfaced in October 2016, per procedures described in the Fugitive Dust Risk Management Monitoring Plan.

The Worker Dust Protection Plan details those programs in place to monitor and minimize workers' exposure to dust while at Red Dog and to facilitate comprehensive communication about these programs, policies, and practices. In 2016, worker health monitoring continued through regular blood lead level testing, results of which are reported directly to the State of Alaska by the testing laboratory and by environmental monitoring performed by the onsite Safety & Health department. Strictly enforced policies remain in place to ensure that worker health is protected and that all work environments are safe. Teck takes employee health extremely seriously and noncompliance with health and safety policies is not tolerated.

The Uncertainty Reduction Plan is intended to identify and implement research or studies to reduce uncertainties related to the assessment and management of risk to humans and the environment. In 2014, a study was planned to evaluate bone and bone marrow consumption. Part of the study incorporates a cooking competition so that individuals from Kivalina and Noatak can prepare dishes that include caribou bone, and lead concentrations in those dishes will be measured. Sampling of caribou and implementation of the first phase of the study is anticipated for early 2018, with development of the detailed phase two study plan (the community-based cooking study) to follow later in 2018.

The Monitoring Plan is intended to provide the necessary operational and environmental monitoring data to facilitate continued reduction of fugitive metals emissions and dust emissions and verify the continued safety of caribou and other subsistence foods and water, as well as the health of ecological environments and habitats in the vicinity of the mine, road, and port. In 2016, monitoring activities described in the Monitoring Plan proceeded on schedule, and statistical analyses were performed on multi-year data to identify and evaluate any trends and

patterns; specific results are presented in the “Monitoring Actions” section of this report. In 2016, the following monitoring programs were implemented:

- Visual emissions evaluations
- Source monitoring at the mine and port with real time air samplers
- Real-time alarm system monitoring for dust at the mine
- Road surface monitoring to assess tracking of metals
- Dustfall jar monitoring at the mine, road, and port.

Results from the monitoring programs largely indicate that concentration trends are flat over the most recent four-year period (i.e., no increasing or decreasing trend). Overall, environmental media concentrations remain similar to or lower than those evaluated in the DeLong Mountain Transportation System (DMTS) risk assessment (Exponent 2007).

Introduction

In accordance with the RMP (Exponent 2008), the purpose of this report is to provide a summary of risk management activities conducted at the Red Dog operation in the prior calendar year.

Background

The Red Dog Mine is approximately 50 miles inland of the Chukchi Sea, in the western end of the Brooks Range of Northern Alaska. The mine is located on land owned by NANA and operated by Teck Alaska Incorporated (Teck). Base metal mineralization occurs naturally throughout much of the western Brooks Range, and strongly elevated zinc, lead, and silver concentrations have been identified in many areas (Exponent 2007). The Red Dog Mine has been in operation since 1989.

At the mine, ore containing lead sulfide and zinc sulfide is mined and milled to produce lead and zinc concentrates in a powder form. These concentrates are hauled year round from the mine via the DMTS road to concentrate storage buildings (CSBs) at the port, where they are stored until being loaded onto ships during the summer months. The storage capacity allows mine operations to continue year round. During the shipping season, the concentrates from the storage buildings are loaded into an enclosed conveyor system and transferred to the shiploader and then into barges. The barges have built-in and enclosed conveyors used to transfer the concentrates to the holds of deepwater ships. The DMTS road passes through the Cape Krusenstern National Monument (CAKR), which is managed by the National Park Service (NPS). A study conducted by NPS in 2000 found elevated levels of metals in moss near the DMTS road, declining with distance from the road (Ford and Hasselbach 2001).

Teck conducted studies to characterize the dust issue throughout the mine, road, and port areas, and subsequently conducted a human health and ecological risk assessment (Exponent 2007) to estimate possible risks to human and ecological receptors[1] posed by exposure to metals in soil, water, sediments, and plants and animals in areas surrounding the DMTS and in areas surrounding the Red Dog Mine ambient air/solid waste permit boundary and port site. The human health risk assessment evaluated potential exposure to DMTS-related metals through

[1] Plants and animals

incidental soil ingestion, water ingestion, and subsistence food consumption under three scenarios: 1) child subsistence use, 2) adult subsistence use, and 3) combined worker/subsistence use.

The human health risk assessment, which included subsistence foods evaluations, found it is safe to continue harvesting subsistence foods from all areas surrounding the DMTS and mine, including in unrestricted areas near the DMTS, without restrictions. Although harvesting remains off limits within the DMTS, human health risks were not elevated even when data from restricted areas were included in the risk estimates.

The ecological risk assessment evaluated potential risks to ecological receptors inhabiting terrestrial, freshwater streams and ponds, coastal lagoons, and marine environments from exposure to DMTS-related metals. The ecological risk assessment found that:

- In the tundra environment, changes in plant community composition (for example, decreased lichen cover) were observed near the road, port, and mine, although it was not clear to what extent those effects may have resulted from metals in fugitive dust, or from other chemical and physical effects typical of dust from gravel roads in Alaska.
- The likelihood of risk to populations of animals was considered low, with the exception of possible risks related to lead for ptarmigan living closest to the port and mine.
- No harmful effects were observed or predicted in the marine, coastal lagoon, freshwater stream, and tundra pond environments, although the potential for effects to invertebrates and plants could not be ruled out for some small, shallow ponds found close to facilities within the port site. However, no effects were observed in these port site ponds during field sampling.

After completing the risk assessment, Teck prepared an RMP designed to minimize the potential for effects to human health and the environment over the remaining mine life and beyond (Exponent 2008).

Risk Management Plan Overview

Based on the results of the risk assessment, and stakeholder input on risk management objectives, an RMP was developed to combine and build upon Teck's prior and ongoing efforts to reduce dust emissions and minimize potential effects to human health and the environment

over the life of the mine. Specifically, the overarching risk management goal is to: "*Minimize risk to human health and the environment surrounding the DMTS and outside the Red Dog Mine boundary over the life of the mine*."[2]

Although human health risks were not found to be elevated, and potential ecological risks were found to be limited, conditions may change over time, and this possibility was also considered in the design of the RMP. Future changes in conditions and in potential human and ecological exposures over the life of the operation can be addressed through implementation of risk management, dust emissions control, and monitoring activities. More specifically, the RMP established a set of seven risk management objectives (Exponent 2008), which formed the basis for preparation of six implementation plans. Each of the six implementation plans addresses one or several of the overall objectives of the RMP (Figure 1) and includes the planned scope of work to achieve the objectives.

This annual report assumes the reader has some familiarity with the Fugitive Dust Risk Management program and is therefore not intended to be a thorough discussion of that program, nor is it intended to provide complete background on either the risk management program or risk assessment that lead to the development of the RMP. To develop a more thorough understanding of the risk management programs, interested parties are encouraged to review the human health and ecological risk assessment documents (Exponent 2007), as well as the RMP (Exponent 2008) and its component implementation plans:

- Communication Plan (Exponent 2010)
- Dust Emissions Reduction Plan (Exponent 2011a)
- Remediation Plan (Exponent 2011b)
- Worker Dust Protection Plan (Exponent 2011c)
- Monitoring Plan (Exponent 2014a)
- Uncertainty Reduction Plan (Exponent 2012)

These plans are available for review at http://www.teck.com/operations/united-states/operations/red-dog/.

[2] Note that the mine closure and reclamation plan addresses risk management within the mine solid waste permit boundary (collocated with the ambient air boundary, see Figure 3).

Data Collection and Reporting Objectives

The risk management program includes collection of a large amount of data for various implementation plans (discussed below) intended for either operational or regulatory purposes. Data collected for operational purposes are intended to provide Teck with information on the effectiveness of dust emissions control and reduction efforts. Data collected for regulatory purposes are intended to provide the Alaska Department of Environmental Conservation (DEC) with the necessary information to verify that conditions are protective of human health and the environment.

The soil monitoring and marine sediment monitoring programs (described in the section below regarding the summary of monitoring results) are intended to satisfy a number of requirements, including the regulatory requirements under the DEC Contaminated Sites Program (CSP), pursuant to 18 AAC 75.360. These two programs are intended to provide DEC with a means to continue oversight and implement enforcement actions as needed. As such, the results of these programs are formally documented in separate reports to DEC after each monitoring event. These monitoring programs are discussed in the “Monitoring Programs for DEC Oversight” section below, within the “Monitoring Actions” section.

Please note that soil monitoring was not conducted in 2016 because the event is scheduled every three years. The next soil monitoring event is scheduled for summer 2017.

Report Organization

The annual report summarizes work conducted during the 2016 calendar year related to each of the implementation plans that compose the overall RMP. Sections are provided that document the communication, dust emissions reduction, remediation, worker dust protection, uncertainty reduction, and monitoring actions taken in 2016.

Risk Management Actions Taken in 2016

The following sections of this annual report summarize each implementation plan, the corresponding risk management objectives, and the actions taken during the 2016 calendar year toward achieving these objectives.

Communication Actions

The Communication Plan follows from Risk Management Objective #6: *Improve collaboration and communication among all stakeholders to increase the level of awareness and understanding of fugitive dust issues*. To achieve this objective, the Communication Plan was developed with the goal "To establish consistent methods for communication and collaboration among stakeholders regarding efforts related to dust emission issues." The plan identified multiple types of communication actions in three categories: communication, collaboration, and education and outreach. A number of methods from these three categories have been implemented as part of the various risk management programs within the RMP. The actions taken in 2016 are outlined below.

The following actions were taken in 2016 to increase communication and participation and to ensure that information is being communicated to all stakeholders and communities of interest in an effective manner:

- **Community Meetings.** Red Dog continued to hold annual community visits/meetings in the surrounding communities. The community meetings provide an opportunity for Red Dog to give the communities updated information on operations, including environmental matters. It also provides an opportunity for community members to raise any concerns.
- **Subsistence Committee Meetings.** Red Dog holds quarterly meetings with the Red Dog Subsistence Committee. This provides a key opportunity to obtain input from knowledge holders and elders from Kivalina and Noatak.
    - In 2016, Red Dog shared information about concentrate spill cleanup efforts, Red Dog longevity, shipping season, port security procedures and caribou hunting safety, and fugitive dust control.
    - Teck received a letter from the Subsistence Committee regarding dust control, mainly on the Port Road and Port Site. Teck is working to address the concerns outlined in this letter. The process to make dust control a higher priority has

involved many departments, such as Mining, Surface Crew, Heavy Equipment (HE), and Information Technology. The subsistence committee is updated quarterly on Teck's progress addressing these concerns. For more detail, please refer to the section titled "Dust Emissions Reduction Actions" below.

- **Meetings with the Kivalina IRA.** Red Dog meets regularly with the Kivalina IRA Council. Topics of discussion have included the creation of a Memorandum of Agreement (MOA) in which a working group is formed to address environmental concerns, human health issues, traditional land use, and other topics decided on by the working group.

- **Outreach and Education.** Red Dog continues to look for opportunities to provide stakeholders and communities of interest with greater understanding of their operations.
    - The Red Dog Environmental Observer program was implemented to encourage community members to accompany Red Dog environmental technicians (or others) in the field during sampling or testing events. In 2016, the environmental observer program focused on providing additional opportunities for community members to develop a greater understanding of health and environmental monitoring efforts. A resident from Kivalina was invited to accompany and observe the marine sediment sampling event conducted offshore near the Red Dog Port site. The sampling event is conducted by Red Dog environmental personnel every two years as part of the RMP. For more detail, please refer to the section titled "Monitoring Actions" below.
    - Red Dog continued working in collaboration with the Alaska Plant Materials Center to develop a native seed collection program in the village of Noatak, with the intent to use the seed for Red Dog reclamation activities including concentrate spill sites. The pilot study will serve to establish a fair price/unit for native seeds so that stakeholders who wish to collect native plant seeds for remediation/reclamation can operate as independent business owners.

Dust Emissions Reduction Actions

The Dust Emissions Reduction Plan is intended to achieve Risk Management Objective #1: *Continue reducing fugitive metals emissions and dust emissions*. To achieve this objective, the Dust Emissions Reduction Plan was developed with the goal "To reduce the amount of fugitive

dust released into the environment near the DMTS and Red Dog Mine to protect human health and the environment."

Road Dust Emissions Reduction Actions. In spring and summer 2016, as in every spring and summer, during the warmer months when snow and ice are no longer present, calcium chloride is applied to the gravel roads as a dust suppressant because it retains moisture for prolonged periods. Additionally, water trucks spread water on the port and mine site roads. Using the calcium chloride with water applications holds down dust and stabilizes unpaved road surfaces. Calcium chloride applications will be continued in spring 2017, but an additional product(s) may also be tried and evaluated for effectiveness.

Subsistence Committee Port Road Concerns. On October 3, 2016, the Subsistence Committee, composed of Kivalina and Noatak elders, sent a letter to RDO expressing concerns about the watering trucks being out of service and unavailable during summer 2016. In response to the letter, RDO has elevated the importance of how water trucks are serviced, making them a high priority for repairs. Specifically in response to the letter, the following system improvements have been made in the heavy equipment repair shop:

- An EV (environmental) designation has been added to all watering-related equipment, including trucks, pumps, spray parts, etc. The EV designation emphasizes the importance of the equipment that supports environmental commitments, marking it as first priority for repairs.
- A new planning board was installed in the HE Shop for surface crew equipment (started October 12, 2016) to improve communication between the Surface Crew and the HE Shop.
- The HE Shop has committed one bay per shift to working on surface crew equipment (starting October 17, 2016) so EV designated equipment always has priority for repairs and maintenance.

During the quarterly Subsistence Committee meeting (October 18, 2016), a representative from the Red Dog Environmental Department was present and thanked the Elders for providing the letter of concern to Red Dog. A presentation that outlined the above changes was also discussed with the Elders.

Tailings Beach Dust Suppression. In 2015, a new dust suppression product was tested in the laboratory and showed favorable results for use at RDO. Although initially intended for use on the roads, further discussion with the manufacturer suggested it might not hold up to heavy traffic as well as the calcium chloride already in use on the road. Instead, laboratory trials by the manufacturer suggested the product would be well suited for dust suppression on Red Dog tailings beaches. Therefore, the product was ordered and applied by a crop duster airplane (garret turbine powered Thrush with a load capacity of 4,000 pounds and 510 gallons) from Glenn Air and also by hydroseeder from September 9–16, 2016, to all exposed tailings beaches. The product (Tall Oil Pitch, or TOP, by *Enssolutions*) is derived from wood and is biodegradable, non-toxic, non-water soluble, non-leaching, non-corrosive, and passes toxicity testing. The viscous, dark brown sticky substance is effective at suppressing dust releases from mine tailings by forming a water and wind-proof barrier. Depending on ease of use and effectiveness, the product may be used again in fall 2017 for tailings dust suppression.

Future Dust Emissions Reduction Actions. In 2016, RDO began discussions regarding future planned dust emissions reduction actions. A few ideas were generated during discussions, including purchasing a calcium chloride dust suppressant spreader for the port areas, securing a water truck specifically for watering roads in the port area, and possibly designing a waterless air-wash for trucks exiting the Truck Unloading Building at the Port. Updates on these potential plans will be provided in 2017.

Remediation Actions

The Remediation Plan is intended to facilitate the achievement of the Risk Management Objective #2: *Continue remediation or reclamation of selected areas to reduce human and ecological exposure.* To achieve this objective, the Remediation Plan was developed with the goal “To define a consistent method for identifying and selecting affected areas and implementing remediation and/or reclamation” (for metals- or ore-concentrate-affected areas). Specific requirements for remediation are set forth in various permits and approved documents such as the Reclamation and Closure Plan (Teck 2011) and referenced in the Remediation Plan.

MS-13 Zinc Spill Reclamation. Reclamation of a previous zinc concentrate spill at MS-13 occurred in 2016. On October 3, 2015, a Nana/Lynden truck trailer hauling a load of zinc concentrate along the Port Road from the Red Dog Mine towards the Red Dog Port exited the

shoulder of the road. The rear trailer went off the west side of the Port Road, and the spill occurred in an area with a steep slope leading from the west Port Road shoulder down to a drainage. The tractor and first trailer stayed upright, and the driver was uninjured. The total weight of concentrate spilled to the environment was 144,000 pounds (65,500kg).

The driver reported the incident to his supervisor, the scene was secured, and agencies and stakeholders were notified of the spill as required. A major recovery effort was undertaken immediately to collect the concentrate piled on the tundra and in the drainage. Areas with elevated zinc levels were excavated by hand, and the excavated soil was removed from the site. Soil samples were taken after the cleanup for laboratory analysis.

Based on the results of analyzing the soil samples, additional corrective actions were completed with participation of the firm Restoration Science and Engineering in February 2016 to complete the cleanup activities. On June 18 and June 19, 2016, the following control and protective measures were used for revegetation and stabilization at the MS-13 Site by Nana/Lynden and Restoration Science and Engineering personnel:

- Upslope Control Measures
  - Two shallow diversion ditches were installed along the road to help prevent run-on during stabilization of the site
  - Two rock check dams were installed between the diversion ditches to help reduce sediment flow and slow storm water velocities
  - Coir logs were installed at the drainage location between the roadway ditch and site to help slow, filter and dissipate run-on

- Control Measures Installed
  - Surface roughening and trench preparation for jute mat and fiber rolls
    - Using hand tools (hoes, shovels, and pick-axe) and jack hammer in some areas
  - Grading side slope to remove rill and gully formation
    - Using hand tools (hoes and shovels)
  - Hydro seeded the disturbed areas per the Alaska Revegetation Manual for Arctic Region and existing Red Dog revegetation practices
    - Approximately 25 to 30 lb of seed mix

        - Approximately 25 lb of Arctared red fescue, Alyeska polargrass, and Tundra glaucous bluegrass
        - Approximately 5 lb of Norcoast Bering hairgrass
    - 150 lb of fertilizer
    - 300 lb of mulch
- Jute mat installation in accordance with the manufacturers recommendations and Best Management Practice AK-14, keyed in at top and 6-inch staples throughout
- Coir log and straw wattles along slope, approximately 10 to 15 foot intervals based on steepness of the slope
    - Coir logs were installed at the toe of the slope for stream bank protection while vegetation becomes established and to reduce the potential sediment transport into the stream.

The entire seeded area was watered a few times per week to provide sufficient moisture for seed germination, but the ground cover failed to establish. Seed samples were sent to Peter Johnson at Alaska Department of Natural Resources (Plant Materials Center) for testing. Unfortunately, the seed tests suggested rates of germination from 0 to 7%. Therefore, additional fresh seeds will be ordered and the site will be revegetated in May or June 2017, using the same methods outlined above. Additionally, all previous spill sites remediated in 2015 and 2016 will be revisited in summer 2017 and reseeded as necessary.

Port Race Track Remediation and Resurfacing. As part of the Red Dog Fugitive Dust Risk Management Monitoring Plan, road surface monitoring is conducted to determine metals concentrations on road surfaces, which are potential sources of metals via tire spray and windblown dust to the surrounding environment. Monitoring is conducted every two months. As discussed in the Fugitive Dust Risk Management Plan 2015 Annual Report, data collected in 2015 showed that lead concentrations exceeded Arctic Zone Industrial Cleanup Levels three consecutive times in 2015 at the port site. Based on these results, the section of the road that had elevated metals concentrations was reclaimed and resurfaced in October 2016, per procedures described in the Fugitive Dust Risk Management Monitoring Plan.

On August 23, 2016, additional port road sampling was conducted by the Red Dog Environmental Department. The port road was sampled from the surge bin to 2,500 feet beyond the racetrack exit. Each sampling decision unit was 500 feet long, and 10 x-ray fluorescence

(XRF) samples were taken from each decision unit and averaged together. Results were highest just past the Truck Unloading Building and tapered off from that point. Concentrations decreased drastically as one continued clockwise around the racetrack. Concentrations along the port road were also much lower than those around the racetrack. This sampling event dictated that remediation of the road was warranted all around the racetrack.

Remediation took place from August 27 through 29, 2016. A total of 325.5 cubic yards of material (11 dump-truck loads and 7 end-dump loads) were hauled from the racetrack to the mine for recycling through the mill. Approximately 499 cubic yards of clean material was placed back around the racetrack to replace what had been hauled away.

Worker Dust Protection Actions

The Worker Dust Protection Plan was developed in response to Risk Management Objective #7: *Protect worker health*. To achieve this objective, the Worker Dust Protection Plan was developed with the goal "To minimize worker exposure to fugitive dust, provide ongoing monitoring of exposure, and ensure a comprehensive communication system."

Safety is a core value for Teck, and Teck is committed to providing leadership and resources for managing safety and health. Accordingly, the company has developed Environment, Health, Safety, and Community Management Standards applicable to their operations worldwide. In addition, Teck has developed a comprehensive Occupational Safety and Health Program tailored specifically to RDO to protect worker health. The program complements the corporate standards and is designed to manage all aspects of workplace safety and health, including worker dust protection. The Worker Dust Protection Plan ties in closely with the existing health and safety programs at the mine, which are overseen by the Safety & Health and Medical departments.

Worksite blood lead monitoring was conducted in 2016 by the Safety & Health and Medical Departments. Blood lead level testing is performed for all employees on a regular basis and the State of Alaska receives copies of all laboratory results directly from the third-party laboratory. In 2016, blood lead monitoring results indicated exposures were below both the MSHA/OSHA standards. Five people exhibited blood lead levels slightly highergreater than the more stringent Red Dog standards, ranging from 25.2 to 37.3 µcg/dL. Therefore, those five underwent

additional blood lead monitoring, and two of them received counseling. No workers were removed from the job due to blood lead levels in 2016.

Uncertainty Reduction Actions

The Uncertainty Reduction Plan follows from Risk Management Objective #5: *Conduct research or studies to reduce uncertainties in the assessment of effects to humans and the environment*. In order to achieve this objective, the Uncertainty Reduction Plan was developed with the goal: "To identify and prioritize prospective research or studies to reduce uncertainties in the assessment of effects of fugitive dust to humans and the environment."

Caribou Subsistence Use. Because caribou are an important subsistence resource, a scientific research article was prepared in 2017 that addresses the Western Arctic Herd caribou that overwinter near Red Dog. In the article, multiple lines of evidence were used to evaluate the contribution of metals in fugitive dusts associated with Red Dog operations and transport to metals levels in caribou and potential risks associated with subsistence consumption of caribou harvested near the road and mine. The study found that fugitive dust emissions associated with Red Dog are not a significant source of metals in caribou and that caribou remain safe for subsistence level human consumption. In addition, the study indicates that caribou do not appear to avoid the area of RDO, the Road, and the Port. Rather, the data indicate actual use of the area by WAH caribou is what would be expected based on its geographic area relative to the entire WAH range. The manuscript, titled "Application of a weight of evidence approach to evaluating risks associated with subsistence caribou consumption near a lead/zinc mine" was submitted for peer review to a scientific journal. A draft copy of the manuscript is included in the appendix.

Upcoming Caribou Cooking Study. The results of the risk assessment (Exponent 2007) indicated that overall human health risks were low, including potential risks associated with consumption of metals in caribou tissue. Consumption of caribou muscle (meat), liver, and kidney was evaluated in the risk assessment, but bone and bone marrow were not directly evaluated. Community members expressed concern that they could be exposed to lead stored in caribou bone; therefore, an additional study has been planned to evaluate bone and bone marrow consumption. The primary objective of the study is to conduct an analysis to determine typical bone lead levels in caribou and transfer of lead from bone to food during cooking. In addition, a cooking competition will be incorporated into the study so that individuals from

Kivalina and Noatak can prepare dishes that include caribou bone, and lead concentrations will be measured in those dishes. The scientific questions that this study seeks to address include the following:

1. What are the lead concentrations in bone and bone marrow in caribou harvested near Red Dog?
2. Are lead concentrations in marrow and bone from caribou harvested near Red Dog different from those in reference caribou harvested elsewhere?
3. How much lead does marrow/bone contribute to food cooked by the local community with those ingredients?
4. How do lead concentrations in marrow/bone from other meats (e.g., beef) compare to caribou?

A detailed phase one study plan (the laboratory-based cooking study) was developed in 2015 and 2016. The detailed phase one study plan will be issued for review by the Ikayuqtit Review Team in 2017. Following stakeholder review, the detailed phase one study plan will be updated as needed and then posted to www.RedDogAlaska.com. Sampling of caribou and implementation of the first phase of the study is anticipated for 2018, with development of the detailed phase two study plan (the community-based cooking study) to follow later in 2018 or 2019.

Monitoring Actions

The Monitoring Plan (Exponent 2014a) is intended to facilitate the achievement of the following risk management objectives:

- Objective 1: Continue reducing fugitive metals emission and dust emissions [this objective is indirectly addressed through monitoring to verify effectiveness of operational dust control measures]
- Objective 3: Verify continued safety of caribou, other representative subsistence foods, and water
- Objective 4: Monitor conditions in various ecological environments and habitats, and implement corrective measures when action levels are triggered
- Objective 6: Improve collaboration and communication among all stakeholders to increase the level of awareness and understanding of fugitive dust issues.

To achieve these objectives, the Monitoring Plan (Exponent 2014a) was developed with the goal "To monitor changes in dust emissions and deposition over time and space, using that information to: 1) assess the effectiveness of operational dust control actions, 2) evaluate the effects of the dust emissions on the environment and on human and ecological exposure, and 3) trigger additional actions where necessary."

Actions included in the Monitoring Plan were developed from priority actions identified during development of the RMP, with input from local stakeholders, technical experts, and state and federal regulatory agencies. This section presents the results of the Monitoring Plan actions implemented during 2016. An overview of the components of the monitoring program with frequencies of monitoring is shown in Figure 2. A map-based illustration of monitoring program components and monitoring stations and sites is shown in Figure 3.

Monitoring Programs for DEC Oversight

The marine sediment and soil monitoring programs are ongoing for DEC oversight, and results are also used for trend analysis at RDO. Soil monitoring is planned again for 2017. Marine sediment monitoring conducted in 2016 is summarized below.

Marine Sediment Monitoring

Marine sediment sampling was conducted in the fall of 2016 to monitor operational-scale dust deposition in the marine environment surrounding the DMTS port ship loader facilities (Exponent 2016). The sediment samples were collected from seven locations around the Red Dog port facility that had exhibited elevated metals concentrations when sampled in 1990 (Figure 3). These locations have been periodically re-sampled since 2003 as part of the ongoing marine sediment monitoring program to evaluate temporal changes in the average metal concentrations. The purpose of the marine sediment sampling program is to measure and track over time the concentration and distribution of metals in marine sediments around the port shiploader (Figure 4).

Samples were analyzed for cadmium, lead, and zinc, which are the primary constituents of concern and risk drivers in the lead and zinc concentrates transported via the shiploader and barges. As specified in the monitoring plan (Exponent 2014a), the measured levels are compared with the effects range low (ER-L) guideline values developed by Long et al. (1995) for marine sediment.

In 2016, concentrations of cadmium, lead, and zinc in sediment did not exceed their respective ER-L at any of the sampling stations. Also, cadmium, lead and zinc concentrations did not exceed the ER-Ls at more than one station for more than two annual monitoring events in a row in 2012, 2014, and 2016. Therefore, according to the protocol in the monitoring plan (Exponent 2014a), monitoring continues on a biennial basis, with the next marine sediment monitoring sampling event scheduled for 2018.

The marine sediment monitoring report is included in an appendix.

Operational Monitoring

U.S. EPA Method 22 – Visible Emissions Evaluation

Visible emissions evaluations (VEE) were conducted as required for the Title V air permit at the mine. Monitoring occurs at multiple locations within the mine boundary and at the port. Along the DMTS road, VEE observations are conducted daily when road surfaces are dry but not frozen. Typical VEE monitoring locations are shown on Figure 3, though the locations depicted are not all-inclusive, as the locations may vary. All VEE readings required under the Title V permit have been performed and are submitted twice a year to DEC in the Title V Facility Operating Report.

In addition, when operational changes are made for which additional VEE readings are used to evaluate before/after results, these results are reported in the Annual Report. No such changes occurred in 2016; therefore, there is no additional VEE monitoring to report for 2016.

TEOM Source Monitoring

Tapered element oscillating microbalance (TEOM) samplers are used for air quality monitoring at four locations near sources within the mine and port (Figure 3). Mine TEOMs are located downwind of the pit and crusher at the Personnel Accommodations Complex (PAC) and at the main tailings dam (Tdam) downwind of the tailings beach, mill, and other facilities (Figure 4). Port TEOMs are located downwind of the CSBs and in the lagoon area downwind of the concentrate conveyor (Figure 5).

The TEOMs produce real-time measurements of dust in air and collect discrete samples which are then analyzed to provide airborne metals concentrations. Measurements are reported as total suspended particulates (TSP), and zinc and lead concentrations are reported as TSP-Zn

and TSP-Pb, respectively. TEOMs are operated continuously[3] to measure real-time TSP. Filters collect TSP over 24-hour periods every third day at the mine and every sixth day at the port for TSP-Zn and TSP-Pb analysis.

The monthly averages of 2013, 2014, 2015, and 2016 TSP-Pb and TSP-Zn concentrations are shown on Figure 6a for all four mine and port TEOM locations. The concentrations of lead and zinc at the mine area are typically higher than those at the port area (Figure 6a).

- **Mine TEOM Results.** At the mine, (Figure 6b), lead and zinc concentrations were typically lowest in summer months (the months with higher humidity and more road watering for dust control), and highest in winter months (the coldest, driest, and lowest humidity months, when road watering is not possible because of freezing conditions).
- **Port TEOM Results.** At the port (Figure 6c), lagoon TEOM lead and zinc concentrations are highest from July through November, corresponding with the peak shipping season. Lead and zinc concentrations detected in the port TEOMs are generally lower in 2016 than past years, with the exception of October 2016, when lead concentrations were higher.

Statistical Trend Analysis for TEOM Data. Statistical testing methods were used to evaluate whether TEOM datasets have statistically significant temporal trends in metals concentrations. The Seasonal Mann-Kendall (SMK) trend test is a nonparametric method to investigate temporal trends in time series containing substantial seasonal variability. In this case, TEOM data were summarized on a monthly basis. Seasonal trend tests were conducted using monthly means and monthly 95th percentile concentrations to evaluate both average conditions and a measure of the upper limit. Seasonal trend tests require valid data from each month for at least three years within the period considered.

Results of the statistical trend tests for TEOM data (lead and zinc concentrations) in four locations (Mine PAC, Mine Tdam, Port CSB, and Port Lagoon) are summarized in Table 1. Port CSB and Lagoon results were also analyzed as a combined data set. This combined analysis is

[3] Occasional system upsets do occur as a result of weather or equipment failure. TEOM readings are monitored frequently so that system upsets are noted and corrected as soon as possible. Missing or unusable data are noted in the raw data files and are not used in statistical trend evaluations.

supported by the proximity of the two port locations and the similarities in monthly average concentrations for both lead and zinc (Figures 7a and 7b).

For the most recent four-year period (2013–2016), statistical analysis indicates the Port area and the Mine area have been relatively stable to declining in lead and zinc concentrations, both in mean and 95th percentile concentrations (Table 1, Figures 7a and 7b). In fact, the Port Lagoon TEOM has shown significant decreasing trend in mean zinc concentration over the last four years.

TEOM Real-Time Alarm System Monitoring

Real-time TEOM data is used internally to monitor for high dust events so that mine activities can be modified (where possible) to reduce dust levels. When air quality measurements exceeded a warning level or an alarm level, the alarm status was displayed on the Red Dog weather intranet web page to notify personnel within the Mine Operations and Environmental departments to take corrective action. Examples of these corrective actions include ordering water on the roads or stockpiles or shutting down loading operations during windy conditions.

Road Surface Monitoring

Loose fine materials subject to airborne transport into the surrounding environment are sampled from the road surface at eight locations every two months. From the mine site to the port, the eight road surface monitoring station locations are:

- Mine CSB (near exit from truck loading portion of CSB)
- The Y (near the back dam, between the CSB and the Airport)
- Airport
- MS-13 (former material site where road crosses the mine boundary)
- MS-9 (material site between the mine and CAKR)
- R-Boundary (northern boundary of CAKR)
- MS-2 (material site just inside the northern boundary of the port)
- Port CSB Track (road near exit from truck unloading building at the port CSBs)

Samples were analyzed onsite using a portable XRF analyzer to determine lead, zinc, and cadmium concentrations in road surface materials. The “Mine CSB” and “The Y” stations (inside the mine boundary) often exceed the cleanup levels and are managed so as to reduce tracking of metals concentrates toward the port. Final remediation of the mine areas will occur after mine

closure according to the methods outlined in the Red Dog Mine Waste Management, Reclamation and Closure Monitoring Plan (Teck 2011).

For the most recent four-year period (2013–-2016), statistical analysis indicates that road surface samples have been relatively stable in mean lead, zinc, and cadmium concentrations (Table 3, Figures 8a, 8b, and 8c). Note, if measured road surface concentrations at stations outside the mine boundary exceed Arctic Zone Industrial Cleanup Levels for lead, zinc, or cadmium (800, 41,100, and 110 mg/kg respectively[4]) for more than two consecutive sampling periods, that road section is to be remediated and resurfaced as described in the Remediation Plan (Exponent 2011).

Results for stations outside the mine and port boundaries did not exceed Arctic Zone Industrial Cleanup Levels for lead, zinc, or cadmium from 2011 to 2015 (Figures 8a, 8b, and 8c). However, at the Port CSB Track, lead concentrations exceeded the cleanup levels for two consecutive sampling periods in 2015 (Figure 8a). Thus at the Port CSB Track, where lead concentrations exceeded the cleanup levels in consecutive sampling periods in 2015 (Figure 8a), remediation work was implemented. Based on road surface monitoring results from 2016, no additional road remediation and resurfacing is required in 2017.

Dustfall Jar Monitoring

Dustfall jars are passive continuous collectors for measuring dust deposition; samples are collected every two months at all locations. Approximately 86 dustfall stations are located around the mine, port, and DMTS road, as follows:

- At the mine, approximately 34 jars are placed in locations around the facilities (Figure 3).
- Along the DMTS road, 12 dustfall jars are located at three stations, each with four dustfall jars, two on either side of the road. The DMTS road stations are collocated with road surface sampling stations near the port boundary, the CAKR northern boundary, and midway between CAKR and the mine. The dustfall jars are located approximately 100 m from the shoulder of the DMTS, with 100 m between them, oriented parallel to the road (Figure 3).

[4] Cleanup levels according to 18 AAC 75.341, as revised in 2008 (available on the internet at https://dec.alaska.gov/spar/csp/docs/75mas_art3.pdf). Note that the cadmium and zinc cleanup level would be lower, at 79 and 30,400 mg/kg, if the zone were considered to be the “Under 40 inch Zone” by DEC, which is a function of the definitions at 18 AAC 75.990.

- At the port, 38 jars are placed roughly in a rectangular grid throughout the area (Figure 3).
- An additional two jars are considered reference stations, one upwind of the road near Evaingiknuk Creek and another near the Wulik River, to the north of the operation (Figure 3).

Statistical Trend Analysis for Dustfall Jar Data. Temporal trends in deposition rates or metals concentrations in dustfall jars data were evaluated using the same statistical methods used for the TEOM analyses, using seasonal trend tests conducted with bi-monthly mean and 95th percentiles (method as discussed above in the "TEOM Source Monitoring" section).

- **Lead.** For lead, dustfall deposition rates and concentrations have been stable over the most recent four-year period. No statistically significant trends were identified at any location over the most recent four-year period, except for at the port when considering only upper limits (Table 2). Time series plots of lead dustfall deposition rates and concentrations are presented in Figures 9 and 12, respectively.
- **Zinc.** For zinc, dustfall deposition rates and concentrations have been stable over the most recent four-year period. No statistically significant trends were identified at any location over the most recent four-year period, either in average or upper limits (Table 2). Time series plots of zinc dustfall deposition rates and concentrations are shown in Figures 10 and 13, respectively.
- **Total Solids.** For total solids, the deposition rates have been stable with no statistically significant trends identified at any location over the most recent four-year period, either in average or upper limits (Table 2). Time series plots of total solids dustfall rates are presented in Figure 11.

Caribou Tissue Monitoring

Red Dog Mine is located within the normal annual range of the WAH. Surveys of caribou have been conducted periodically since 1984 by the Alaska Department of Fish and Game (DFG) and have provided baseline information against which more current studies may be compared. Caribou tissue monitoring for dust-related constituents under the RMP program was scheduled to occur in 2015 and then again in 2016, but due to lack of caribou overwintering near the road, it was postponed until 2017.

Summary of Monitoring Results

Dust monitoring data from the TEOM air samplers, road surface samples, and the dustfall jars were statistically evaluated to assess the current trends over the most recent four-year period. The data indicates that the measured concentrations and deposition rates at the mine, port, and road areas are stable and not significantly increasing. The one exception is for the port, where dustfall jars indicate a significant increase in the upper bound values of lead deposition rate (but not for average values). On the other hand, the Port Lagoon TEOM has shown a significant decreasing trend in mean zinc concentration.

A summary of statistical trend analysis results for TEOM, road surface, and dustfall jar monitoring programs is presented in Table 4. This table provides an at-a-glance overview of results of dust monitoring programs. Results from the monitoring programs largely indicate that concentration trends are flat (i.e., no increasing or decreasing trend). Overall, environmental media concentrations remain similar to or lower than those evaluated in the DMTS risk assessment (Exponent 2007).

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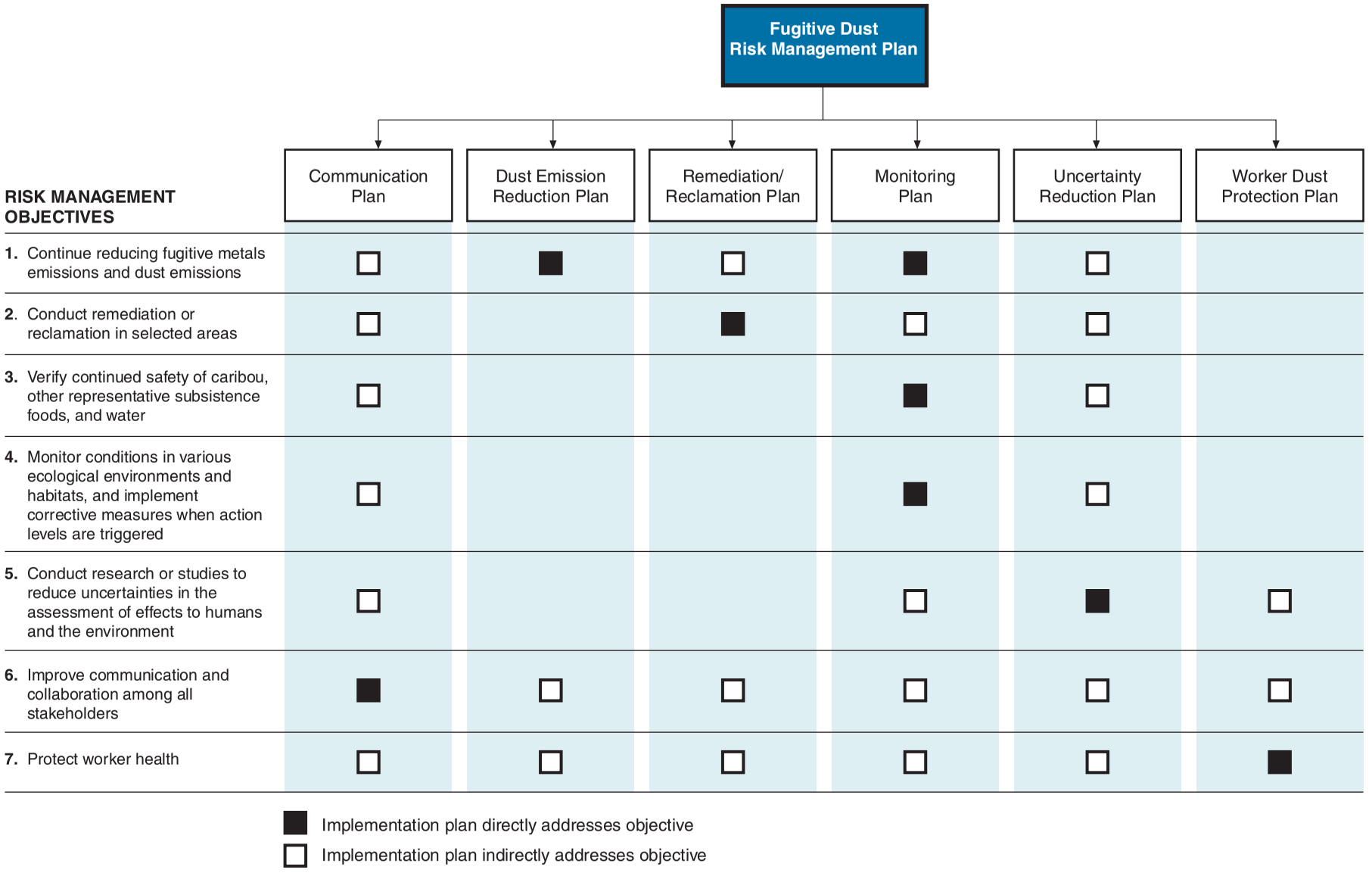


Figure 1. Risk management objectives and associated implementation plans

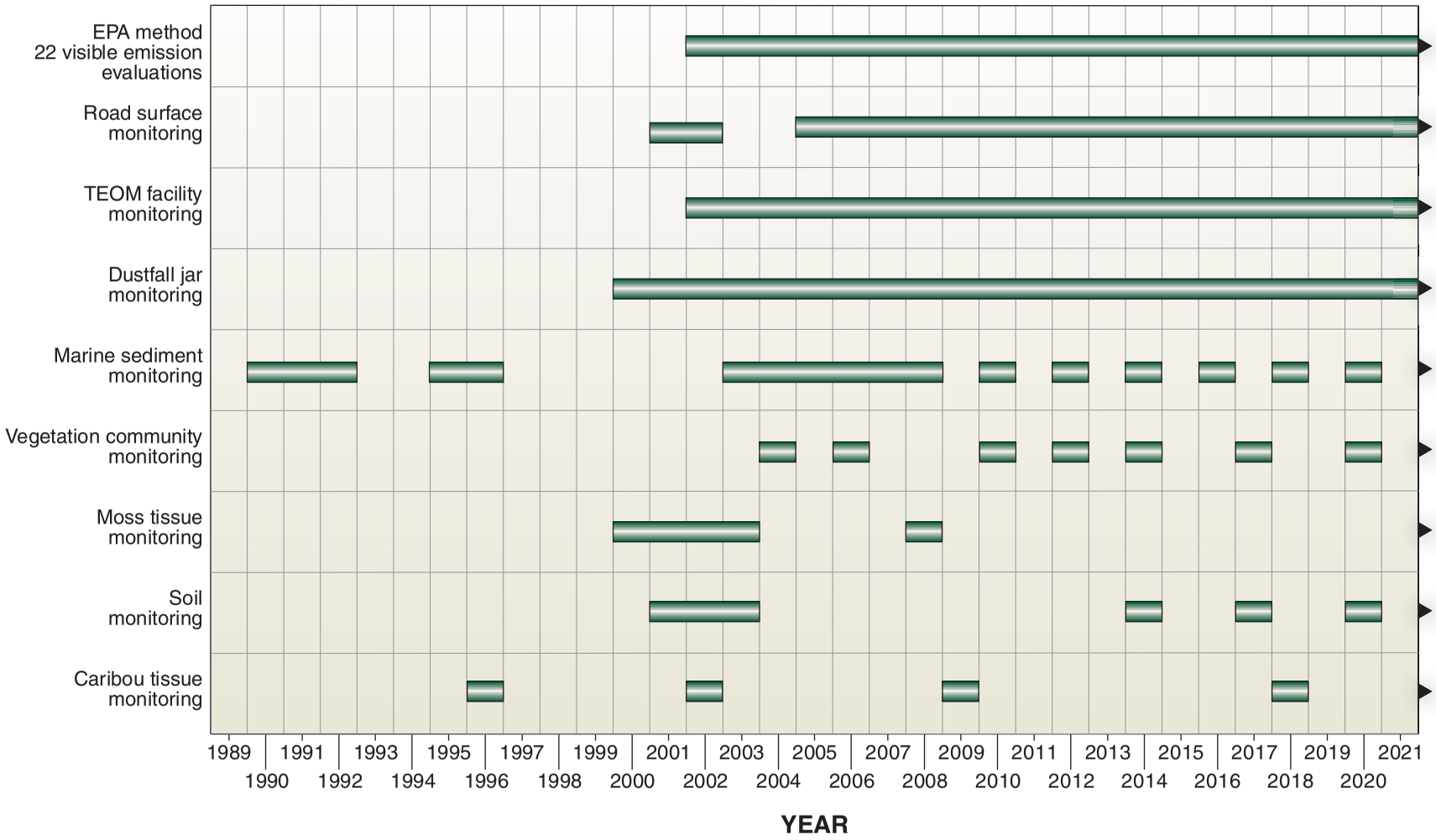


Figure 2. Monitoring timeline with program frequencies

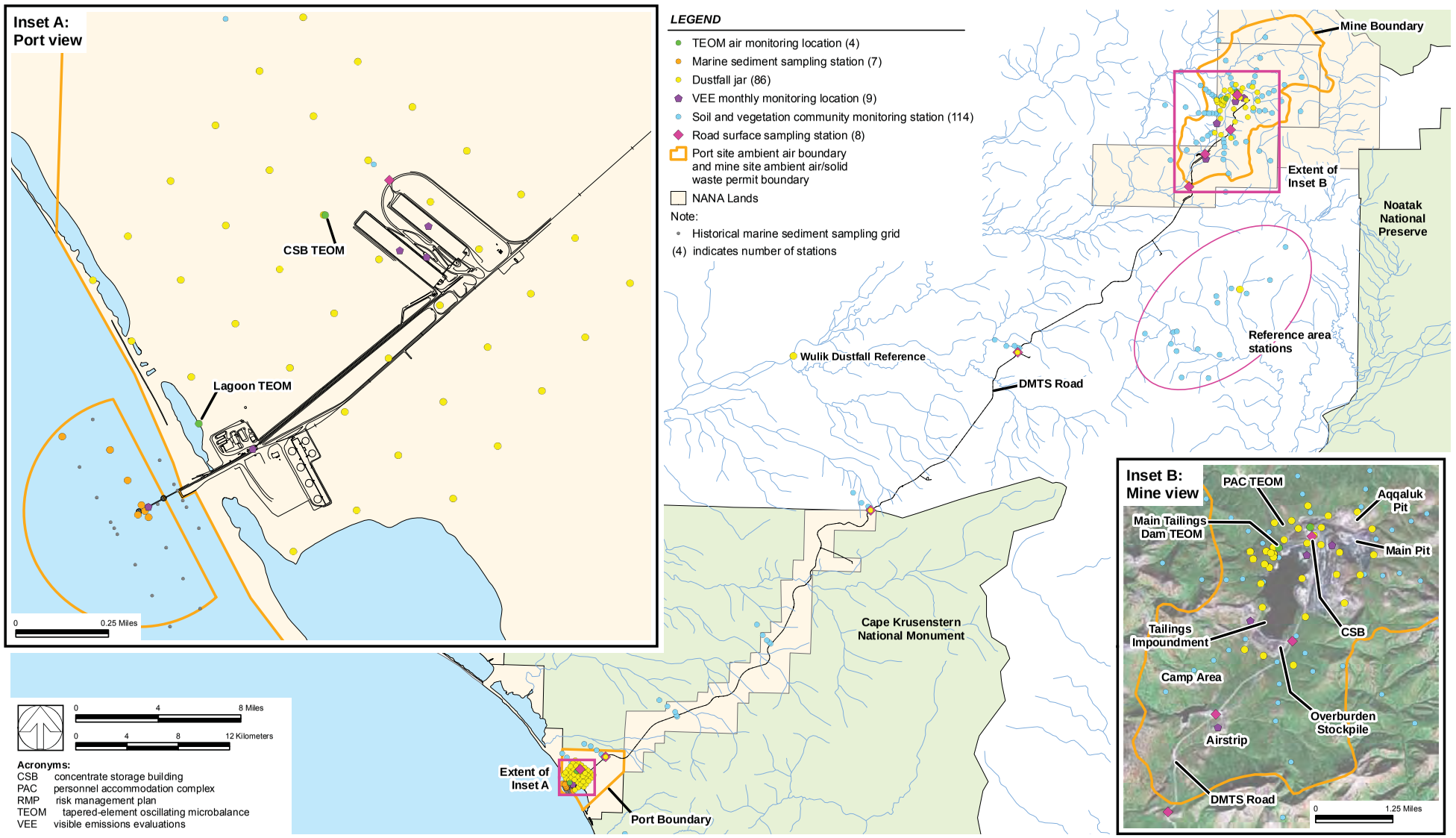
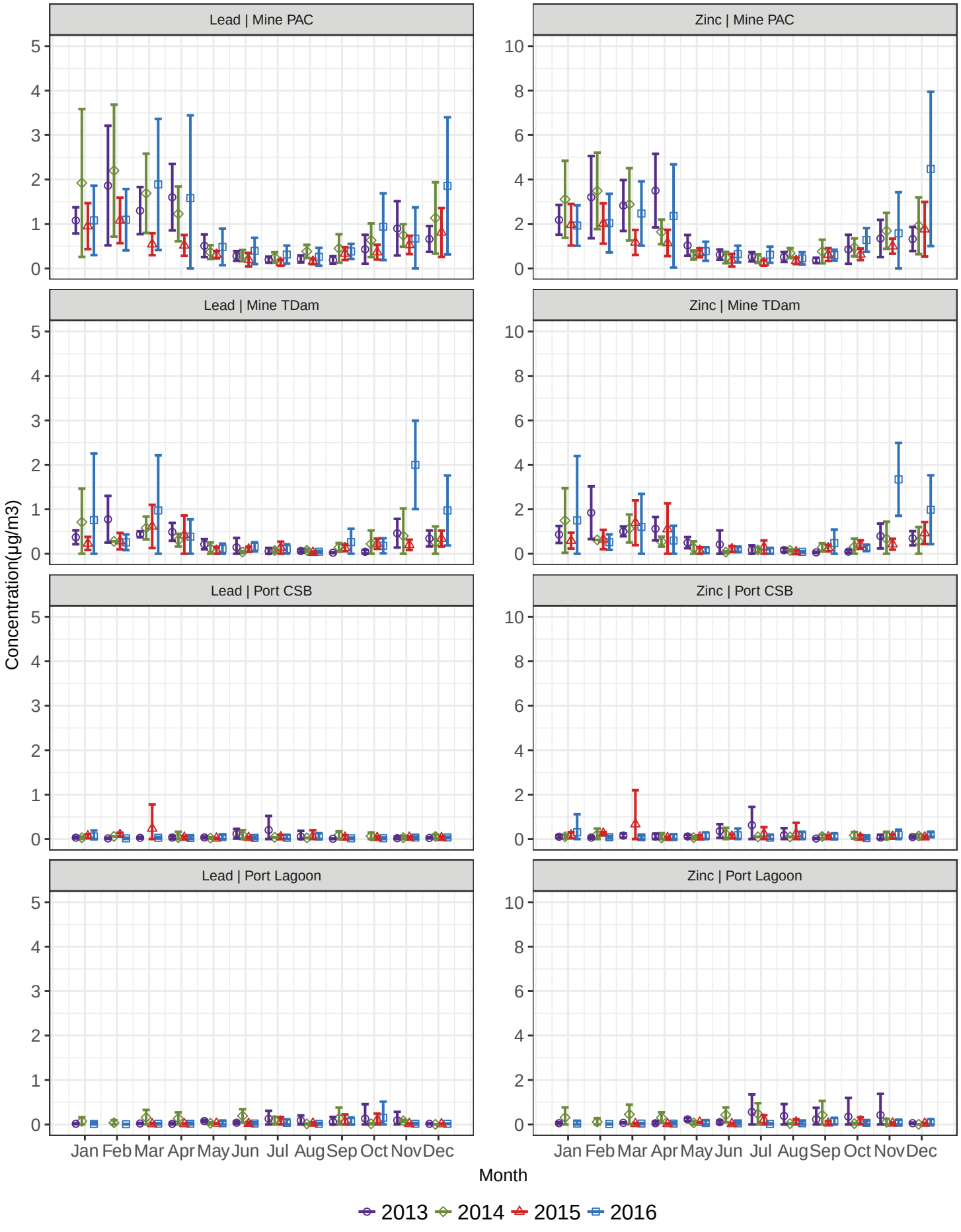


Figure 3. Overview of risk management monitoring programs

Figure 4. Mine TEOM locations

Figure 5. Port TEOM locations



Note: Different vertical axis scales are used for lead and zinc TEOMs.

Figure 6a. TEOM monthly monitoring data comparison, 2013−2016

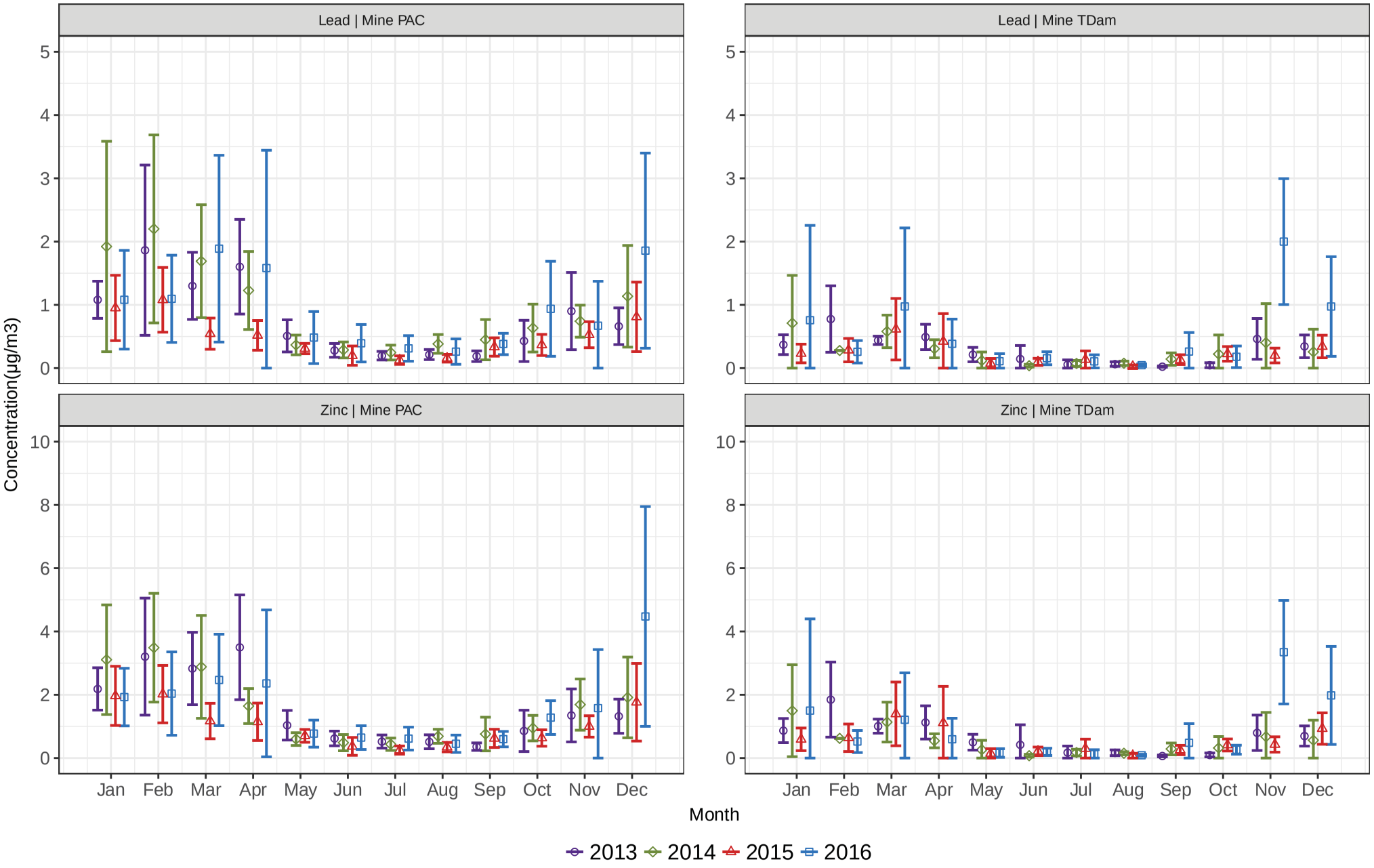


Figure 6b. Mine area TEOM monthly monitoring data comparison, 2013−2016

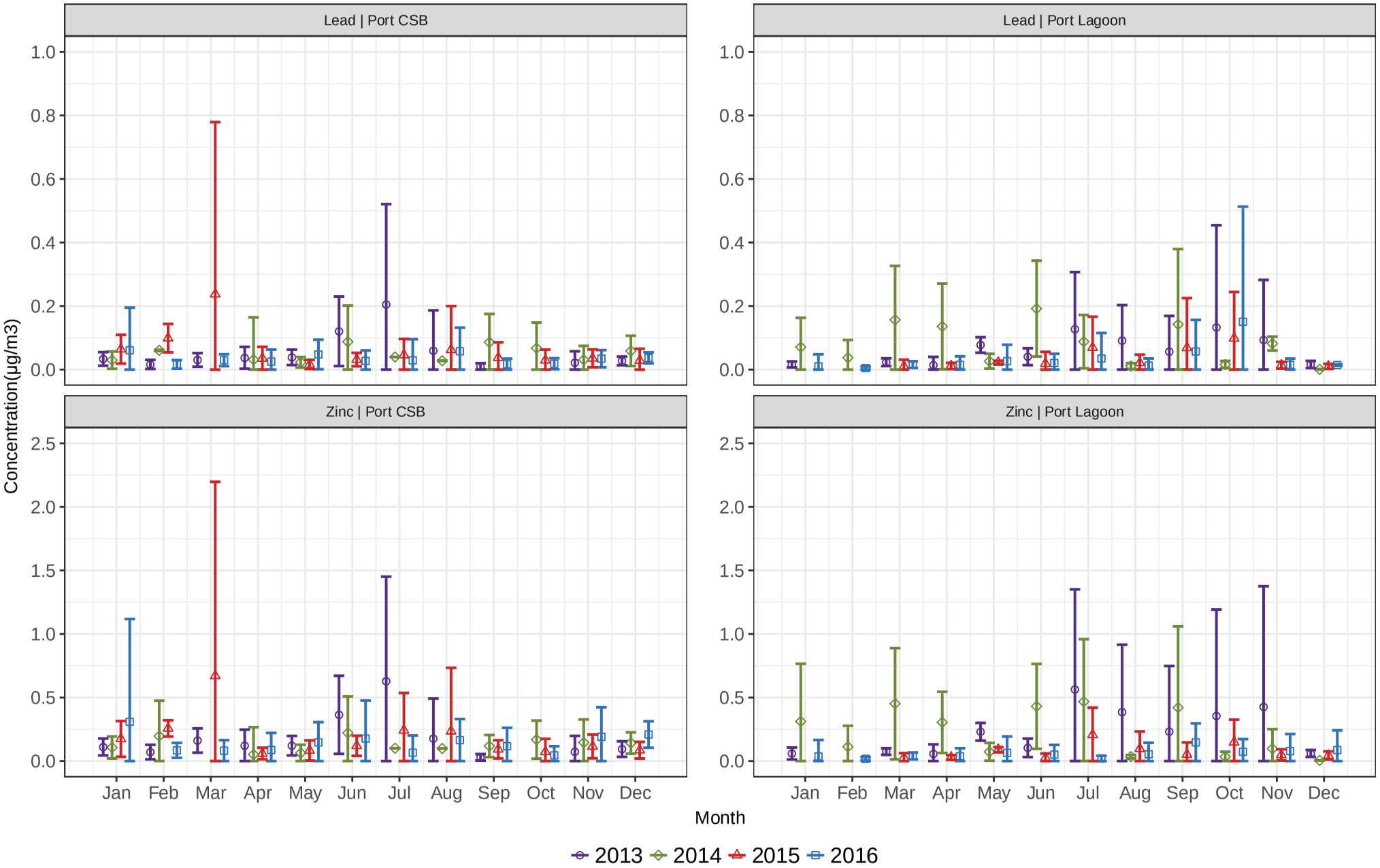


Figure 6c. Port area TEOM monthly monitoring data comparison, 2013−2016

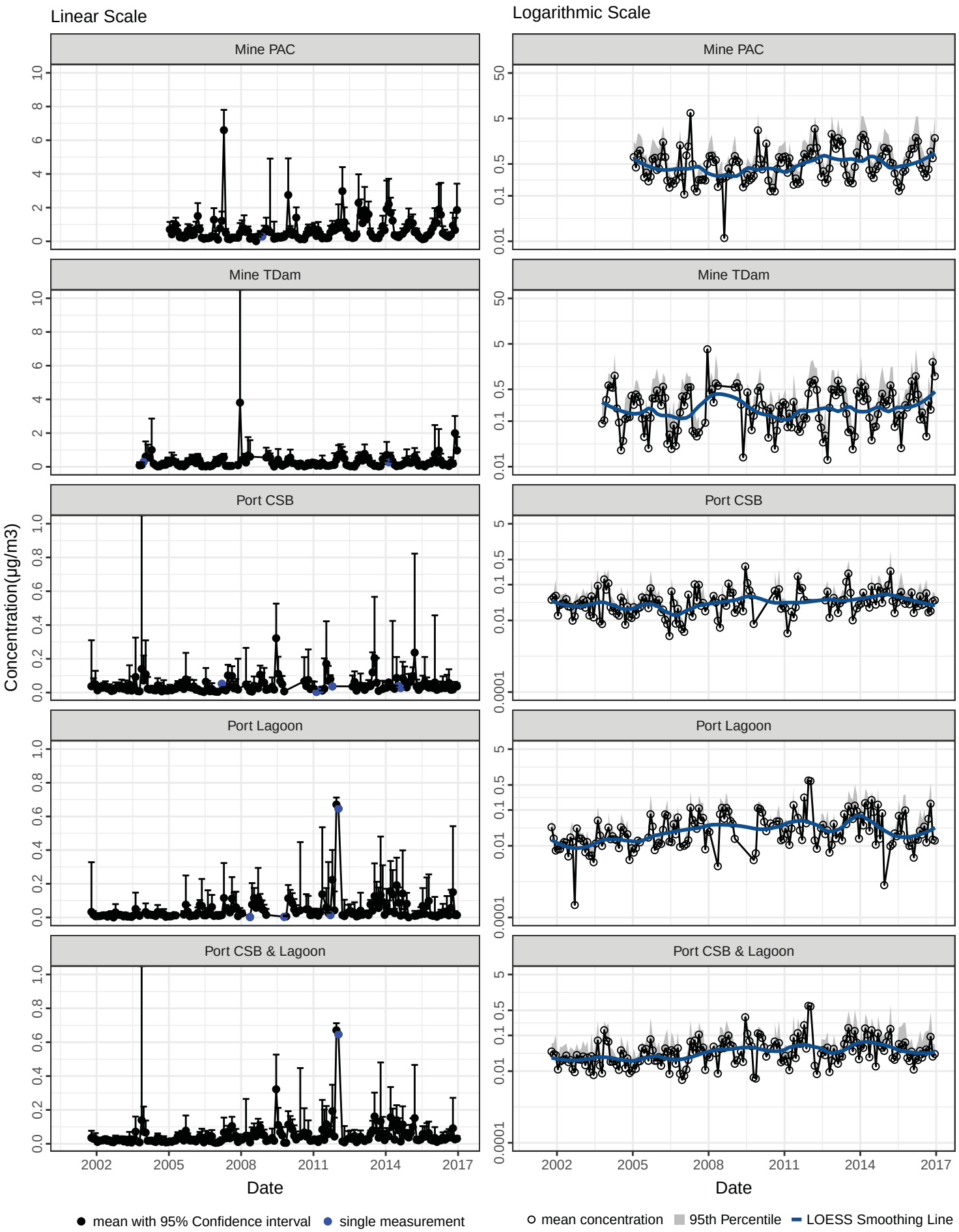


Figure 7a. TEOM Lead Concentration plots (all years)

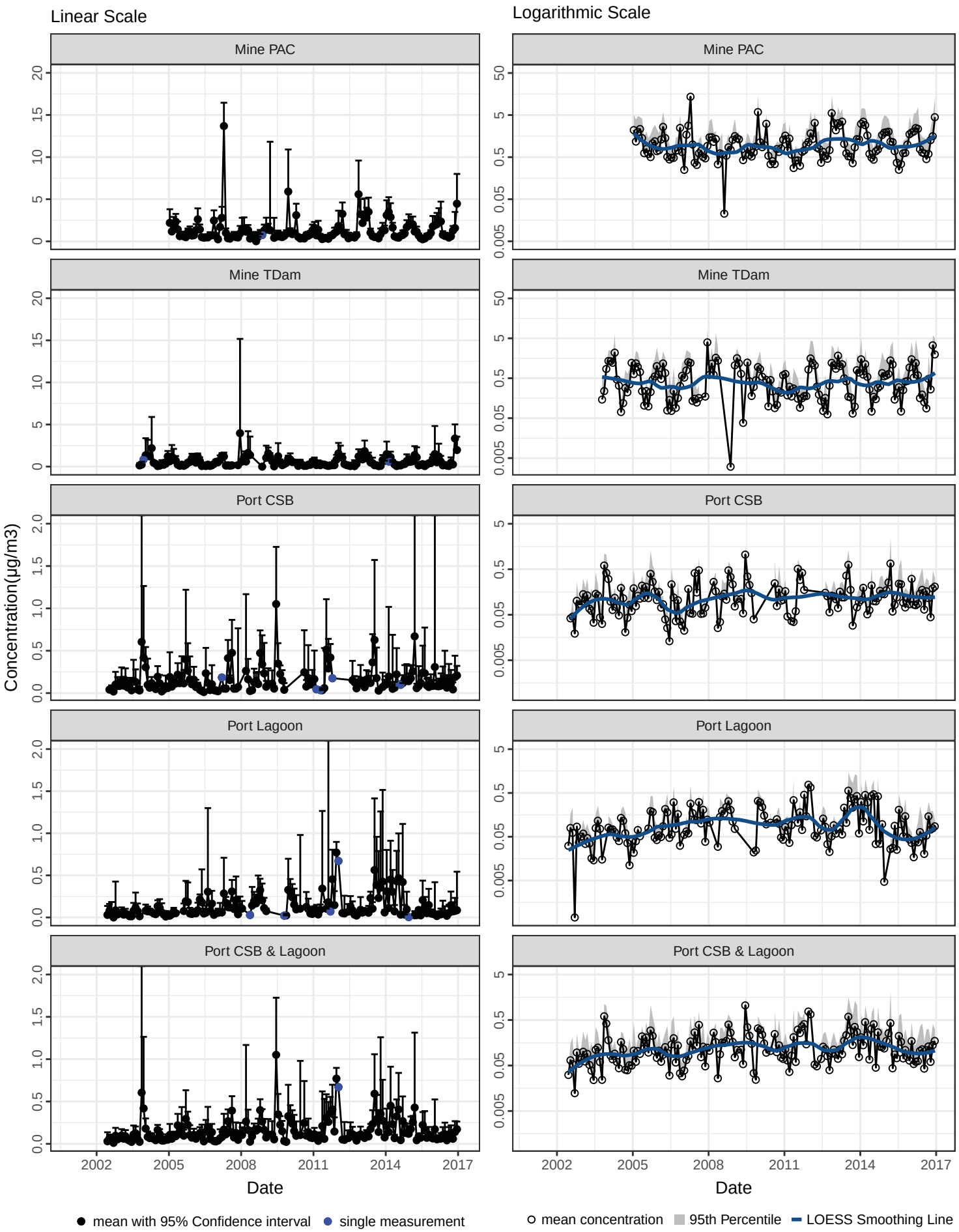


Figure 7b. TEOM Zinc Concentration plots (all years)

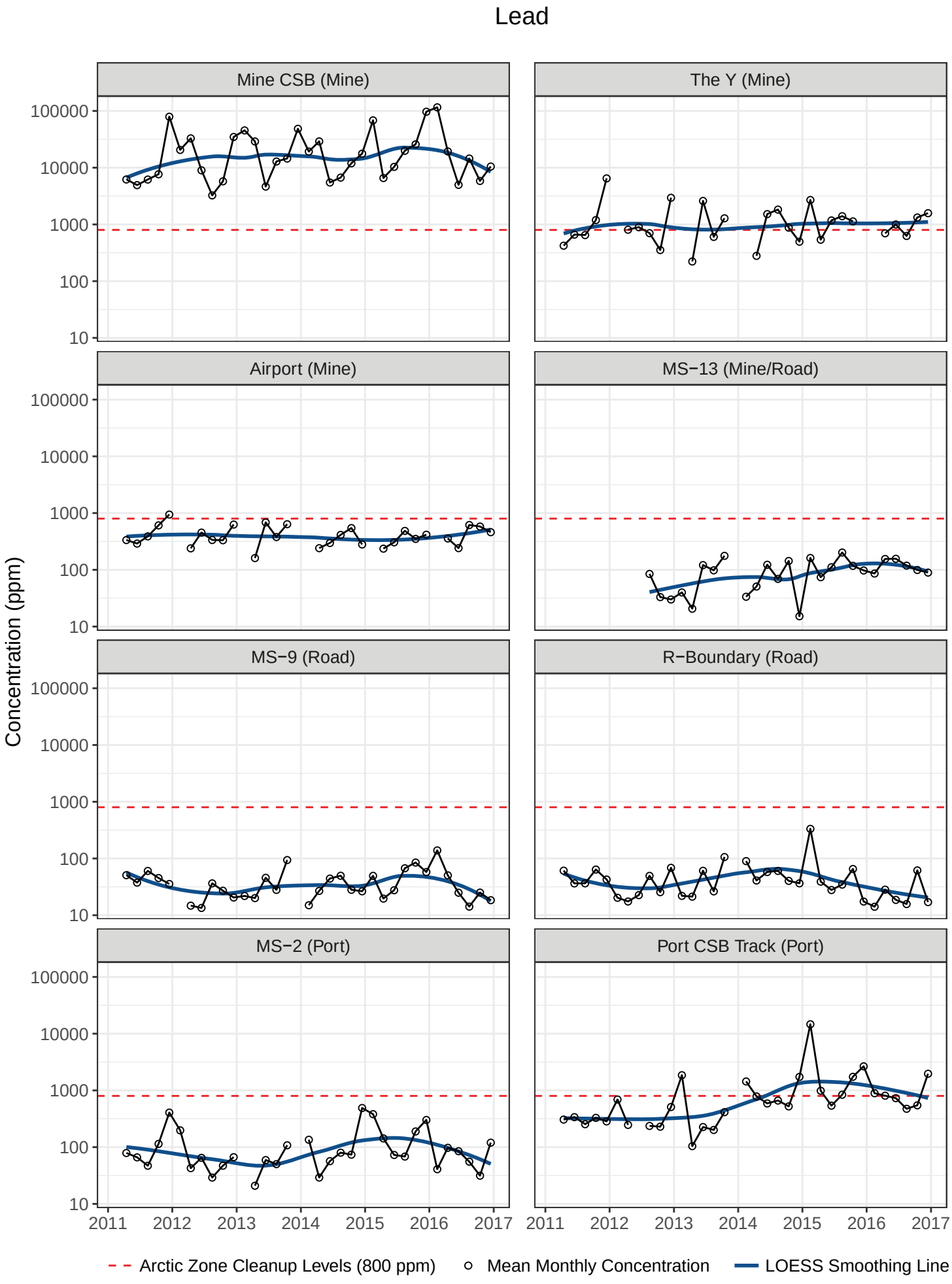


Figure 8a. Road Surface Lead Concentration plots (all years)

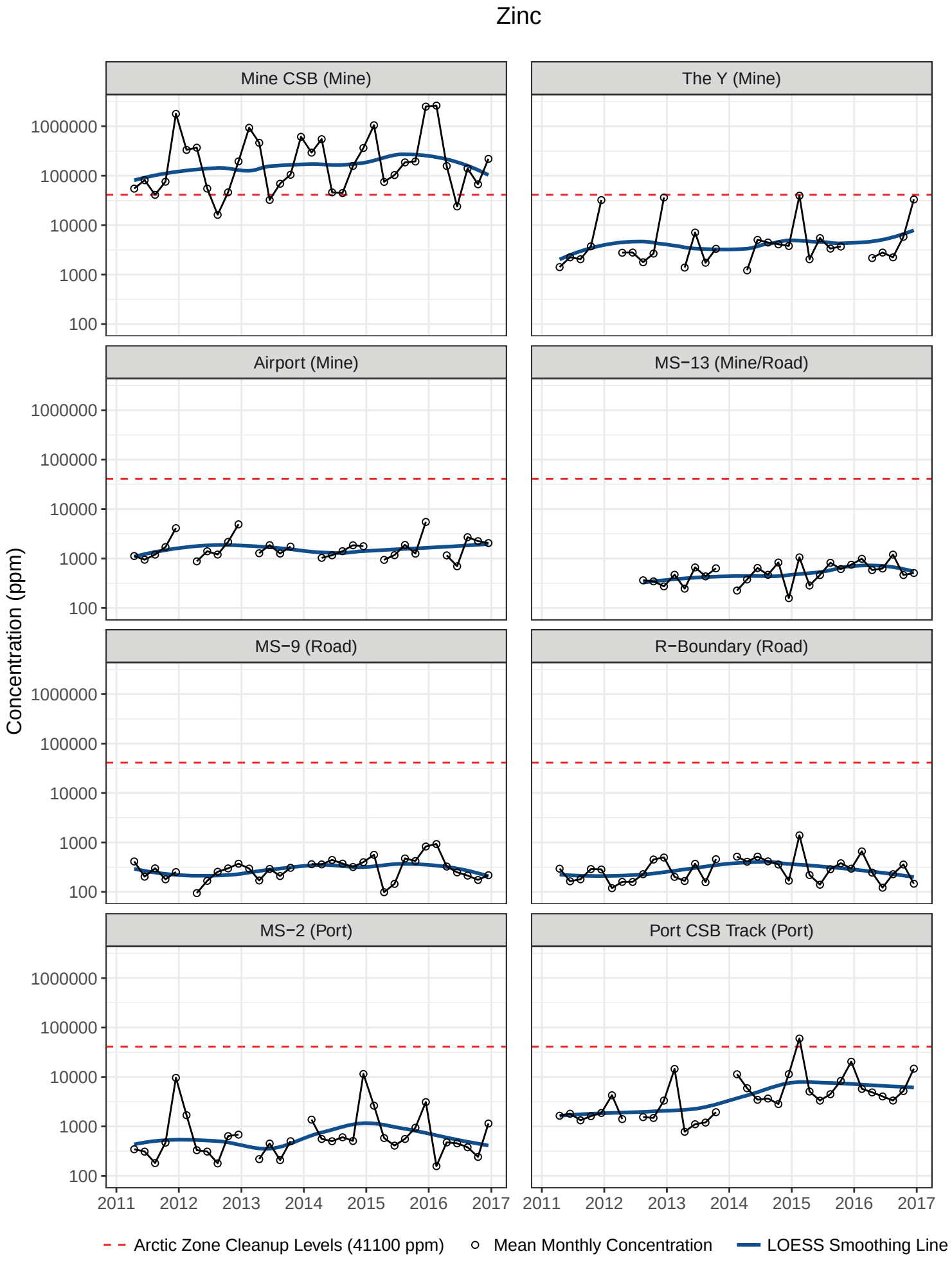


Figure 8b. Road Surface Zinc Concentration plots (all years)

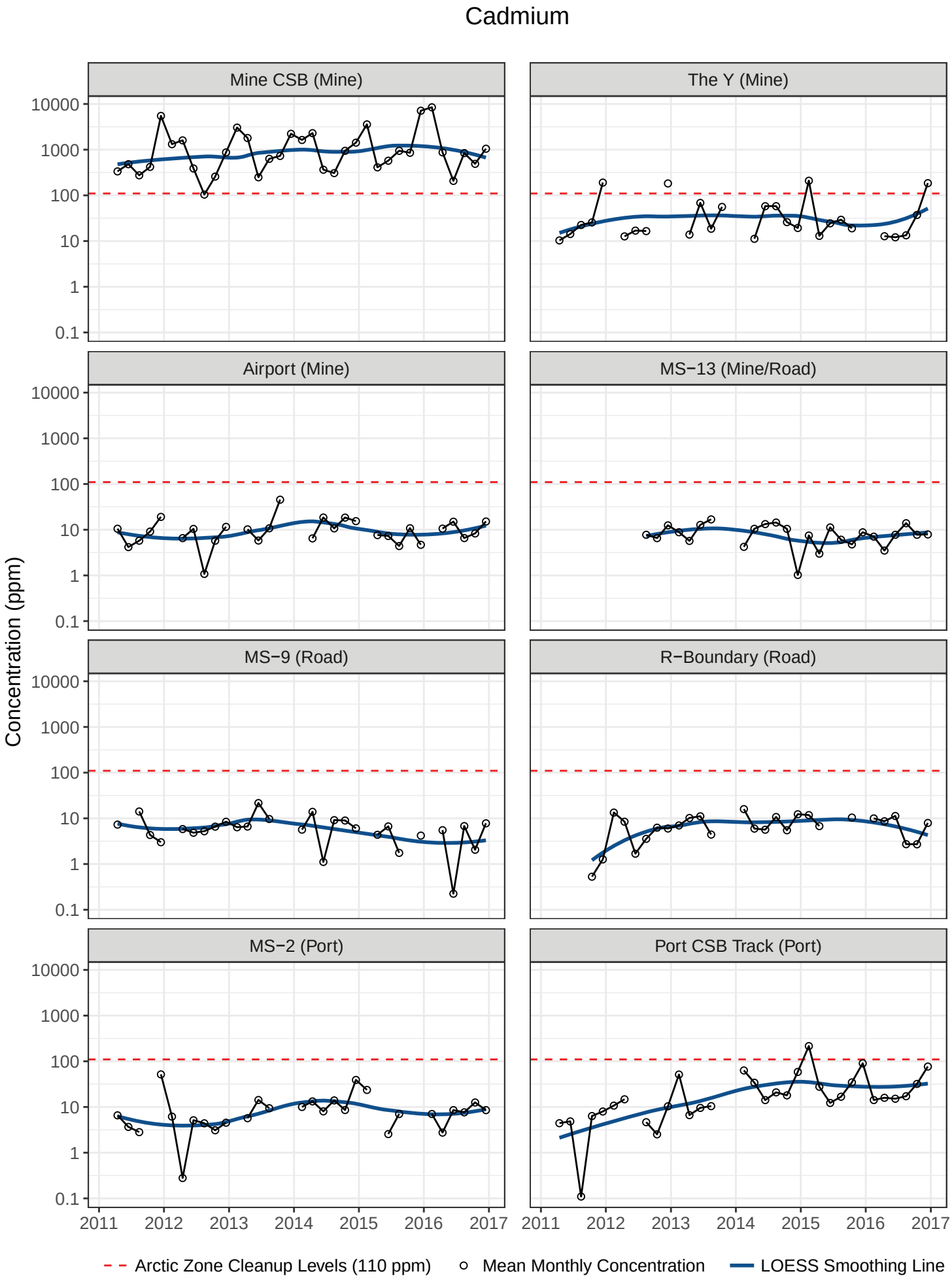


Figure 8c. Road Surface Cadmium Concentration plots (all years)

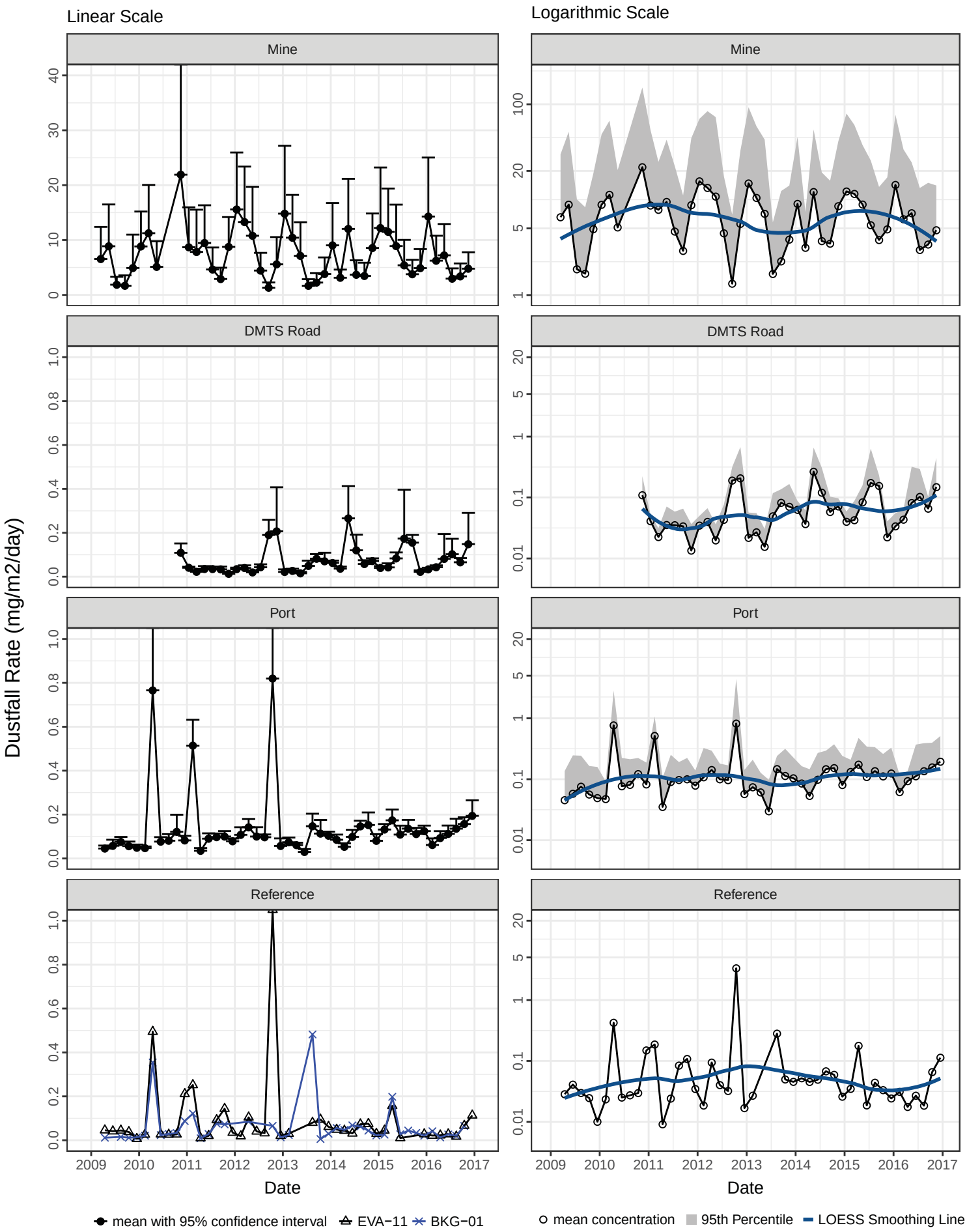


Figure 9a. Dustfall Jars Lead Deposition Rate plots (all years)

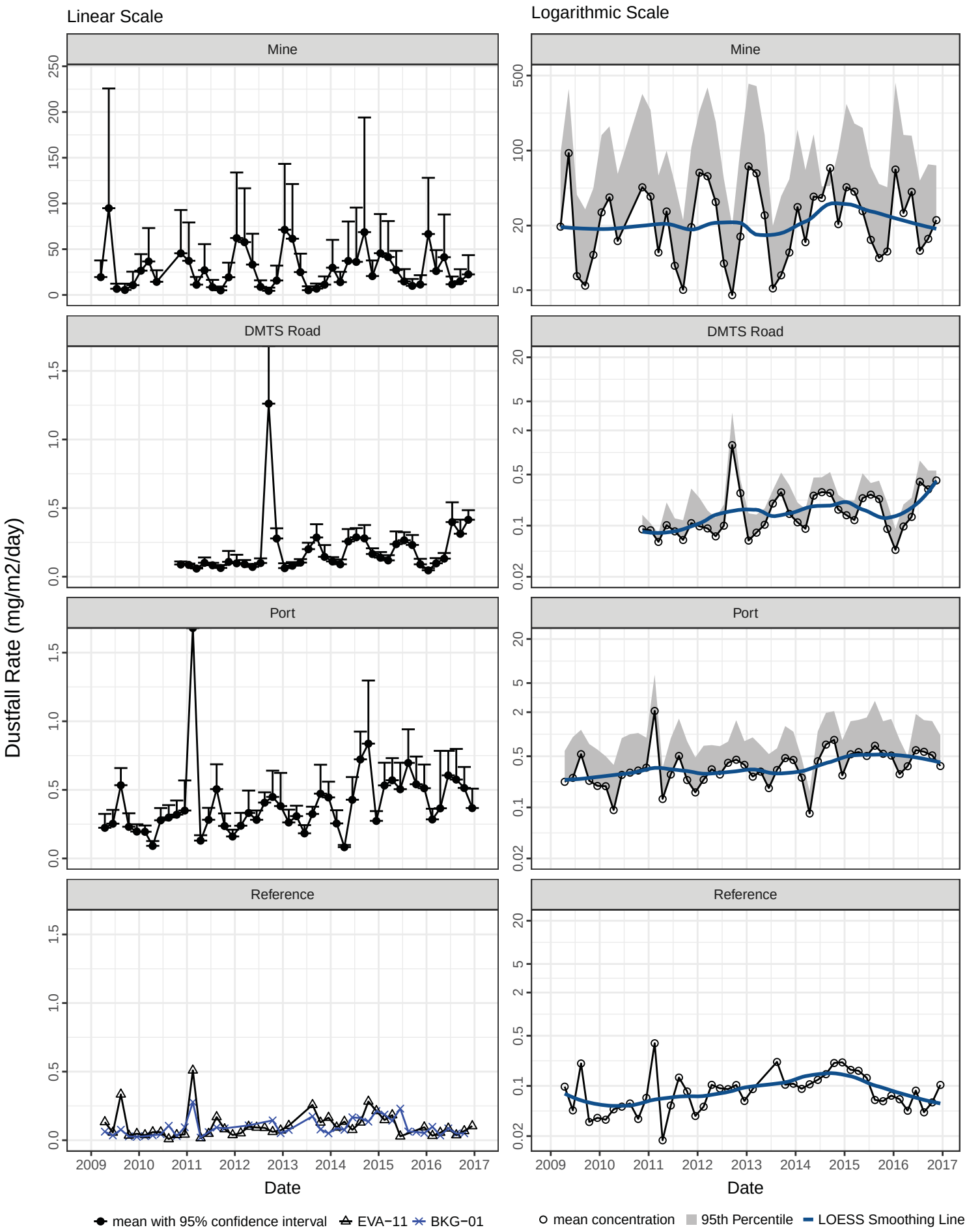


Figure 9b. Dustfall Jars Zinc Deposition Rate plots (all years)

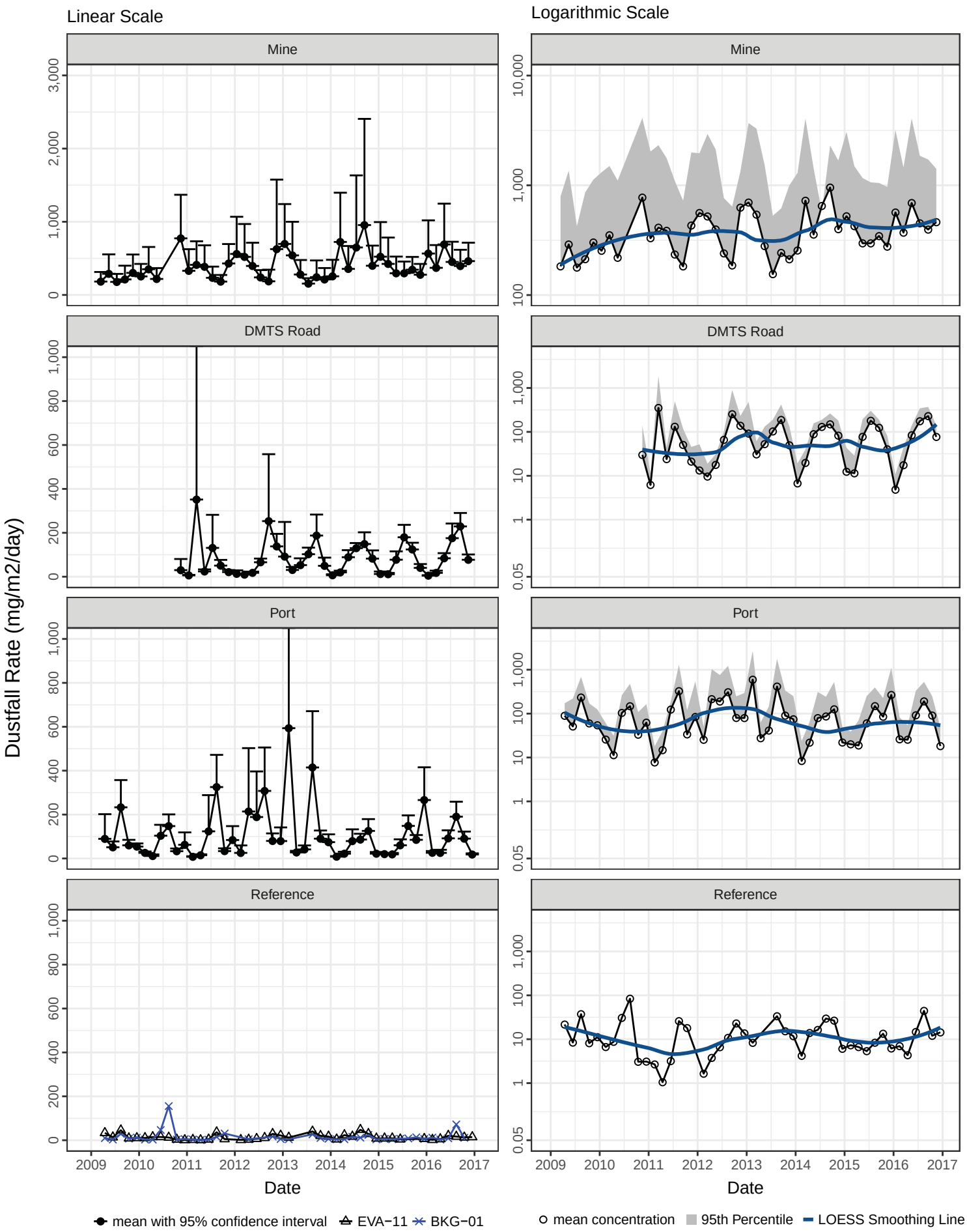


Figure 9c. Dustfall Jars Solids Deposition Rate plots (all years)

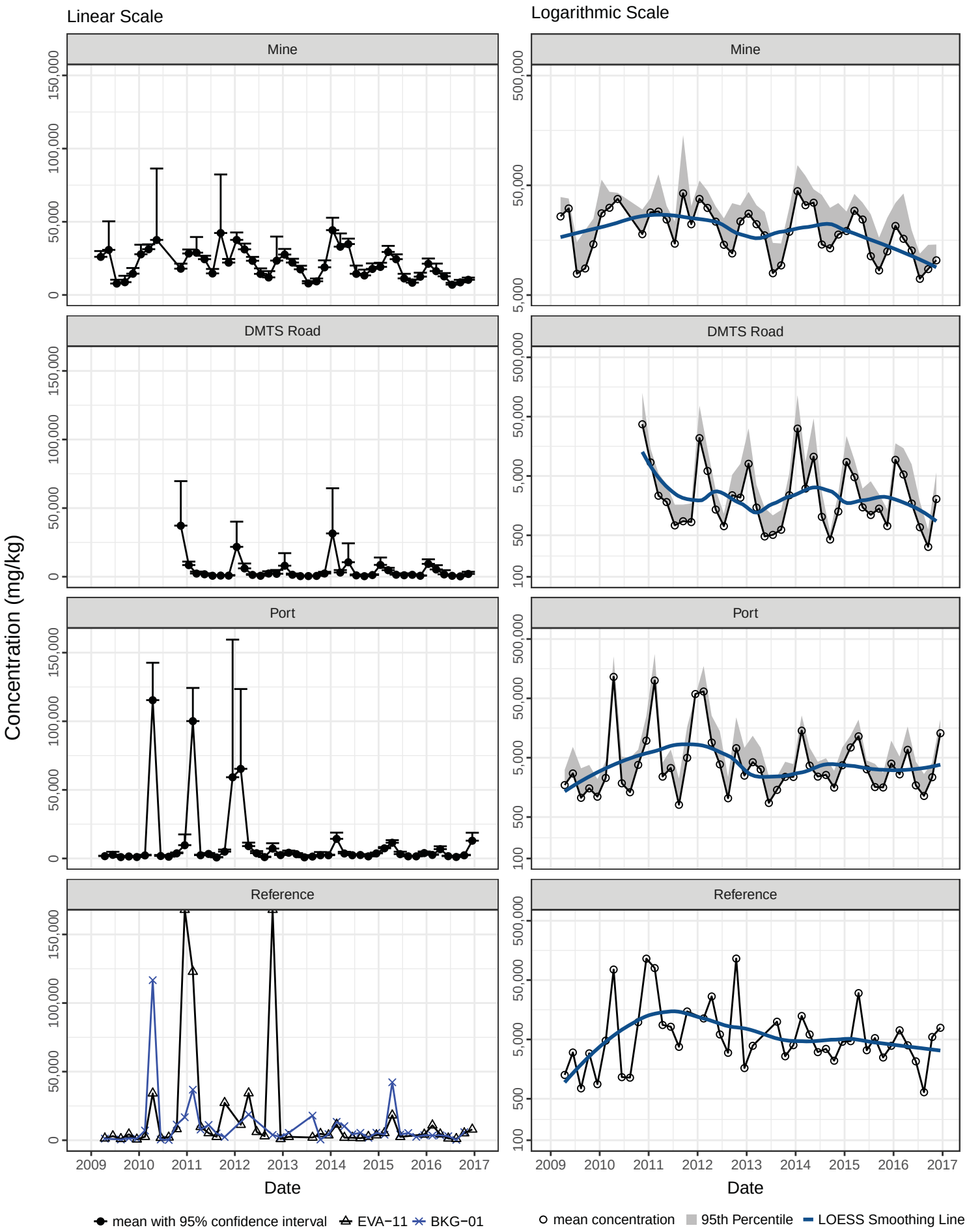


Figure 9d. Dustfall Jars Lead Concentration plots (all years)

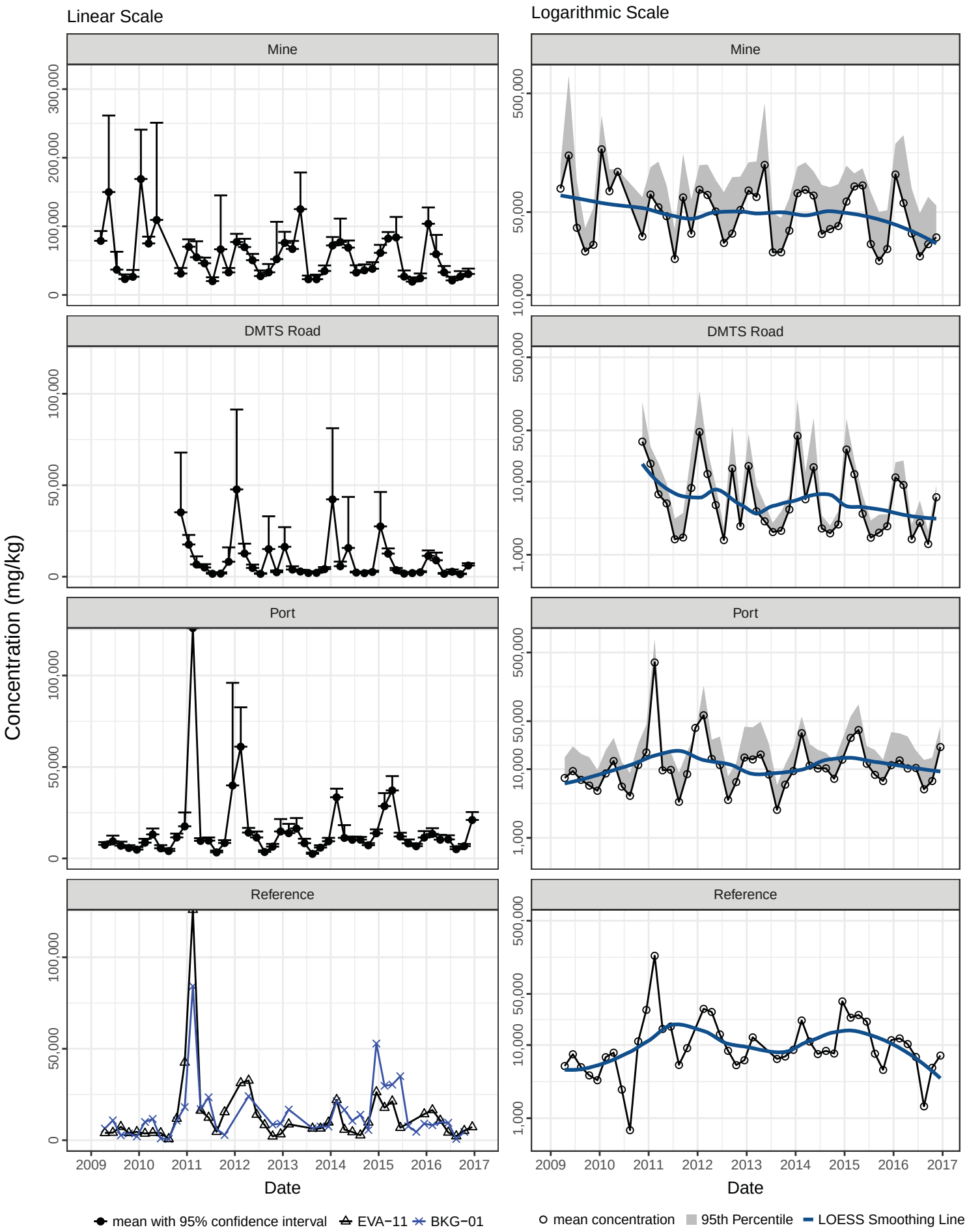


Figure 9e. Dustfall Jars Zinc Concentration plots (all years)

Table 1. TEOM concentration statistical trend analysis (seasonal Mann Kendall trend test)

For 1/2013 - 12/2016; Mean concentration:

LEAD	Concentration (µg/m^3)		
	tau statistic	p value	significant trend?[a]
Mine PAC	0.056	0.695	No
Mine TDam	0.139	0.327	No
Port CSB	-0.121	0.409	No
Port Lagoon[b]	-0.270	0.074	No
Port CSB & Lagoon	-0.306	0.031	No

ZINC	Concentration (µg/m^3)		
	tau statistic	p value	significant trend?[a]
Mine PAC	-0.083	0.556	No
Mine TDam	-0.028	0.845	No
Port CSB	0.061	0.680	No
Port Lagoon[b]	-0.397	0.009	Yes; Decreasing
Port CSB & Lagoon	-0.306	0.031	No

[a] Significant at p<0.05/2 (i.e., p<0.025 with Bonferroni adjustment because multiple [2] related hypotheses are tested).

[b] Excluded February data (see text for explanation)

For 1/2013 - 12/2016; Top 95% concentration:

LEAD	Concentration (µg/m^3)		
	tau statistic	p value	significant trend?[a]
Mine PAC	0.111	0.433	No
Mine TDam	0.167	0.239	No
Port CSB	-0.030	0.837	No
Port Lagoon[b]	-0.302	0.046	No
Port CSB & Lagoon	-0.194	0.170	No

ZINC	Concentration (µg/m^3)		
	tau statistic	p value	significant trend?[a]
Mine PAC	-0.028	0.845	No
Mine TDam	0.167	0.239	No
Port CSB	0.121	0.409	No
Port Lagoon[b]	-0.333	0.027	No
Port CSB & Lagoon	-0.194	0.170	No

[a] Significant at p<0.05/2 (i.e., p<0.025 with Bonferroni adjustment because multiple [2] related hypotheses are tested).

[b] Excluded February data (see text for explanation)

Table 2. Dustfall rate and concentration statistical trend analysis (seasonal Mann Kendall trend test)

For 1/2013 - 12/2016; Mean Deposition Rate and Concentration:

LEAD	Dustfall Desposition Rate (mg/m^2/day)			Concentration (mg/kg-total solid)		
	tau statistic	p value	significant trend?[a]	tau statistic	p value	significant trend?[a]
Mine	0.111	0.579	No	-0.444	0.027	No
Road	0.278	0.166	No	0.222	0.267	No
Port	0.222	0.267	No	0.222	0.267	No
Reference	-0.200	0.355	No	0.000	1.000	No

ZINC	Dustfall Desposition Rate (mg/m^2/day)			Concentration (mg/kg-total solid)		
	tau statistic	p value	significant trend?[a]	tau statistic	p value	significant trend?[a]
Mine	0.222	0.267	No	-0.222	0.267	No
Road	0.278	0.166	No	-0.056	0.782	No
Port	0.278	0.166	No	0.167	0.405	No
Reference	-0.467	0.031	No	-0.267	0.217	No

TOTAL SOLIDS	Dustfall Desposition Rate (mg/m^2/day)		
	tau statistic	p value	significant trend?[a]
Mine	0.222	0.267	No
Road	-0.056	0.782	No
Port	0.000	1.000	No
Reference	-0.267	0.217	No

[a]Significant at p<0.05/3 (i.e., p<0.017 with Bonferroni adjustment because multiple [3] related hypotheses are tested).

For 1/2013 - 12/2016; Top 95% Deposition Rate and Concentration:

LEAD	Dustfall Desposition Rate (mg/m^2/day)			Concentration (mg/kg-total solid)		
	tau statistic	p value	significant trend?[a]	tau statistic	p value	significant trend?[a]
Mine	-0.056	0.782	No	-0.278	0.166	No
Road	0.111	0.579	No	0.167	0.405	No
Port	0.500	0.013	Yes; Increasing	0.278	0.166	No

ZINC	Dustfall Desposition Rate (mg/m^2/day)			Concentration (mg/kg-total solid)		
	tau statistic	p value	significant trend?[a]	tau statistic	p value	significant trend?[a]
Mine	0.278	0.166	No	-0.111	0.579	No
Road	0.333	0.096	No	0.000	1.000	No
Port	0.278	0.166	No	0.278	0.166	No

TOTAL SOLIDS	Dustfall Desposition Rate (mg/m^2/day)		
	tau statistic	p value	significant trend?[a]
Mine	0.111	0.579	No
Road	-0.056	0.782	No
Port	0.000	1.000	No

[a]Significant at p<0.05/3 (i.e., p<0.017 with Bonferroni adjustment because multiple [3] related hypotheses are tested).

Table 3. Road surface concentration statistical trend analysis (seasonal Mann Kendall trend test)

For 1/2013 - 12/2016; Mean concentration:

LEAD		Concentration ($\mu g/m^3$)		
		tau statistic	p value	significant trend?[a]
Mine	Only for years 2013 - 2016	-0.167	0.405	No
Road		0.152	0.466	No
Port		0.273	0.189	No
Mine CSB (Mine)		0.056	0.782	No
The Y (Mine)[b]		0.083	0.734	No
Airport (Mine)		0.259	0.258	No
MS-13 (Mine/Road)		0.212	0.307	No
MS-9 (Road)		-0.152	0.466	No
R-Boundary (Road)		-0.394	0.058	No
MS-2 (Port)		0.067	0.758	No
Port CSB Track (Port)		0.394	0.058	No

ZINC		Concentration ($\mu g/m^3$)		
		tau statistic	p value	significant trend?[a]
Mine	Only for years 2013 - 2016	0.000	1.000	No
Road		0.333	0.109	No
Port		0.212	0.307	No
Mine CSB (Mine)		0.056	0.782	No
The Y (Mine)[b]		0.167	0.497	No
Airport (Mine)		0.111	0.628	No
MS-13 (Mine/Road)		0.152	0.466	No
MS-9 (Road)[c]		0.152	0.466	No
R-Boundary (Road)		-0.091	0.662	No
MS-2 (Port)		-0.067	0.758	No
Port CSB Track (Port)		0.273	0.189	No

CADMIUM		Concentration ($\mu g/m^3$)		
		tau statistic	p value	significant trend?[a]
Mine	Only for years 2013 - 2016	-0.111	0.579	No
Road		-0.133	0.537	No
Port		0.133	0.537	No
Mine CSB (Mine)		0.000	1.000	No
The Y (Mine)[b]		-0.500	0.042	No
Airport (Mine)		-0.259	0.258	No
MS-13 (Mine/Road)		-0.400	0.064	No
MS-9 (Road)[c]		-0.429	0.098	No
R-Boundary (Road)[d]		-0.048	0.851	No
MS-2 (Port)[e]		-0.333	0.227	No
Port CSB Track (Port)		0.267	0.217	No

[a]Significant at $p<0.05/3$ (i.e., $p<0.017$ with Bonferroni adjustment because multiple [3] related hypotheses are tested)

[b]Excluded February, December (see text for explanation)

[c]Excluded February, October (see text for explanation)

[d]Excluded December (see text for explanation)

[e]Excluded October, December (see text for explanation)

Table 4. Summary of dust monitoring trends

For most recent 4 years (2013-2016)																	
Location and Measure	Road Surface (Concentration)			Location and Measure	TEOM (Air Concentration)				Location and Measure	Dustfall Jars (Concentration and Deposition Rate)							
	Mean Concentration				Mean Concentration		95th Percentile			Mean Concentration			95th Percentile				
	Pb	Zn	Cd		Pb	Zn	Pb	Zn		Pb	Zn	Solids	Pb	Zn	Solids		
Mine (Conc.)	—	—	—	Mine Tdam (Conc.)	—	—	—	—	Mine (Conc.)	—	—	a	—	—	a		
				Mine PAC (Conc.)	—	—	—	—	Mine (Rate)	—	—	—	—	—	—		
Road (Conc.)	—	—	—						Road (Conc.)	—	—	a	—	—	a		
									Road (Rate)	—	—	—	—	—	—		
Port (Conc.)	—	—	—	Port CSB (Conc.)	—	—	—	—	Port (Conc.)	—	—	a	—	—	a		
				Port Lagoon (Conc.) [b]	—	↘	—	—	Port (Rate)	—	—	—	↗	—	—		
				Port CSB & Lagoon (Conc.)	—	—	—	—									
									Reference (Conc.)	—	—	a					
									Reference (Rate)	—	—	—					

[a] Concentration is not evaluated for solids, because total solids is the entire sample mass.

[b] Excluded February data (see text for explanation)

1. Results are summarized from statistical test results in Tables 1, 2, and 3 for air concentrations, road surface concentrations, concentrations in dustfall, and dustfall rates, respectively.
2. Results are presented for statistical testing using data from the past four years.

Notes:

— Indicates no statistically significant change over time period tested (trend is FLAT).

↗ Indicates a statistically significant increase over time period tested (trend is UP).

↘ Indicates a statistically significant decrease over time period tested (trend is DOWN).

TEOM = tapered element oscillating microbalance (air sampling device)
Conc = air concentration (TEOM air sampling) or concentration in dustfall (dustfall jars)
Rate = dustfall deposition rate based on dustfall jar measurements
Tdam = mine tailings dam
PAC = personnel accommodations complex
CSB = concentrate storage building

Application of a Weight of Evidence Approach to Evaluating Risks Associated with Subsistence Caribou Consumption Near a Lead/Zinc Mine

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Running Title: Subsistence Caribou Weight of Evidence Assessment

Abbreviations[1]

[1] ADPH, Alaska Department of Public Health; ALM, Adult Lead Model; CAH, Central Arctic herd; DMTS, DeLong Mountain Regional Transportation System; EPA, Environmental Protection Agency; FI, Fractional Intake; TCH, Teshekpuk herd; WAH, Western Arctic herd;

ABSTRACT

Overland transport of ore concentrate from the Red Dog lead/zinc mine in northwest Alaska to its seaport has historically raised concerns among local subsistence users regarding the potential impacts of fugitive dust from the operation, including the potential uptake of metals into caribou meat. Caribou are an integral part of life for northern Alaska Natives for both subsistence and cultural reasons. The Western Arctic caribou herd, whose range includes the Red Dog mine, transportation corridor, and port site, sometimes overwinter in the vicinity of mine operations. A weight of evidence approach using multiple lines of evidence was used to evaluate potential risks associated with subsistence consumption of caribou harvested near the road and mine. Data from a long-term caribou monitoring program indicate a lack of consistent trends for either increasing or decreasing metals concentrations in caribou muscle, liver, and kidney tissue. Lead, cadmium, and zinc from all tissues were within the range of reference concentrations reported for caribou elsewhere in Northern Alaska. In addition, a site use study based on data from satellite-collared caribou from the Western Arctic Herd showed that caribou utilize the area near the road, port, and mine approximately $1/20^{th}$ to $1/90^{th}$ of the time assumed in a human health risk assessment conducted for the site, implying that risks were significantly overestimated in the risk assessment. The results from multiple lines of evidence consistently indicate that fugitive dust emissions from Red Dog Operations are not a significant source of metals in caribou, and that caribou remain safe for human consumption.

Key Words: fugitive dust; Western Arctic Herd; native northern Alaskans; metals

INTRODUCTION

The Red Dog mine area in northwest Alaska is highly mineralized and overland transport of lead and zinc ore concentrate from the mine to the seaport occurs throughout the year along the DeLong Mountain Regional Transportation System (DMTS). Sampling results from 1999 indicated the presence of lead in road soil and on moss growing near the road (NPS 2000). Caribou (*Rangifer tarandus*) are an integral part of life for northern Alaska Natives for both subsistence and cultural reasons. Multiple studies of caribou were conducted to evaluate potential risks associated with subsistence consumption of caribou harvested near the Red Dog mine and DMTS road. These studies, along with an additional site use study based on data from satellite-collared caribou from the Western Arctic Herd, are described in this paper. We evaluated multiple lines of evidence from these studies to determine whether fugitive dust emissions from Red Dog Operations are a significant source of metals in caribou, and to assess whether caribou remain safe for human consumption.

Caribou herds in Northern Alaska

Four distinct caribou herds are found in northern Alaska. The area near the Red Dog mine and the DMTS is included in the normal annual range of two of those herds, the Western Arctic (WAH) and the Teshekpuk (TCH) herds (Figure 1). The Western Arctic herd (WAH) ranges over approximately 140,000 square miles (Dau 2015). This herd numbered approximately 242,000 in 1970, declined to approximately 75,000 in 1976, and peaked at approximately 490,000 in 2003. In 2013, the herd numbered approximately 235,000 (Dau 2015). The smaller TCH numbered approximately 39,000 in 2013, the last year for which photocensus data were available (Parrett 2015). The TCH range also extends to the area around the DMTS, particularly in the winter (Person et al. 2007). In addition, caribou from these two herds regularly mix (Dau

2015; Parrett 2015). Person et al. (2007) estimated an apparent emigration rate from the Teshekpuk herd of approximately 7% in 1990–2005, evenly split between the WAH and the Central Arctic herd (CAH). The WAH ranges widely throughout the year, and in some years caribou from this and the TCH winter near the road and mine thus raising the possibility these animals might be exposed to mine-generated metals in dust, soil, water, or plants.

Previous caribou studies

In 2001, the Alaska Department of Public Health (ADPH) conducted a health study evaluating exposure of residents from Kivalina and Noatak, the two villages nearest Red Dog mine, to metals present in subsistence foods (ADPH 2001). The ADPH study included a review of prior studies conducted by ADFG and others, as well as an analysis of metals levels in subsistence foods, including in caribou collected from near the Red Dog mine as part of a study conducted by ADFG in 1996. ADPH concluded that "…average concentrations of metals found in caribou harvested near the Red Dog Mine and DMTS road were low. Eating caribou from the Western Arctic caribou herd does not pose a public health threat."

An additional site-specific, multipathway human health risk assessment (HHRA) was conducted using data collected from 2000-2004 that evaluated exposure to DMTS-related metals through incidental soil ingestion, water ingestion, and subsistence food consumption under three scenarios: 1) child subsistence use, 2) adult subsistence use, and 3) combined worker/subsistence use (Exponent 2007). Estimated risks from each of the scenarios were well within acceptable public health limits. However, exposure to metals through caribou consumption accounted for approximately 70% of the total estimated risk in all three scenarios, highlighting the importance of additional understanding of this potential exposure pathway.

In risk assessment practice, the term “subsistence level consumption” describes consumption of most or all of a particular food type or group of foods from a locally harvested source and/or consumption of those foods at significantly higher rates than the general public. Two key assumptions were included in the HHRA to address uncertainty in the contribution of subsistence foods to the overall diet and the contribution of site-related metals to human health risk. First, although data from the region indicate that subsistence foods compose approximately 20% of the total diet (Johnson et al. 2009), the HHRA assumed that subsistence contribute 100% of the diet of local subsistence users. Second, fractional intake (FI, defined as the fraction of metals in a food type derived from the site relative to total metals present in the food source) was estimated to be 0.09 (i.e., 9%) based on the ratio of the total land area covered by the study area relative to the total harvest area used by neighboring communities. The latter assumption overestimates the contribution of metals from the site both because the caribou home range is far greater than the harvest area for local communities and because individual caribou spend a relatively small amount of time in the area near the mine and DMTS road.

Although the ADPH analysis and the HHRA indicated that potential impacts to caribou and subsistence users were minimal to negligible, additional monitoring and study of caribou and other subsistence foods are included as part of ongoing fugitive dust risk management activities for the site. Results from that monitoring are included in the analyses described herein.

METHODS

One aspect of ongoing risk management for fugitive dust at Red Dog Operations includes periodic collection and necropsy of caribou to assess their general health and determine tissue metal concentrations. Additionally, a caribou site use study was conducted to reduce uncertainty related to risk assessment assumptions. In this paper, the results of these studies are evaluated in

the context of potential risks associated with subsistence consumption of caribou harvested near the road and mine. The methods used in these studies are described below.

Caribou monitoring program

In spring 2002 and again in spring 2009, 10 caribou were harvested from near the Red Dog mine and the DMTS road by hunters from Kivalina or Noatak who had been contracted by Teck Alaska for this purpose. All caribou collected had overwintered near the Red Dog Mine and northeastern section of the DMTS. Caribou were killed by a gunshot to the head or cervical vertebrae whenever possible, and intact carcasses were transported to a heated building immediately after being taken. During 2002 necropsies were conducted by Dr. P. Meyer and J. Dau following standard laboratory procedures. Necropsies conducted during 2009 were performed by Dr. K. Beckmen, J. Dau and L. Parrett following the CARMA protocol (Gunn and Nixon 2008). All necropsies were conducted on the same day that the animals were harvested, and usually within 1-4 hours of time of death. Muscle, liver, and kidney tissues were dissected at the time of harvest, frozen immediately, and shipped for metals analysis. No samples were taken from tissue areas that might have been affected by bullet fragments. Incisor teeth were collected to estimate animal age. All edible meat from collected caribou was salvaged and distributed to residents of Noatak and Kivalina.

Metals data from the 2009 collection were compared to metals concentrations in the "reference" caribou tissue harvested in 1996 from other areas in northern Alaska (O'Hara et al. 2003). Because raw data from the 1996 data set were not available, statistical differences between Red Dog and reference caribou were assessed by treating each location mean in the reference dataset as an independent measurement and calculating a one-sided 95 percent upper

prediction limit (95%UPL) for the range of expected measurements. Red Dog caribou tissue concentrations were considered statistically different if the mean exceeded the 95%UPL.

Data were also compared to metals concentrations in Canadian caribou and Scandinavian reindeer from the literature (Borch-Johnsen et al. 1996; Chan et al. 2001; Crete et al. 1986; Elkin and Bethke 1995; Kuhnlein and Soueida 1992; Larter and Nagy 2000; Rintala et al. 1995). None of the populations included in the literature comparisons was known to have any specific metal exposure other than to levels that occur naturally in the environment. Raw data were not reported in these studies so statistical analysis of the comparison was not conducted.

To assess temporal trends, Red Dog caribou metals concentrations from 2009 were compared to previous years. Concentrations in 2009 were compared to 2002 using the two-sided Student's t-test. To assess the effect of animal age on organ metals concentrations, data were also evaluated following age adjustment, whereby metals concentrations were divided by the age of the animal, with results expressed in mg/kg/year. Differences were considered statistically significant at $P<0.05$.

Caribou site use study

The caribou site use study was conducted using satellite collar location data from WAH caribou in collaboration with the Alaska Department of Fish and Game (ADF&G). The purpose was to determine if the assumed fractional intake used in the HHRA was realistic. The ADFG satellite collar data needed for the analysis are protected information, in order to protect the herds from overhunting. Analysis parameters and GIS shape files were developed and transmitted to ADF&G, where site use related statistical analyses were conducted.

The analyses included data collected from satellite-collared caribou between 2000 and 2012, excluding data from the date of initial collaring (September of each year) until May 6th of

the following year (beginning of spring migration) to allow newly deployed collars to become distributed throughout the WAH range. The analysis included data from two types of satellite collars: platform terminal transmitter (PTT) and global positioning system (GPS). Data from both collar types were combined after statistical analysis demonstrated a lack of significant differences in frequency of site usage between the PTT and GPS collars (Randomized Block ANOVA. Area 1: $F=2.30$, $P=0.13$; Area 2: $F=2.18$, $P=0.14$).

The analysis was conducted for two zones of distance from the road complex:

- Area 1 — Delineated by a 5-km zone to the N/NW and a 2-km zone to the S/SE of the DMTS and mine air permit boundary (Figure 2). This was the assumed site area in the HHRA.

- Area 2 — Delineated by a 10-km zone on all sides of the DMTS and the mine air permit boundary (Figure 2). This area was included as an upper-bound estimate of an area that could be affected by dust from the site (although most of this area is unlikely to be significantly affected).

Site use was analyzed in three ways:

1. Fractional Site Use — The fraction of time spent by WAH caribou in the site area was estimated by calculating the ratio of total number of satellite collar locations within the site area relative to the total number of satellite collar data signals recorded outside of those areas in that year. Because this metric considers the amount of time all satellite-collared caribou spent within versus outside the study areas, it probably better represents intensity of use at the herd level than the two alternative approaches described below.

2. Site Entry — The fraction of animals from the WAH that entered the site was estimated by the total number of satellite-collared caribou that entered the site at least once each year relative to the total number of satellite-collared caribou in the herd. This measurement does not consider how long the animals spent in the site area, only whether they entered the site at all. Site entry is, thus, only a crude estimate of FI.

3. Fractional Site Use by Individual Caribou — This approach considered only those satellite-collared caribou that entered one of the two study areas at least once during some year. For these individuals, the fraction of time spent in the site area was estimated as the total number of satellite-collar locations within the site area relative to the number of satellite-collar locations recorded outside of that area for that year. As with the first approach described above, this metric considers the amount of time each caribou spent near vs. far from the development complex. However, it overestimates intensity of use because it ignores those collared individuals that never entered one of the 2 study areas during a particular year, which was usually the majority or vast majority of the WAH,

Data distributions in the site use study were determined to be lognormal; therefore, non-parametric methods of statistical analysis were used for the analysis. Randomized block analysis of variance (ANOVA) was used to evaluate differences between PTT and GPS collar data. Differences in site use between time periods were evaluated using Kruskall-Wallis one-way ANOVA.

RESULTS

Caribou monitoring program

The 2009 Red Dog tissue sample results were compared with metals concentrations in caribou collected in 1996 from North Slope locations monitored by the North Slope Bureau. There were no consistent differences between tissue metals concentrations in the 2009 Red Dog data and the 1996 Northern Alaska data (Figure 3). In most cases, Red Dog metals were below the 95%UPL for the reference samples. Lead in Red Dog caribou slightly exceeded the reference 95%UPL for liver (2.5 versus 2.2 mg/kg) and kidney (1.6 versus 1.4 mg/kg). Mean caribou muscle lead (0.026 mg/kg) was less than the mean concentration in each reference group and similar to the typical lead concentrations in meat, fish, and poultry in the United States and Canada, where mean lead concentrations of approximately 0.02 mg/kg have been reported (ATSDR 2007). Cadmium concentrations in caribou harvested in 2009 near Red Dog were similar to the northern Alaska reference concentrations (O'Hara et al. 2003) for all tissues. Mean muscle cadmium (0.0135 mg/kg) was less than the mean concentration in each reference group (Figure 3). Zinc concentrations were also similar to the 1996 Northern Alaska reference animals.

There were no consistent trends in differences between the 2009 Red Dog tissue data and metals concentrations compared to Canadian caribou and Scandinavian reindeer reference populations reported in the literature (Borch-Johnsen et al. 1996; Chan et al. 2001; Crete et al. 1986; Elkin and Bethke 1995; Kuhnlein and Soueida 1992; Larter and Nagy 2000; Rintala et al. 1995; Figure 4). In most cases, values were reported both above and below the concentrations in the 2009 Red Dog samples, with a large degree of intra-group variability. Statistical analysis was not conducted for these comparisons because of the lack of raw data and differences in reporting methods. Similar to the comparison to the northern Alaska reference data, mean liver

and kidney lead concentrations in the 2009 Red Dog data slightly exceeded the mean concentrations for each of the reference samples.

Metals concentrations from caribou collected near the Red Dog mine and DMTS in 1996, 2002, and 2009 are presented in Figure 5. Metals concentrations were not consistently higher or lower in 2009 compared to 2002. Muscle lead ($P=0.02$) and cadmium ($P=0.006$) concentrations from 2009 caribou were statistically significantly lower than concentrations from 2002. Muscle ($P<0.0001$) and kidney zinc ($P=0.003$) were statistically significantly higher in 2009 relative to 2002. All other tissue metals concentrations were not significantly different.

Caribou site use study

Fractional site use – The percentage of time WAH caribou spent in the site area was consistently low throughout the study period (Table 1). The median site use was 0.1% for Area 1 and 0.4% for Area 2 for the entire study period, 2000–2012. Site use differed significantly between the 2000–2010 period (0.1%) and the 2011–2012 period (0.6%) for Area 1 ($p=0.03$), and the difference between those time periods approached significance for Area 2 (0.3% vs. 1.2%; $p=0.08$), although it was still low in the highest use year, 2012 (0.8% in Area 1, 1.5% in Area 2), relative to the FI assumed in the HHRA (9%).

Site entry – The percentage of the WAH entering the site was relatively consistent during the 2000–2010 period (median 4% and 9% for Areas 1 and 2, respectively) but increased significantly to 36% and 43% for those areas in the following 2-year period, 2011–2012 ($p=0.03$ for both Area 1 and Area 2) (Table 1). This finding is consistent with the increased fractional site use recorded for those years.

Individual fractional site use – The percentage of time spent by individual WAH caribou in the site area was consistently low throughout the study period (Table 1). From 2000 to 2010,

the median site use was 1.1% for Area 1 and 1.5% for Area 2. During the 2011–2012 period, despite increased numbers of animals entering the site (Table 1), the median percentage of time that these animals spent in Area 1 decreased significantly to 0.6% ($p=0.05$). The median time spent in Area 2 in 2011–2012 (1.1%) did not differ statistically from the 2000–2010 time period. Combining all years from 2000 to 2012, the median time spent in Areas 1 and 2 by animals that entered the site at least once was 1.0% and 1.4%, respectively.

DISCUSSION

The caribou monitoring program is an integral component of a comprehensive fugitive dust risk management plan developed by Teck Alaska that continues to track caribou health and metals concentrations. The risk management monitoring plan stipulates an ongoing monitoring frequency of once every 6 years. The analysis presented herein confirms that the caribou monitoring frequency identified in the monitoring plan together with other more frequent monitoring programs also included in that plan are adequate to verify the continued safety of subsistence use of caribou in the area (Exponent 2014).

The results of both the ADPH study and the site-specific HHRA indicated human health risks associated with subsistence food consumption and harvest activities are within acceptable limits, including risks associated with caribou consumption. As with any risk assessment, assumptions incorporated into the evaluation have inherent uncertainty. The studies described here were conducted to address areas of uncertainty related to the potential contribution of Red Dog fugitive dusts to metals concentrations in caribou, and in response to ongoing community concerns for the safety of caribou as a food source.

Results from previous and current studies described herein indicate that metals concentrations in caribou harvested near the mine and DMTS were similar to reference caribou

from elsewhere in Northern Alaska and to caribou and reindeer from other parts of the world. In addition, the 2009 sampling did not find a consistent trend in metals concentrations compared to 2002. Thus, fugitive dust emissions from Red Dog Operations do not appear to cause a significant increase in metal concentrations in caribou. Although a formal trend analysis was not yet possible given the few available sampling events, these data will form the basis for future analyses, which will be conducted following the next monitoring period.

Evidence in the literature suggests that organ metals concentrations in caribou and other animals are age related and consequently, metals concentrations are often age adjusted prior to analysis. However, the relationship for a given metal and tissue does not appear to be consistent from one population to another in these studies. For example, Larter and Nagy (2000) analyzed metals concentrations in the kidneys of two caribou populations in northern Canada—the Bluenose herd in the Northwest Territories and an arctic herd on Banks Island. Cadmium concentrations were positively correlated with age in the Bluenose herd ($r = 0.64$, $P = 0.002$). But in the Canadian arctic population studied by Larter and Nagy (2000), cadmium concentrations were negatively correlated with age as a result of one outlying data point ($r = -0.88$, $P = 0.05$). Excluding the outlying animal, there was no significant relationship between age and cadmium. There was also no significant relationship between kidney lead concentration and age. With respect to the Red Dog results, by comparison with the 2002 data, there were four results that differed significantly in the 2009 Red Dog caribou data: muscle cadmium and lead were lower, and muscle and kidney zinc were higher. However, after adjusting for age, only two results remained significant: muscle cadmium was lower ($P = 0.03$) and muscle zinc higher ($P < 0.0001$) in 2009 compared to 2002 (Table 2). In addition, muscle

lead was nearly significantly lower ($P = 0.06$). Thus, age-adjustment does not alter interpretation of the results.

The HHRA used an estimated value of 0.09 (i.e., 9%) for FI. This estimate was based on the ratio of the total land area covered by the study area relative to the total harvest area used by residents of Kivalina and Noatak. This was assumed to overestimate actual site use by caribou, because it did not take into account the full extent of the caribou home range. The actual site use by caribou was uncertain because of the lack of quantitative temporal data on site use. The site use study using ADFG radiocollar satellite data from the WAH provides data for a quantitative estimate and demonstrates that actual site use by WAH caribou is much lower than the estimate used in the HHRA. The best estimate of site use from the current study is 0.001 (i.e., 0.1%), the median site use for Area 1. Even considering site use only by caribou that entered the site at least once in a given year, median site use (0.01 for Area 1; i.e., 1%) is still nearly an order of magnitude lower than the estimate originally used in the HHRA (Table 3).

Individual animals can spend substantially more time at the site. For example, one collared caribou that overwintered near Red Dog in 2011–2012 and frequently came within the two areas of interest substantially skewed the data for those years. The fractional site use values for that animal in 2012, which represent the maximum for the 2000-2012 time period, were 0.094 and 0.189 for Areas 1 and 2, respectively. Caribou do overwinter near the DMTS in some years, but the data and field observations suggest that it is usually a small proportion of the herd and that it happens infrequently. Furthermore, caribou tissue samples used in the HHRA have historically been collected from animals that overwintered in the area, and therefore any site-related effect on tissue metals concentrations would likely have been reflected in the HHRA results.

Data from the site entry analysis indicate that, in some years, many more caribou enter the site study area than is typical. In addition to approaching close to the road during July 2011, many WAH caribou contacted the road as they moved southeast along the coast during the fall migration. However, it is important to note that although the approach of caribou to the DMTS during July 2011 increased the number of animals that entered the study area compared to 2000–2010, these animals spent little time within the study area. Despite the increased number of animals entering the study area, the fraction of time spent within the study area by individual animals decreased in 2011–2012. The number of caribou (or proportion of the overall herd) that comes in proximity to the Red Dog development complex in any particular year, and the amount of time that they spend there, are likely driven more by the myriad of factors that influence annual caribou movements and distribution rather than specific selection based on factors associated with the development complex itself. In fact, the fractional site use estimates based on our analysis are consistent with the fraction of the total WAH range (157,000 mi^2; Dau 2015) covered by our study areas. Area 1 (269 mi^2) makes up 0.2% and Area 2 (776 mi^2) 0.5% of the total WAH range. These values are similar to fractional site use of 0.1% and 0.4% for Areas 1 and 2, respectively, and less than fractional site use during relatively high use periods (0.6% in Area 1 and 1.2% in Area 2 in 2011-2012). Thus, WAH caribou do not appear to be specifically avoiding the area around Red Dog. Rather, our data indicate actual site use is what would be expected based on the geographic area of the site relative to the WAH range.

O'Hara et al. (2003) reported that the animals harvested near Red Dog mine in the 1996 study were from the WAH. ADFG identified the animals collected in 2002 as belonging to the WAH, and animals in the 2009 study as belonging to the TCH. It is possible that sampling of animals from different herds from one sampling period to the next could result in increased data

variability and mask herd-specific differences in tissue metals concentrations that might exist. The current dataset does not allow us to directly assess potential differences between the herds. In addition, as previously noted, both temporary mixing and more permanent emigration between herds have been documented (Person et al. 2007; Parrett 2015). Individual animals sampled during a given sampling event may be associated with another herd with a different migratory pattern. However, this is likely to have no more influence on contact rate with the Red Dog mine and DMTS than typical year-to-year variability in migratory patterns within one herd.

The FI estimate in the HHRA did not take into account the time caribou spend at the site, nor did it reflect the total home range of caribou that spend time in the vicinity of Red Dog. Quantitative analyses of satellite collar data for WAH caribou showed that median site use was 0.001 (0.1%) for Area 1 and 0.004 (0.4%) for Area 2 over the study period. Thus, the FI of 0.09 (i.e., 9%) used in the HHRA overestimates actual site use by a factor of approximately 20 to 90. Therefore, the FI value used in the HHRA was protective of human health and may overestimate actual risk by one to two orders of magnitude. This result is consistent with the findings to date of the caribou monitoring program, which indicate little if any influence from Red Dog fugitive dusts on metals concentrations in caribou.

Along with the ADPH evaluation and the site-specific HHRA, the caribou monitoring and site use studies described here provide multiple lines of evidence indicating that fugitive dust emissions from Red Dog operations are not a significant source of metals in caribou. Metals levels in caribou harvested near Red Dog remain similar to concentrations of caribou collected elsewhere. Thus, with respect to metals, caribou remain safe for subsistence consumption, consistent with the prior conclusions of the HHRA.

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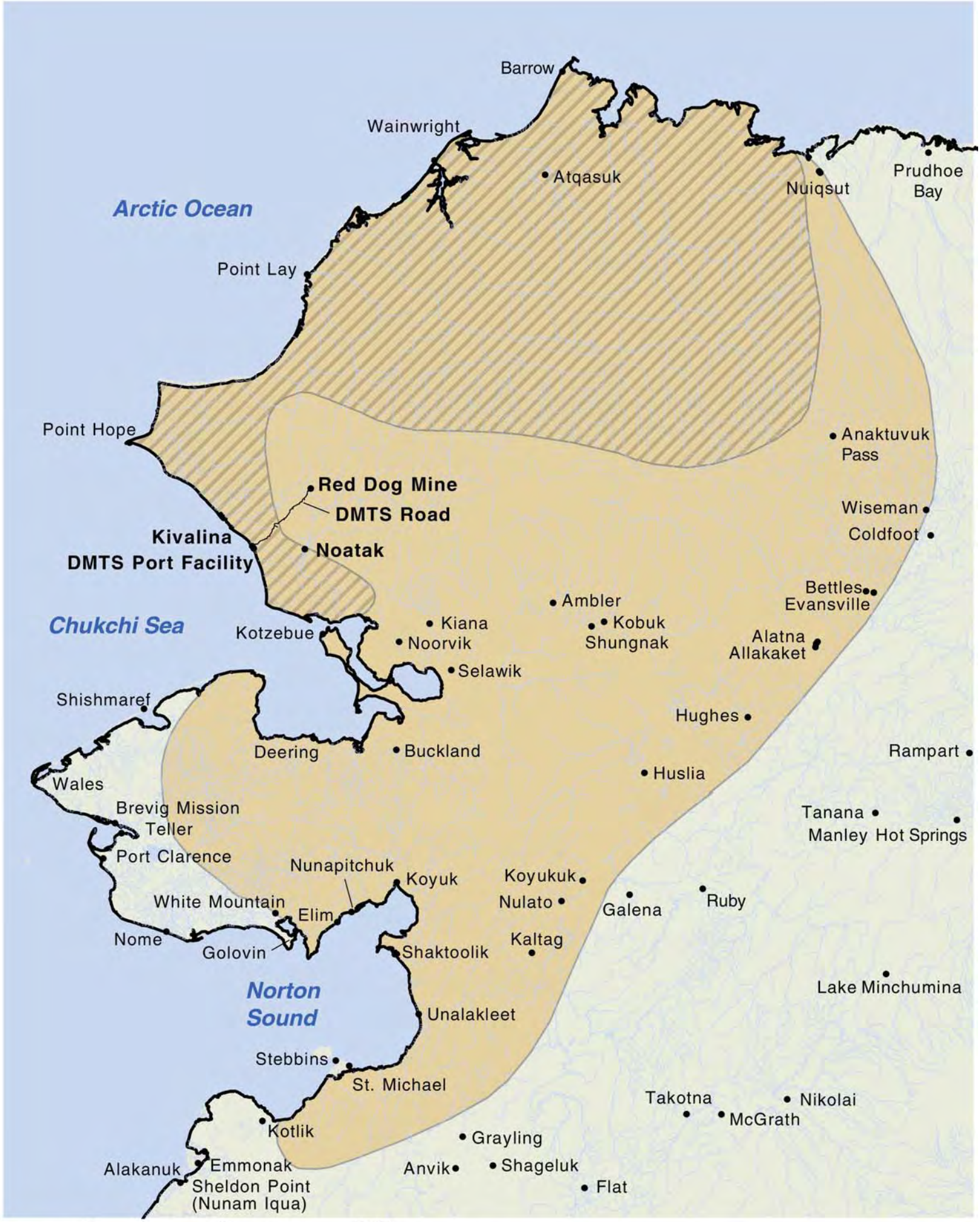
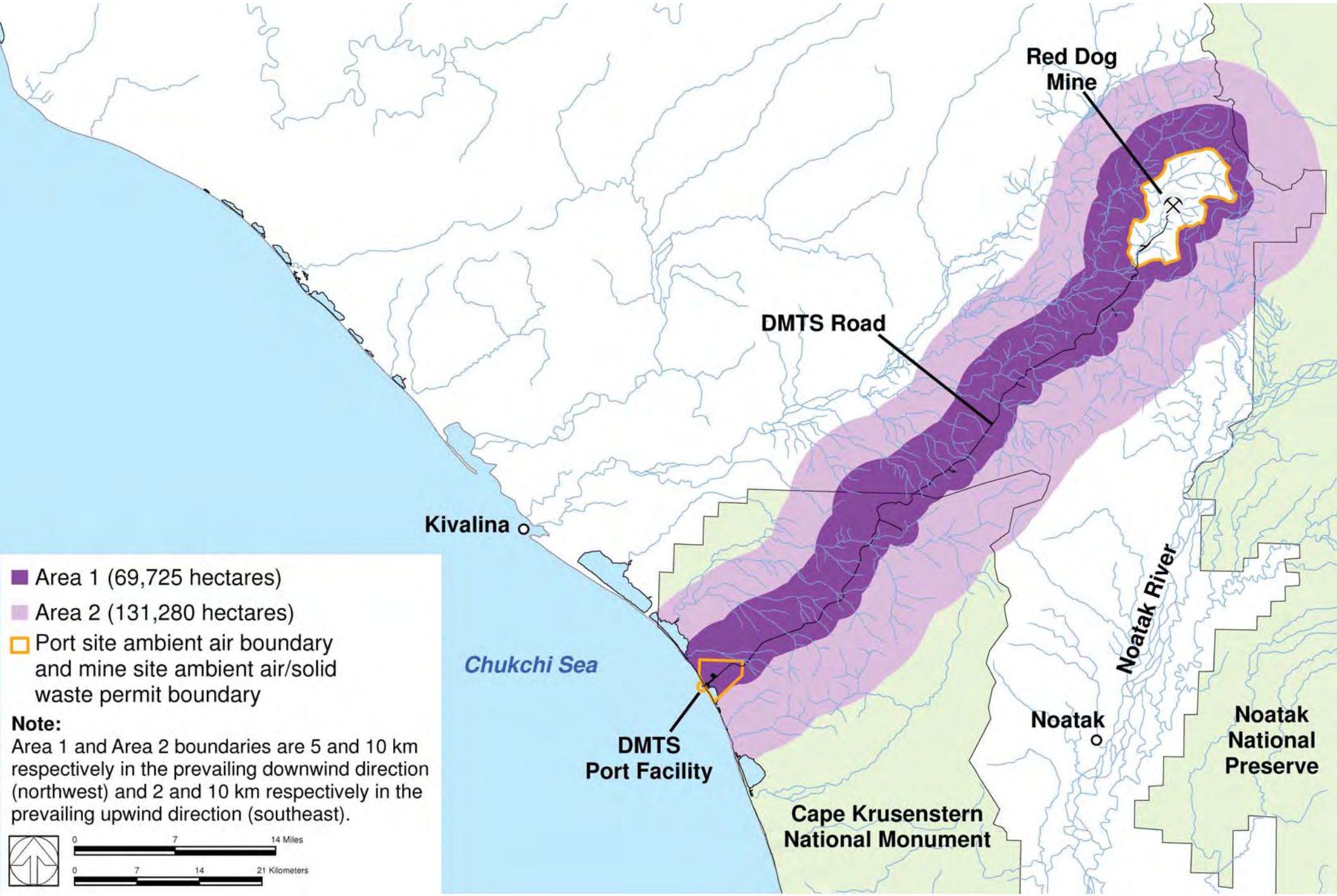
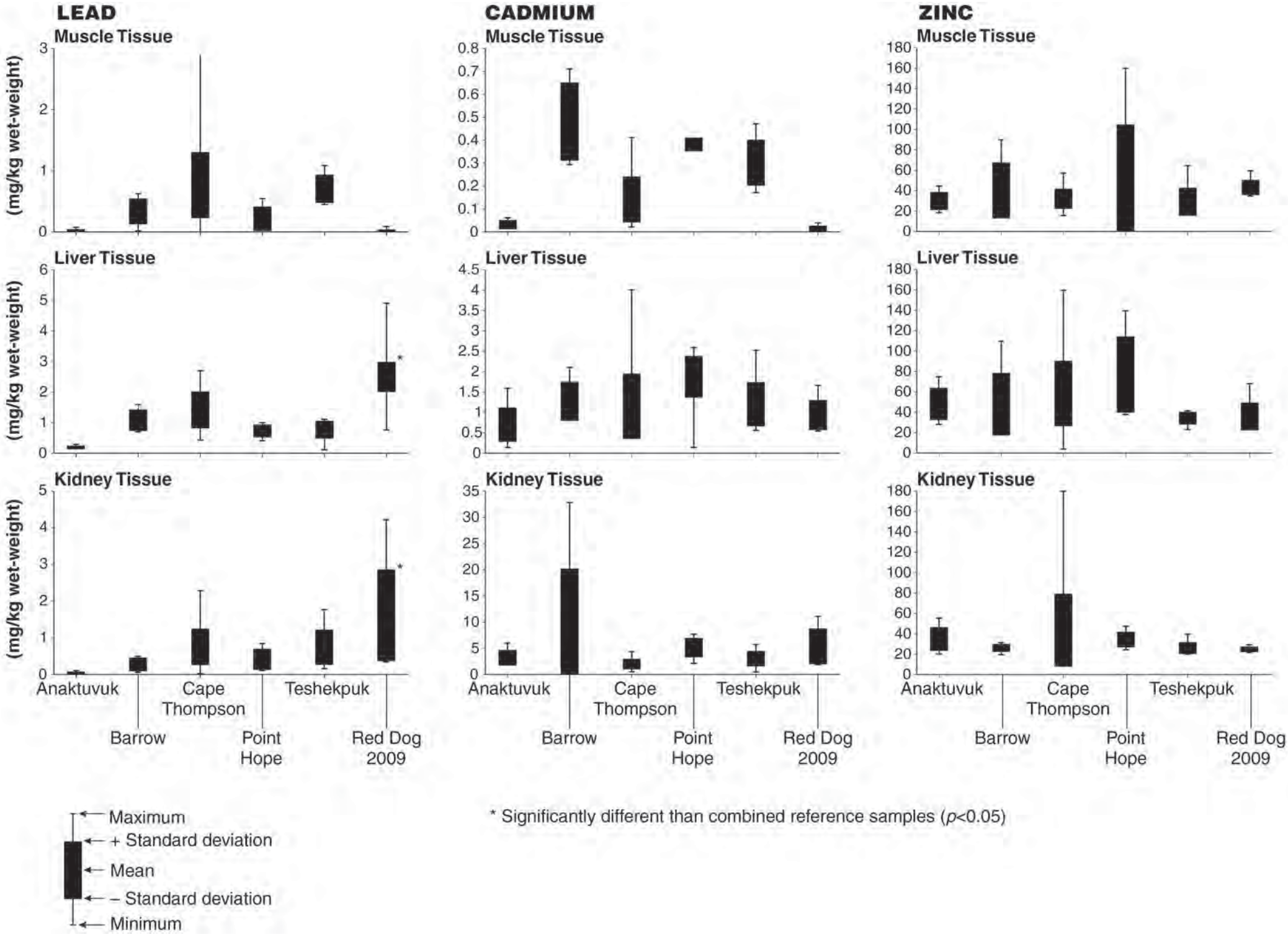
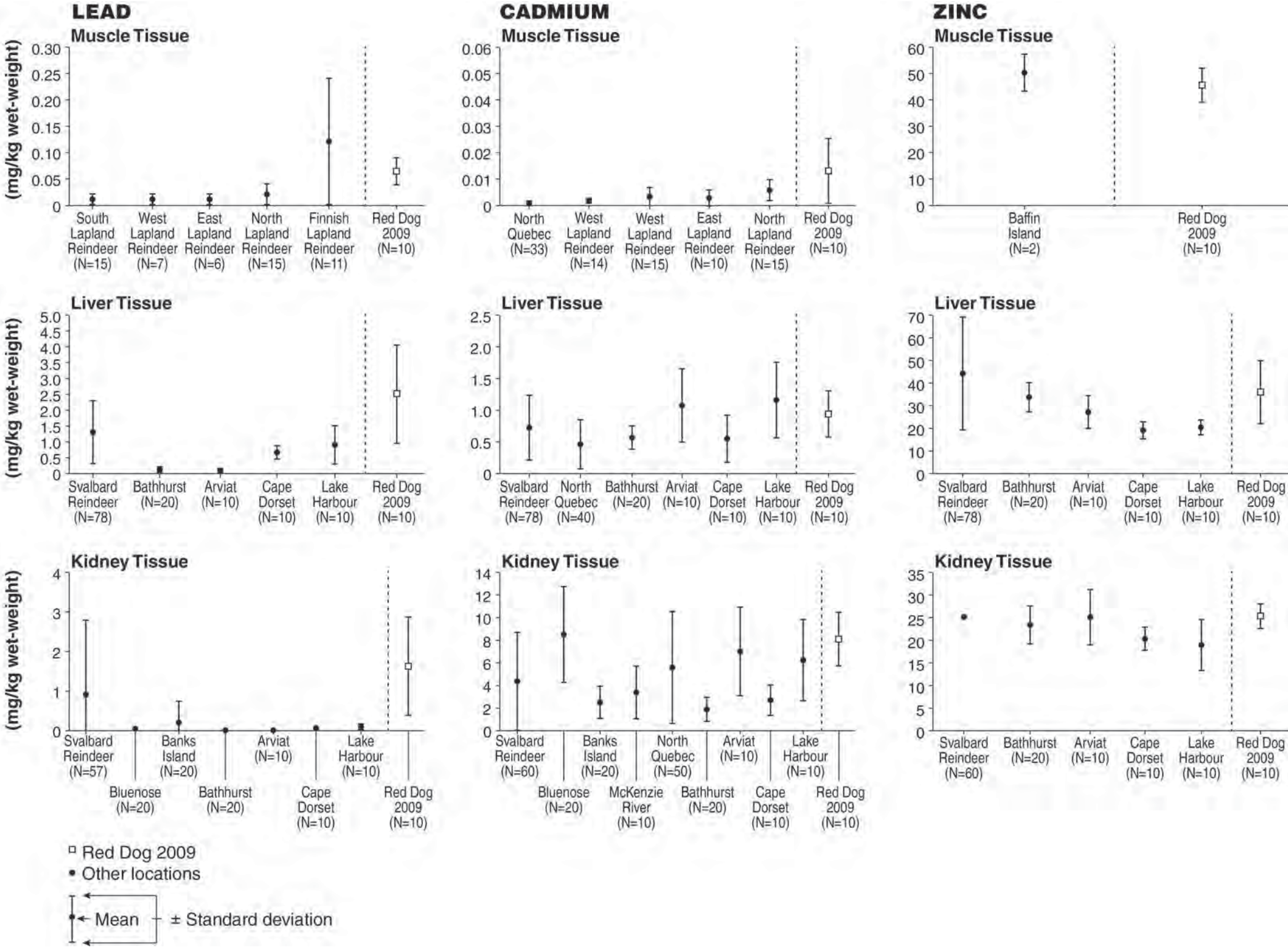


Source: Adapted from ADFG (2005) and USFWS (2008).


Red Dog Mine
DMTS Road
Kivalina
Chukchi Sea
DMTS Port Facility
Noatak River
Noatak
Noatak National Preserve
Cape Krusenstern National Monument
Area 1 (69,725 hectares)
Area 2 (131,280 hectares)
Port site ambient air boundary and mine site ambient air/solid waste permit boundary
Note:
Area 1 and Area 2 boundaries are 5 and 10 km respectively in the prevailing downwind direction (northwest) and 2 and 10 km respectively in the prevailing upwind direction (southeast).
0 7 14 Miles
0 7 14 21 Kilometers


LEAD
CADMIUM
ZINC
Muscle Tissue
Liver Tissue
Kidney Tissue
(mg/kg wet-weight)
Anaktuvuk
Barrow
Cape Thompson
Point Hope
Teshekpuk
Red Dog 2009
Maximum
+ Standard deviation
Mean
– Standard deviation
Minimum
* Significantly different than combined reference samples (p<0.05)


LEAD
Muscle Tissue
(mg/kg wet-weight)
0.30
0.25
0.20
0.15
0.10
0.05
0
South Lapland Reindeer (N=15)
West Lapland Reindeer (N=7)
East Lapland Reindeer (N=6)
North Lapland Reindeer (N=15)
Finnish Lapland Reindeer (N=11)
Red Dog 2009 (N=10)
Liver Tissue
(mg/kg wet-weight)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
Svalbard Reindeer (N=78)
Bathhurst (N=20)
Arviat (N=10)
Cape Dorset (N=10)
Lake Harbour (N=10)
Red Dog 2009 (N=10)
Kidney Tissue
(mg/kg wet-weight)
4
3
2
1
0
Svalbard Reindeer (N=57)
Bluenose (N=20)
Banks Island (N=20)
Bathhurst (N=20)
Arviat (N=10)
Cape Dorset (N=10)
Lake Harbour (N=10)
Red Dog 2009 (N=10)
CADMIUM
Muscle Tissue
0.06
0.05
0.04
0.03
0.02
0.01
0
North Quebec (N=33)
West Lapland Reindeer (N=14)
West Lapland Reindeer (N=15)
East Lapland Reindeer (N=10)
North Lapland Reindeer (N=15)
Red Dog 2009 (N=10)
Liver Tissue
2.5
2.0
1.5
1.0
0.5
0
Svalbard Reindeer (N=78)
North Quebec (N=40)
Bathhurst (N=20)
Arviat (N=10)
Cape Dorset (N=10)
Lake Harbour (N=10)
Red Dog 2009 (N=10)
Kidney Tissue
14
12
10
8
6
4
2
0
Svalbard Reindeer (N=60)
Bluenose (N=20)
Banks Island (N=20)
McKenzie River (N=10)
North Quebec (N=50)
Bathhurst (N=20)
Arviat (N=10)
Cape Dorset (N=10)
Lake Harbour (N=10)
Red Dog 2009 (N=10)
ZINC
Muscle Tissue
60
50
40
30
20
10
0
Baffin Island (N=2)
Red Dog 2009 (N=10)
Liver Tissue
70
60
50
40
30
20
10
0
Svalbard Reindeer (N=78)
Bathhurst (N=20)
Arviat (N=10)
Cape Dorset (N=10)
Lake Harbour (N=10)
Red Dog 2009 (N=10)
Kidney Tissue
35
30
25
20
15
10
5
0
Svalbard Reindeer (N=60)
Bathhurst (N=20)
Arviat (N=10)
Cape Dorset (N=10)
Lake Harbour (N=10)
Red Dog 2009 (N=10)
Red Dog 2009
Other locations
Mean
± Standard deviation

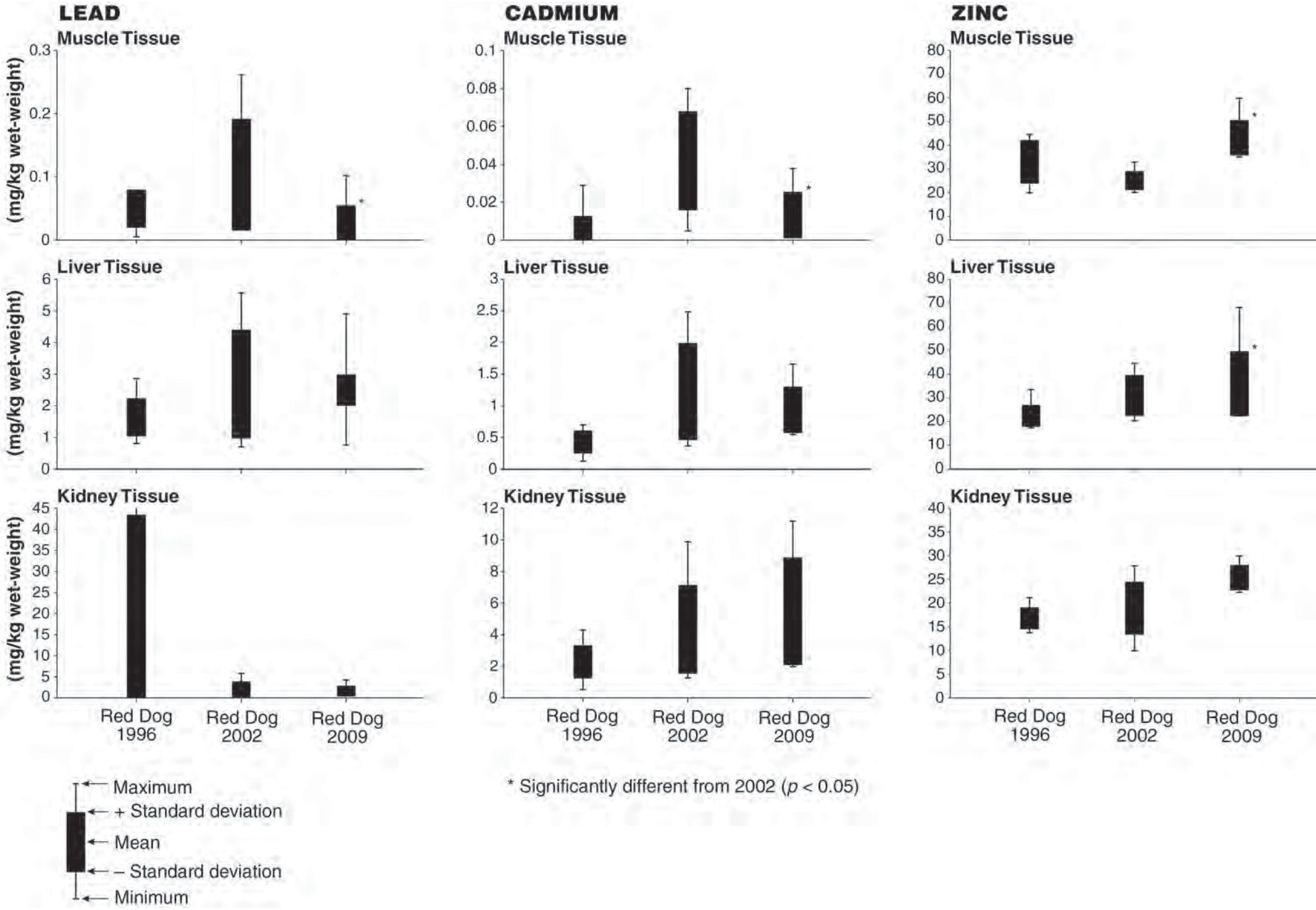

LEAD
CADMIUM
ZINC
Muscle Tissue
Liver Tissue
Kidney Tissue
(mg/kg wet-weight)
Red Dog 1996
Red Dog 2002
Red Dog 2009
Maximum
+ Standard deviation
Mean
– Standard deviation
Minimum
* Significantly different from 2002 ($p < 0.05$)

Table 1. Site Use by WAH Caribou

	Fractional Site Use			*Site Entry*			*Fractional Site by Individual Caribou*			
Year	Total Number Satellite Collar Locations in WAH Range	Time Spent in Area 1 (percent)	Time Spent in Area 2 (percent)	Total Number Satellite-Collared Caribou in WAH	Site Entry Area 1 (percent)	Site Entry Area 2 (percent)	Number Satellite-Collared Caribou that Entered Area 1	Median Individual Time Spent in Area 1	Number Satellite-Collared Caribou that Entered Area 2	Median Individual Time Spent in Area 2
2000	6751	0.1	0.2	25	4	4	1	1.2	1	3.9
2001	7003	0.1	0.4	33	3	15	1	1.5	4	1.4
2002	8701	0.1	0.5	39	13	18	5	1.1	7	1.9
2003	13736	0.1	0.1	45	7	9	2	1.3	4	1.5
2004	11251	0.1	0.7	47	9	13	4	0.5	6	1.5
2005	7921	0.2	0.6	45	4	9	2	2.0	4	2.9
2006	6486	0.0	0.0	38	0	3	0	0.0	1	0.2
2007	10592	0.0	0.1	52	0	8	0	0.0	4	0.6
2008	19285	0.0	0.4	62	3	13	2	0.7	7	1.4
2009	20554	0.2	0.3	58	5	7	3	1.0	4	2.0
2010	44439	0.0	0.1	108	1	7	1	2.7	8	0.4
2011	43859	0.4	0.9	115	25	30	28	0.5	32	1.2
2012	41587	0.8	1.5	115	46	56	51	0.6	62	0.9

Time Spent in Area = (# collar locations in area / # collar locations in entire range) × 100
Site Entry = (# collared caribou entering site at least once / # collared caribou) × 100
Time Spent in Area = (# individual caribou collar signals in area / # collar signals in entire range for that caribou) × 100
Area 1 is defined as that area within 5 mi NW and 2 mi SE of the DMTS
Area 2 is defined as that area within 10 mi of the DMTS

Table 2. Statistical comparison of caribou metal concentrations: 2009 vs. 2002 (p-values)

	Cadmium		Lead		Zinc	
Unadjusted						
Muscle	0.006	↓	0.02	↓	<0.0001	↑
Liver	0.29	n.s.	0.78	n.s.	0.34	n.s.
Kidney	0.42	n.s.	0.56	n.s.	0.003	↑
Age-Adjusted						
Muscle	0.03	↓	0.06	n.s.	<0.0001	↑
Liver	0.45	n.s.	0.68	n.s.	0.89	n.s.
Kidney	0.17	n.s.	0.62	n.s.	0.35	n.s.

Notes: ↑ – statistically significantly higher in 2009 relative to 2002
↓ – statistically significantly lower in 2009 relative to 2002
n.s. – not significantly different in 2009 relative to 2002

Table 3. Comparison of Fractional Intake Estimates*

FI Used in DMTS Risk Assessment	Satellite Collar Site Use		Satellite Collar Individual Site Use	
	Area 1 Median	Area 2 Median	Area 1 Median	Area 2 Median
0.09	0.0007	0.0025	0.006	0.01

*Expressed as a fraction rather than a percent, consistent with use in risk assessment calculations.
Area 1 is defined as that area within 5 mi NW and 2 mi SE of the DMTS
Area 2 is defined as that area within 10 mi of the DMTS

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DRAFT

2016 Marine Sediment Monitoring Report

Red Dog Mine
Fugitive Dust Risk Management Monitoring Program

2016 Marine Sediment Monitoring Report

Red Dog Mine
Fugitive Dust Risk Management Monitoring Program

ADEC File No. 475.38.010

Prepared for

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December 2016

8601997.016-5888

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List of Tables

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Acronyms and Abbreviations

ACZ	ACZ Laboratories, Inc.
ASTM	American Society for Testing and Materials
DEC	Alaska Department of Environmental Conservation
DI	deionized water
DMTS	DeLong Mountain Regional Transportation System
ER-L	Effects Range-Low
ICP-MS	inductively coupled plasma/mass spectrometry
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS/MSD	matrix spike/matrix spike duplicate
RMP	Draft Fugitive Dust Risk Management Plan
QA/QC	quality assurance/quality control
Teck	Teck Alaska Incorporated
EPA	U.S. Environmental Protection Agency

Introduction

This report describes the findings of chemical analysis for metals in marine, nearshore sediment samples collected in September 2016 in the vicinity of the DeLong Mountain Regional Transportation System (DMTS) port. At the DMTS port, lead and zinc concentrates from the Red Dog Mine are loaded into barges for transfer to deep water cargo vessels. The sediment sampling was conducted as part of an ongoing fugitive dust risk management monitoring program (Exponent 2014). This data collection was conducted in a manner intended to meet the Alaska Department of Environmental Conservation's (DEC) requirements for decision-making purposes and to satisfy regulatory requirements under the DEC Contaminated Sites Program. The sampling was conducted to detect, observe, and record fugitive dust-related changes in the sediment environment.

The following sections provide background information regarding marine sediment data, methods for the study, field sampling details, analysis, and conclusions of the study. In addition, a data quality assurance review, field notes and photos, and laboratory reports are included as appendices.

Background

In August, 2008, the Draft Fugitive Dust Risk Management Plan (RMP) was prepared as part of a process intended to minimize risks associated with fugitive dust emissions from operations at the Red Dog Mine (Exponent 2008). The RMP combined and built upon a variety of prior and ongoing efforts by Teck Alaska Incorporated (Teck) to reduce dust emissions. The RMP identified seven fundamental risk management objectives that address the overall goal of minimizing risk to human health and the environment, identified and evaluated risk management options to achieve those objectives, and described a process for developing six implementation plans to achieve the fundamental objectives. The development of the Red Dog Monitoring Plan (Exponent 2014) is part of the process identified in the RMP to address the objectives. The other five implementation plans are as follows:

- Communication plan
- Dust emissions reduction plan
- Remediation/reclamation plan
- Uncertainty reduction plan
- Worker dust protection plan

The monitoring plan details techniques to detect, observe, and record fugitive dust-related changes in the environment, to address the following fundamental objectives:

- Assess the effectiveness of operational dust control actions.
- Evaluate the effects of the dust emissions on the environment and on human and ecological exposure.
- Trigger additional actions where necessary.
- Continue reducing fugitive metals emissions and dust emissions (this objective is addressed indirectly through monitoring to verify the effectiveness of operational dust control measures).
- Verify continued safety of caribou, other representative subsistence foods, and water.
- Monitor conditions in various ecological environments and habitats, and implement corrective measures when action levels are triggered.

This report describes the results of the marine sediment monitoring program, which was designed to monitor and evaluate metals concentrations in the marine environment around the DMTS port ship loading operation.

The marine sediment monitoring program is intended to provide data in support of oversight by the DEC Contaminated Sites Program, pursuant to 18 AAC 75.360. In addition, the marine sediment monitoring program provides data for Teck's use in operational monitoring.

Marine Sediment Monitoring

Marine sediment sampling was conducted on September 4, 2016, to monitor operational-scale dust deposition in the marine environment surrounding the DMTS port and barge-loading facilities. The sediment samples were collected at seven locations (Figure 1, Table 1) around the port facility which have at times exhibited elevated metals concentrations. These locations have been re-sampled every two years since 2003 as part of the ongoing marine sediment monitoring program to evaluate temporal changes in sediment metal concentrations. Monitoring data from

these stations allows evaluation of temporal changes in metal concentrations in surficial sediments.

Samples are analyzed for cadmium, lead, and zinc, which are the primary constituents of concern and risk drivers present in the lead and zinc concentrates transported from the mine, stored, and transferred to barges at the port. As specified in the monitoring plan (Exponent 2014), the measured levels are compared with the Effects Range-Low (ER-L) guideline values developed by Long et al. (1995) for marine sediment:

- Cadmium ER-L = 1.2 mg/kg dry
- Lead ER-L = 46.7 mg/kg dry
- Zinc ER-L = 150 mg/kg dry.

Marine sediment samples were collected for analysis of these metal constituents as part of the monitoring program. The monitoring plan states that if cadmium, lead, and zinc concentrations are less than their respective ER-L, then monitoring will continue on a 2-year frequency. However, if any of these metals exceed their ER-L at more than one station, then the plan calls for monitoring to be performed annually. Should the concentration of one of these metals exceed the ER-L at more than one station for more than two consecutive annual monitoring events, then additional dust control measures will be evaluated as defined in the dust emissions reduction plan. In that situation, monitoring would continue on an annual basis until metal concentrations remain below the ER-L for two successive years, at which point monitoring would revert to a 2-year frequency (Exponent 2014).

Methods

Marine sediment samples were collected on September 4, 2016, at the sample locations depicted in Figure 1 and listed in Table 1. The monitoring program was implemented by Teck environmental staff under the oversight and assistance of an Exponent senior scientist who meets the requirements of a Qualified Person under 18 AAC 75.990 (100) as required by DEC. The samples were submitted under chain of custody to ACZ Laboratories, Inc. (ACZ) in Steamboat Springs, CO. The data provided by ACZ were assessed and validated by Exponent according to U.S. Environmental Protection Agency (EPA) guidelines and method-specific requirements consistent with the quality assurance project plan, which are included as Appendix A to the monitoring plan (Exponent 2014). Exponent's quality assurance review is provided in Appendix A of this 2016 Marine Sediment Monitoring Report. Exponent's field notes and photographs are provided in Appendices B and C, respectively. Laboratory reports from ACZ are provided in Appendix D.

Surface sediment samples (0–2cm) were collected for metals analysis using a modified petite ponar grab sampler. One sediment sample was collected at each of the seven stations. In addition, a field duplicate was collected to assess the variability of chemical concentrations at the same location and a matrix spike/matrix spike duplicate (MS/MSD) sample was collected for evaluation of possible matrix interference with the analysis. Two water samples were also collected, an equipment rinsate blank, to help identify potential contamination from the sampling equipment and environment, and a source water blank, which consisted of a sample of the laboratory-grade deionized water (DI) used to clean equipment and to produce the equipment blank. As they were collected, samples were labelled, recorded in the field notebook, and stored in a cooler. At the Red Dog environmental facility, the samples were stored in a secured refrigerator before being shipped, on ice and under chain of custody, to ACZ.

Before sampling began at a station, the re-useable equipment was sprayed with a mixture of Liquinox soap and laboratory DI. The surfaces of the equipment were then thoroughly scrubbed with a brush, and the equipment was then thoroughly rinsed. The ponar sampler and stainless steel pan were rinsed with site water, while the bowl and trowel were rinsed with DI. The bowl

and trowel were covered with aluminum foil immediately after being rinsed to keep them clean. The ponar did not require aluminum foil covering, as no significant time elapsed between decontamination and redeployment.

The marine sediment samples were collected from a 30-foot landing craft, with the pre-cleaned ponar deployed from the bow of the vessel. The vessel's GPS receiver was pre-loaded with the station coordinates and used to navigate to each station. Once on station, the ponar was lowered to the sediment surface, retrieved, and placed in the pre-cleaned stainless steel pan. The pan was used to prevent the ponar from touching the deck in between deployments and did not come in contact with the sediment sample. Material collected from within the sampler was evaluated for acceptability according to whether the following criteria were met:

- Ponar was not overfilled
- Overlying water was present and not excessively turbid
- Sediment surface was relatively undisturbed
- Minimum penetration depth (i.e., greater than 2 cm) was attained.

Exponent's field representative evaluated all samples collected. If any of the above conditions were not met, the contents of the ponar were emptied into the pan and the ponar was re-deployed. If a sample was deemed acceptable, the overlying water was removed using a plastic syringe. A pre-cleaned stainless steel trowel was used to collect the upper 2 cm of sediment and transfer this portion into a pre-cleaned stainless steel mixing bowl. To ensure the collection of the proper sediment interval, a 2-cm length from the tip of the trowel was measured and best professional judgment was used in the collection of the representative depth. Sediment that had touched the side of the ponar was excluded from the sample to the best extent possible. The sediment color, general grain size composition, odor, and any other relevant observations were recorded in the field notebook.

Once the appropriate volume of the sediment had been collected in the bowl, the sample was homogenized to consistent color and texture, photographed, and transferred to pre-labeled and pre-cleaned sample containers. The sample containers were then sealed, placed into bubble wrap bags, and then placed into a cooler containing frozen blue ice. The samples were transferred to a secure sample refrigerator upon returning to the facility, where they were maintained at 4 °C

until being packed for shipment to the analytical laboratory. The equipment blank and source blank samples were preserved with nitric acid (HNO_3).

Four quality assurance/quality control (QA/AC) samples were collected during the marine sediment monitoring event: a field duplicate, an MS/MSD, an equipment blank, and a source blank. The field duplicate and MS/MSD were collected at station NMO.

The equipment blank sample was collected by running DI over the surfaces of the ponar and trowel, following completion of decontamination of those tools after sediment sampling. The DI was collected in the bowl, and additional DI was run over the inner surface of the bowl until a sufficient volume of DI had been collected. The DI was then transferred from the bowl into a pre-labeled sample container.

The DI used for decontamination and the equipment blank sample was generated by the Teck laboratory. A sample of this DI was collected as a source blank, because the DI had not been supplied by the laboratory that would perform the sample analyses. The source blank sample was collected concurrently with the equipment blank sample by collecting DI directly from the storage container into a pre-labelled sample container.

ACZ performed the sediment and associated equipment blank analyses with reference to the following methods, as discussed in detail in Appendix A:

Analysis	Method Reference
Total Metals (sediment)	SW-846 Method 6020, inductively coupled plasma/mass spectrometry (ICP-MS)
Total Metals (aqueous)	Method 200.8, ICP-MS
Total Solids	American Society for Testing and Materials (ASTM) Method D2216-80, Standard test method for laboratory determination of water (moisture) content of soil and rock residue

A data validation review indicated that all of the ACZ data are considered usable for project decision making. Non-conformances were noted in the ACZ data and actions were taken for the following non-conformances: holding time exceedance (Total Solids) and equipment blank

contamination (zinc). Specific results of the validation are described in the Results and Discussion section below. A complete Quality Assurance Review is provided in Appendix A.

Results and Discussion

Table 2 summarizes marine sediment percentage moisture, total solids, and metals concentrations for samples collected in fall 2016. Data validation findings indicate the data are useable, with some minor qualifiers:

- "J+" qualifiers were assigned to all sediment zinc results due to equipment blank contamination.
- "J" qualifiers were assigned to the total solids results for all sediment samples due to the holding time exceedances.
- Laboratory-assigned "B" qualifiers indicating results that were less than the method reporting limit (MRL) but greater than the method detection limit (MDL) were replaced by a "J" qualifier during data validation.

Marine sediment monitoring results for cadmium, lead, and zinc are mapped in Figures 2 through 4. Figure 5 shows time series sediment concentrations of cadmium, lead, and zinc relative to ER-L guideline values. In 2016, concentrations of cadmium, lead, and zinc in sediment did not exceed their respective ER-L at any of the sampling stations.

Weather conditions around the time of sampling were clear, calm, and relatively warm for September. The sediment sampling was attempted and completed on September 4, 2016, unlike in 2014 where several sampling attempts were thwarted due to unfavorable winds.

During the 2015 shipping season, ship loading activities were typical, with 269 barges loaded over 120 days. During the 2016 shipping season, 274 barges were loaded over 124 days. In each of those shipping seasons, the tonnage of lead concentrate transported by the barges was approximately 21% of the total tonnage of concentrate transported. In the week up to and including the sampling date (September 4, 2016), four barges were loaded with lead concentrate and 27 barges were loaded with zinc concentrate.

Conclusions

Marine sediment sampling was conducted in the fall of 2016 at the previously established monitoring stations (Figure 1, Table 1) to monitor and evaluate dust deposition and accumulation in the marine environment surrounding the DMTS port facilities.

The current study obtained concentration data for cadmium, lead, and zinc in marine sediment samples collected at stations near the port facilities and compared them to established screening levels.

Concentrations of cadmium, lead, and zinc fell below ER-L guideline values at all stations in 2016.

Since the results of the 2016 marine sediment monitoring show no exceedance of ER-L guideline values for cadmium, lead, or zinc, sampling will continue at a frequency of once every two years. Monitoring results indicate that operational-scale dust deposition in the marine environment surrounding the port ship loader facilities falls within acceptable limits.

References

Exponent. 2008. Draft fugitive dust risk management plan. Red Dog Operations, Alaska. Prepared for Teck Cominco Alaska Incorporated, Anchorage, AK. Exponent, Bellevue, WA. August.

Exponent. 2014. Fugitive dust risk management monitoring plan. Red Dog Operations, Alaska. Prepared for Teck Cominco Alaska Incorporated, Anchorage, AK. Exponent, Bellevue, WA. May.

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Manage. 19(1):81−97.

Figures

December 2016

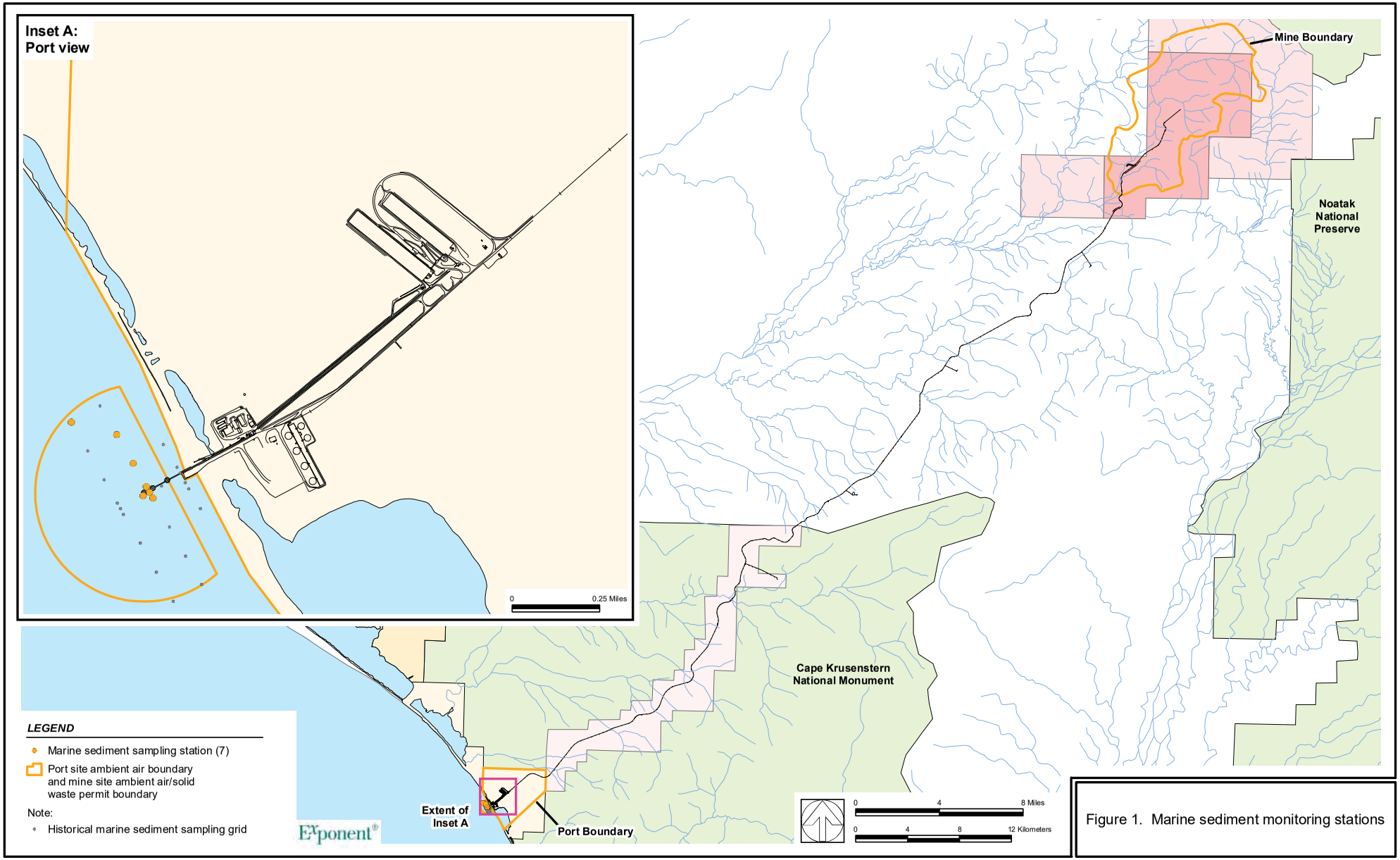


Figure 1. Marine sediment monitoring stations

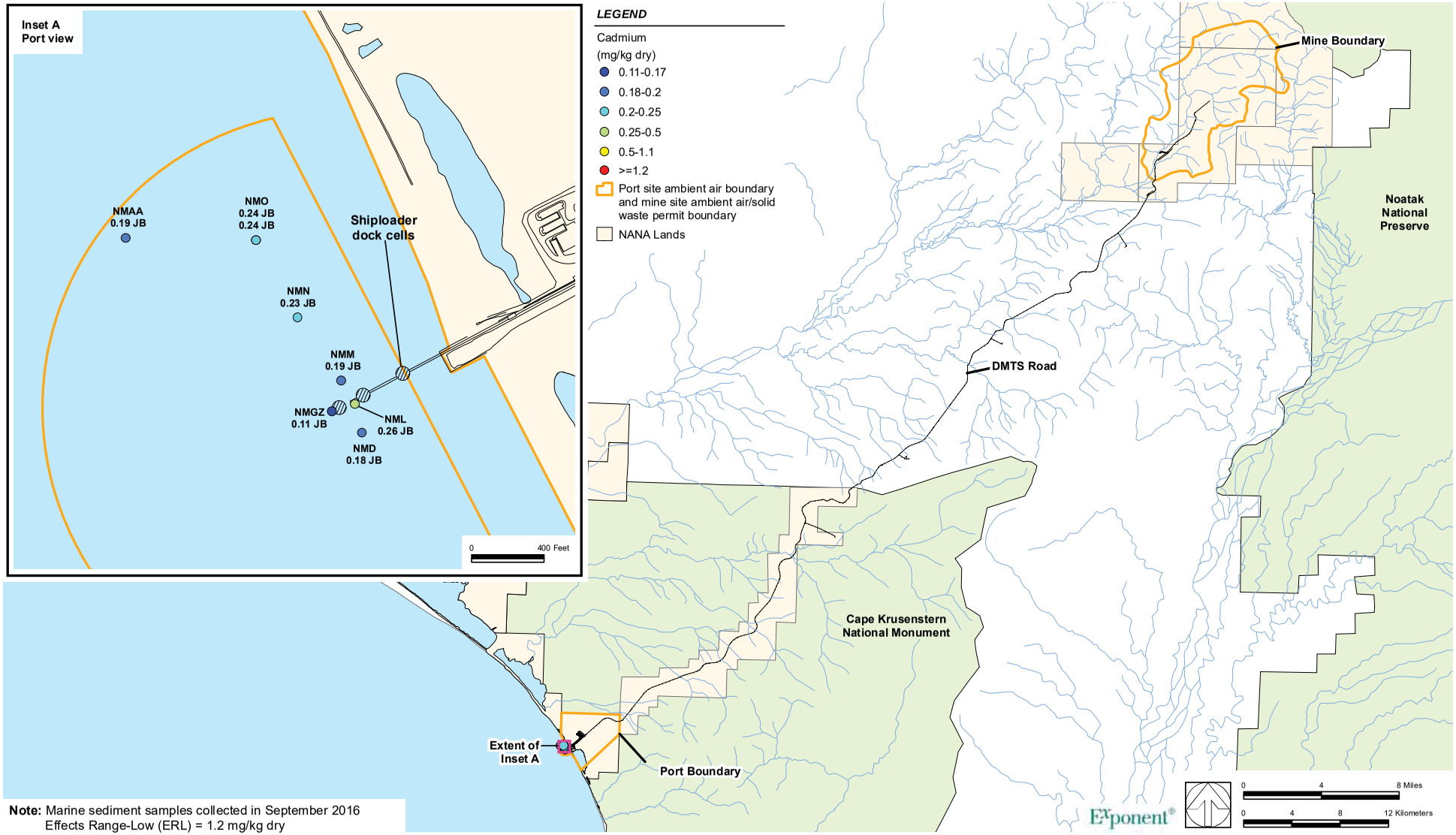
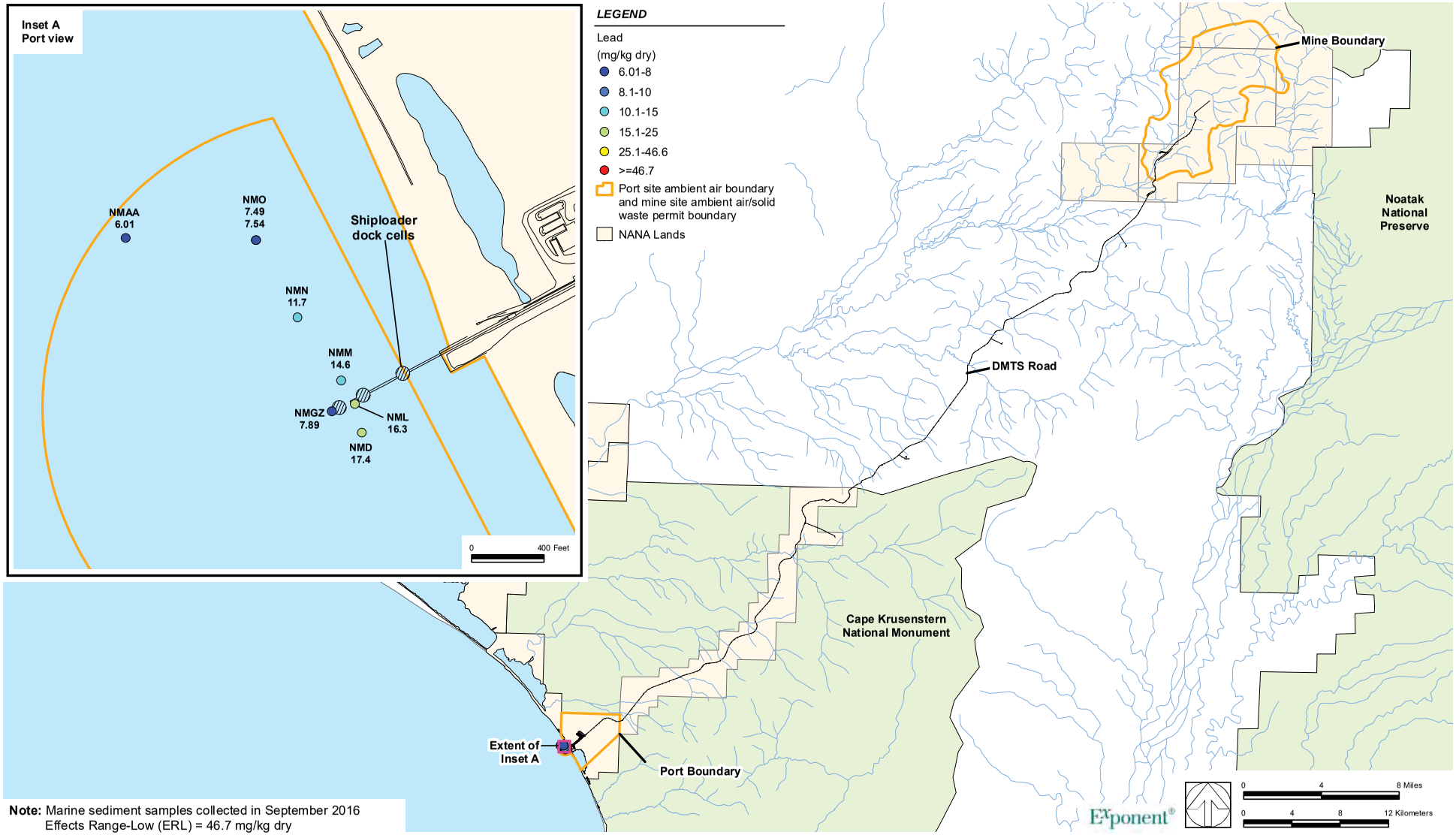


Figure 2. Marine sediment results - Cadmium concentrations



Note: Marine sediment samples collected in September 2016
Effects Range-Low (ERL) = 46.7 mg/kg dry

Figure 3. Marine sediment results - Lead concentrations

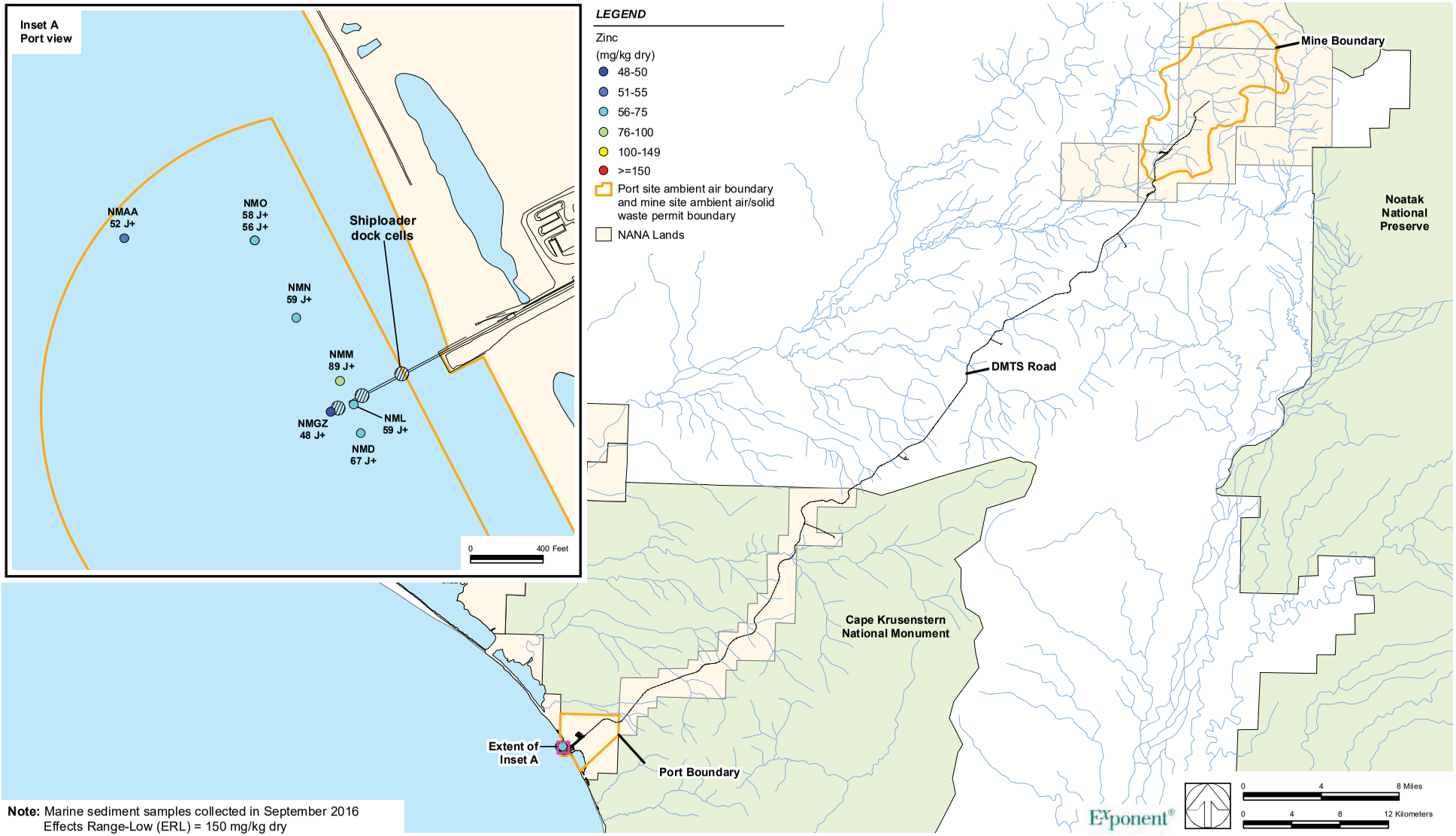
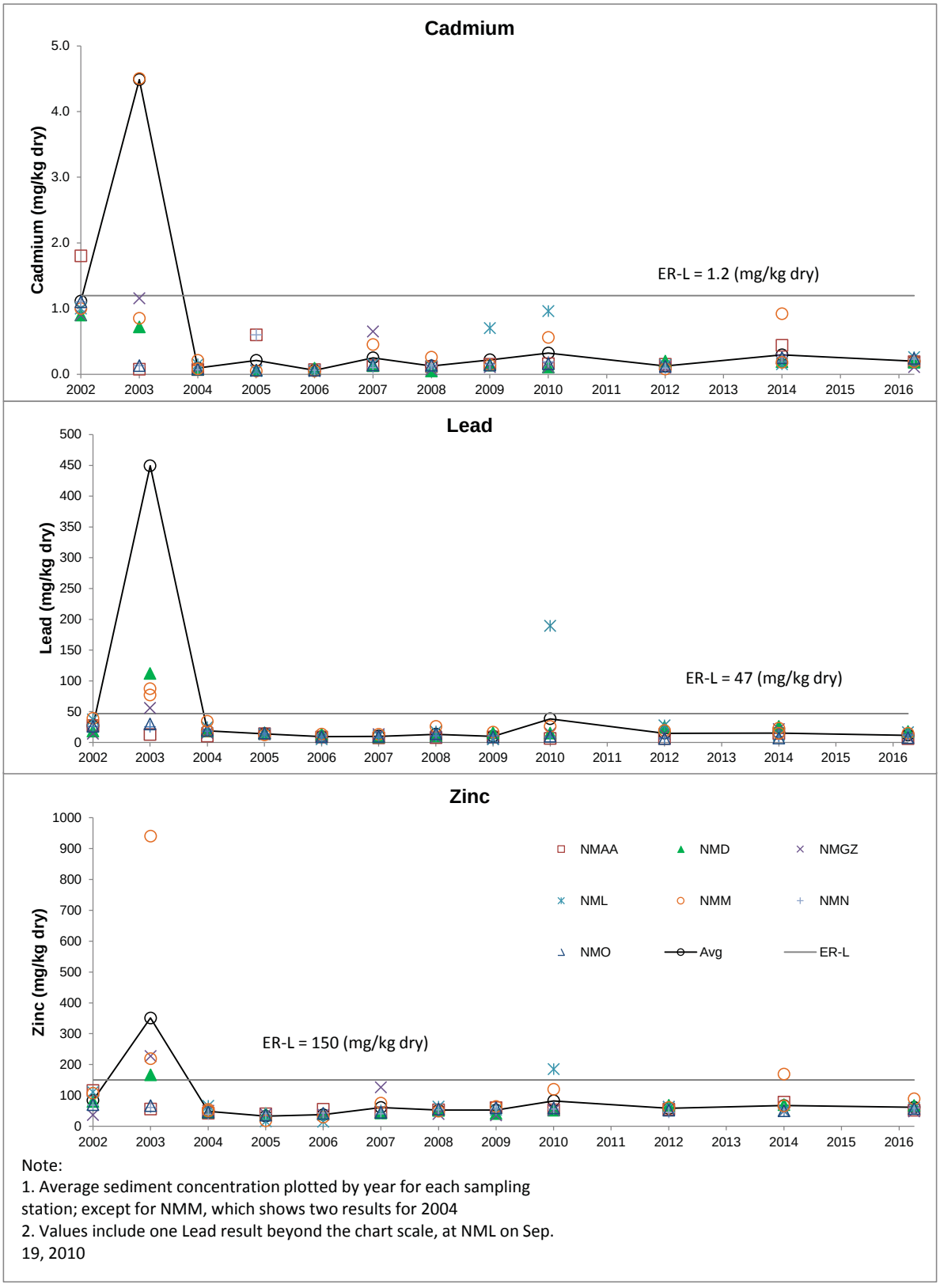


Figure 4. Marine sediment results - Zinc concentrations



Note:
1. Average sediment concentration plotted by year for each sampling station; except for NMM, which shows two results for 2004
2. Values include one Lead result beyond the chart scale, at NML on Sep. 19, 2010

Figure 5. Time series (2002 - 2016) sediment concentrations of cadmium, lead, and zinc relative to ER-L guideline values

Tables

Table 1. Marine sediment monitoring station locations sampled in 2016

Station	Longitude	Latitude
NMAA	-164.072123	67.578642
NMD	-164.063051	67.575621
NMGZ	-164.064139	67.575703
NML	-164.063443	67.575859
NMM	-164.06381	67.576081
NMN	-164.065306	67.577025
NMO	-164.067186	67.578189

Table 2. DMTS port marine sediment samples data for 2016

Survey station	Date	Sample ID	Field replicate	Upper depth (cm)	Lower depth (cm)	Percent moisture (% dry)	Total solids (% dry)	Cadmium (mg/kg dry)	Lead (mg/kg dry)	Zinc (mg/kg dry)
NMM	9/4/2016	16-035_NMM-A	0	0	2	15.7	84.3 *J*	0.19 *JB*	14.60	89 *J+*
NMGZ	9/4/2016	16-036_NMGZ-A	0	0	2	6.0	94.0 *J*	0.11 *JB*	7.89	48 *J+*
NMN	9/4/2016	16-037_NMN-A	0	0	2	26.9	73.1 *J*	0.23 *JB*	11.70	59 *J+*
NMO	9/4/2016	16-038_NMO-A	1	0	2	26.7	73.3 *J*	0.24 *JB*	7.49	58 *J+*
NMO	9/4/2016	16-039_NMO-B	2	0	2	26.0	74.0 *J*	0.24 *JB*	7.54	56 *J+*
NML	9/4/2016	16-040_NML-A	0	0	2	14.3	85.7 *J*	0.26 *JB*	16.30	59 *J+*
NMD	9/4/2016	16-041_NMD-A	0	0	2	9.5	90.5 *J*	0.18 *JB*	17.40	67 *J+*
NMAA	9/4/2016	16-042_NMAA-A	0	0	2	26.7	73.3 *J*	0.19 JB	6.01	52 *J+*

Note:

* - Indicates field replicate sample. ERL (mg/kg dry): 1.2 47 150

dry - indicates measurement is reported on a dry weight basis

Qualifier Definitions:

JB: Results less than MRL but greater than MDL.

J: Holding time exceedance (Total Solids only).

J+: Equipment blank contamination (zinc only).

Appendices

Appendix A

Quality Assurance Review

Exponent®

INTERNAL MEMORANDUM

TO: Scott Shock

FROM: Andrea Mischel, Deb Truini

DATE: November 28, 2016

PROJECT: 8601997.016

SUBJECT: Marine Sediment Monitoring at the DeLong Mountain Regional Transportation System (DMTS) port ship loader facilities; Laboratory Data Assessment for ACZ Laboratories, Inc. (ACZ), Steamboat Springs, CO

Executive Summary

Data were obtained for sediment samples collected in the marine environment surrounding the DMTS port ship loading facilities as a means to monitor operational-scale dust deposition. Sediment samples were collected on September 4, 2016. The samples were collected by Teck Alaska, Inc. and submitted to ACZ located in Steamboat Springs, CO for analysis. ACZ processed and reported the sediment samples with associated field QC under laboratory service request numbers L32770 and L32771. These data were assessed by Exponent according to U.S. Environmental Protection Agency (EPA) guidelines and method-specific requirements.

Surface sediment samples (0–2 cm) were collected for metals analysis (zinc, lead, and cadmium) using a modified Ponar grab sampler. One sediment sample was collected at each of seven previously established stations, with one field duplicate collected to assess the variability of chemical concentrations at a location, for a total of eight sediment samples. In addition, one equipment rinsate blank and one source water blank were collected to assess potential contamination from the sampling environment or the sampling equipment (e.g., sediment grab sampler, bowls, or spoons).

ACZ performed the sediment and associated equipment blank analyses with reference to the following analytical methods:

Analysis	Method Reference
Total Metals (sediment)	SW-846 Method 6020, Inductively Coupled Plasma/Mass Spectrometry (ICP-MS)
Total Metals (aqueous)	Method 200.8, Inductively Coupled Plasma/Mass Spectrometry (ICP-MS)
Total Solids	ASTM Method D2216-80, Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock Residue

The ACZ data packages included in this review were complete. All of the sediment data reviewed are considered usable for project decision making. Nonconformances were noted in the ACZ data and included the following: equipment blank contamination and holding time exceedances. Specifically, ACZ data were qualified as follows:

- "J" qualifiers were assigned to the total solids results in all sediment samples due to holding time exceedances.
- All zinc sediment results were qualified "J+", (estimated with a potential high bias), due to equipment blank contamination.
- Laboratory-assigned "B" qualifiers indicating results that were less than the method reporting limit (MRL) but greater than the method detection limit (MDL) were replaced by a "J" qualifier during data validation.

1 Introduction

The purpose of this memorandum is to document the assessment of data for sediment samples collected on September 4, 2016, in the marine environment surrounding the DMTS port ship loading facilities. This memorandum documents the assessment of data provided in the following laboratory packages:

- November 9, 2016 (revised cover letter date), ACZ Analytical Report for Service Request No.: L32770.
- November 8, 2016 (revised cover letter date), ACZ Analytical Report for Service Request No.: L32771.

2 Data Assessment Approach

The goal of data assessment was to determine the quality of each data point and identify data points that do not meet the project data quality objectives. Exponent staff assessed the analytical data prior to their release, in accordance with the general guidance specified by the *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (National Functional Guidelines)[1,2], the method requirements and/or professional judgment. EPA has not published data validation guidelines for the general chemistry methods. Therefore, chemical data for these analytes were assessed following the general evaluation procedures described in the National Functional Guidelines and according to method requirements. The following quality control indicators were evaluated when available: holding times and preservation, instrument calibrations and blanks, laboratory and equipment blanks, matrix spike/matrix spike duplicate (MS/MSD) samples, laboratory duplicate samples, post-digestion spike samples, inductively coupled plasma (ICP) interference check samples, ICP serial dilutions, and field duplicates. Calculations and transcriptions were verified in one data package and spot checked in the remaining submitted data package.

Data assessment qualifiers were applied to the results, consistent with procedures described in the National Functional Guidelines and with modifications to accommodate method and/or laboratory-specific quality control requirements. Nonconforming data were qualified as not detected (U), estimated (J, UJ, J-, or J+), or rejected (R) as unusable during data assessment, if acceptance criteria were not met. Explanations of the qualifiers are summarized as follows:

Qualifier	Explanation
U	The analyte was analyzed for, but was not detected above the method reporting limit (MRL).
UJ	The analyte was analyzed for, but was not detected. The MRL is approximate and may be inaccurate or imprecise.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J-	The result is an estimated quantity, but the result may be biased low.
J+	The result is an estimated quantity, but the result may be biased high.
R	The data are unusable. The sample results are rejected due to serious deficiencies in meeting quality control (QC) criteria. The analyte may or may not be present in the sample.

1 U.S. EPA. 2014. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. EPA/540-R-10-011. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation, Washington, DC.

2 U.S. EPA. 1994. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. EPA/540-R-94/013. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation, Washington, DC.

Data qualified as not detected (U) were considered to be non-detect at the reported value and are still acceptable for use. Data qualified as estimated (J, UJ, J- or J+) are less precise or less accurate than unqualified data, but are still acceptable for use. When possible, the data assessment summary will include information regarding the direction or magnitude of bias or the degree of imprecision for qualified data. In instances when an analyte has cumulative nonconformances, a bias may not be noted unless all the nonconformances are biased in the same direction. Data users are responsible for assessing the effect of the inaccuracy or imprecision of the qualified data on statistical procedures and other data uses.

3 Data Assessment Findings

3.1 Assessment Findings for ACZ Data Packages L32770 and L32771

The sediment and associated field quality control samples (equipment rinsate and source water blanks) were analyzed for total metals (cadmium, lead and zinc). Sediment samples were also analyzed for total solids.

Holding times and preservation: The sediment and equipment blank samples were collected on September 4, 2016 and shipped on September 6, 2016. The samples were received at the laboratory on September 7, 2016, in coolers at the correct temperatures.

There were no holding time exceedances with the exception of the total solids results for all sediment samples. Air dried total solids (used for sample quantitation) and total solids (used for reporting) were performed on the sediment samples on September 12 and 13, 2016, one to two days beyond the 7-days from collection holding time. The total solids results in all sediment samples were flagged “J” due to the holding time exceedances.

Instrument calibrations: All initial/continuing calibration recoveries where applicable, were within acceptance limits.

Laboratory (method and instrument) and equipment rinsate blanks: The presence of blank contamination indicates that false positive results may exist for these analytes in the associated field samples. Sample results (associated with positive blank results) that are less than the MRL and/or less than five times the maximum blank concentration were qualified with a “U” and are considered to be nondetect at the reported value.

Laboratory blank actions were first taken to the equipment blank samples and the results that were considered to be non-detect due to laboratory blank contamination were not applied to the sediment samples. Positive and negative values reported in the laboratory calibration and method blanks and in the associated field equipment blanks were used to assess contamination in associated sediment samples.

There was no negative instrument drift noted for any of the laboratory blanks (initial and continuing calibration blanks or method blanks).

There were no blank actions resulting from positive contamination noted in the laboratory blanks or method blanks associated with the sediment samples since all sample concentrations were greater than MRL.

One equipment blank sample (i.e. 16-043_EB) and one source water blank (i.e. 16-044_SB) were collected in association with the sediment samples. The highest blank concentrations were used to assess contamination in the sediment samples. Zinc results in all sediment samples were qualified as estimated with potential high bias (J+) since concentrations in the equipment blank were greater than MRL and the sample concentrations were all greater than the MRL but less than the action limit of 10x the maximum blank concentration.

The highest concentrations detected in associated blanks are summarized below.

Analyte (Source)	Maximum Concentration in Blank (mg/L)	10x Blank Concentration (mg/kg)	Data Assessment Actions Taken
Lead (16-043_EB)	0.0011 mg/L	5.5	All sediment samples are > MRL and >10x Action Limit, therefore, no actions required.
Zinc (16-043_EB)	0.040 mg/L	200	All sediment samples are > MRL but <10x Action Limit, qualify associated samples J+, estimated with potential high bias.

Matrix Spike: Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed on sediment sample 16-038 NMO-A (L32770-04) for metals. Percent recoveries (%R) and relative percent differences (RPDs) were within the acceptance limits of 75%–125% and 20 RPD for all analytes.

Post-Digestion Spike (applicable to metals only): there were no post-digestion analyses performed on the sediment samples. There were no qualifications made on this basis.

Laboratory Duplicate: All laboratory duplicate percent relative percent difference (RPD) values (total solids) were within the acceptance limit of 20.

Laboratory Control Sample and Laboratory Control Sample Duplicate: All LCS/LCSD recoveries and RPDs were within acceptance limits.

ICP Interference Check Sample—ICSAB (applicable to metals only): All inter-element check sample recoveries were within acceptance limits.

ICP Serial Dilution (applicable to metals only): Serial dilution analyses were performed on a minimum of one per 20 soil samples for all metals. Serial dilution results were within the acceptance limits of 10 %D for all analytes.

Field Duplicates: Field duplicate sample pair 16-038 NMO-A/ 16-039 NMO-B was submitted for analysis. Field duplicate precision was assessed by calculating relative percent difference (RPD) values. All RPDs were within the acceptance limits of ± 50%.

Additional Issues: Additional issues that may affect data quality are discussed below.

It was noted that the MDLs and MRLs reported by the laboratory did not meet the QAPP specified MDLs and MRLs. The QAPP specified MDL/MRL limits are: cadmium (0.008/0.02 mg/kg), lead (0.005/0.05 mg/kg) and zinc (0.2/0.5 mg/kg). The laboratory reported MDLs/MRLs were: cadmium (0.05/0.3 mg/kg), lead (0.05/0.3 mg/kg) and zinc (1.0/3.0 mg/kg). No qualifications or actions were taken except for this notation since all analytes were reported at detectable concentrations in all samples. Cadmium concentrations were reported below the MRL but were already flagged as estimated.

Laboratory-assigned "B" qualifiers indicating results that were less than the MRL but greater than the MDL were replaced by a "J" qualifier during data validation.

Data Package Summary:

- "J+" qualifiers were assigned to all sediment zinc results due to equipment blank contamination.
- "J" qualifiers were assigned to the total solids results for all sediment samples due to the holding time exceedances.
- Laboratory-assigned "B" qualifiers indicating results that were less than the MRL but greater than the MDL were replaced by a "J" qualifier during data validation.

4 Data Assessment Conclusions

All of the ACZ data are considered usable for project decision making. Nonconformances were noted in the ACZ data and actions were taken for the following nonconformances: holding time exceedance and equipment blank contamination.

Appendix B

Field Notes

INCH

Rite in the Rain®
ALL-WEATHER WRITING PAPER

Name KEN CARRETO
EXPONENT

Address KCERRETO@EXPONENT.COM

Phone 508 314-1156

Project RED DOG 2016
SEDIMENT MONITORING

Clear Vinyl Protective Slipcovers (Item No. 30) are available for this style of notebook.
Helps protect your notebook from wear & tear. Contact your dealer or the J. L. Darling Corporation

CONTENTS

PAGE	REFERENCE	DATE

9/3/16
Arrive RD via charter from ANC ~1600.
Met w/ Jo Sclates after orientation. Plan to meet tomorrow ~0710 Meeting and hopefully set out on the water.

9/4/16
0700 Safety meeting. ~~If barge out weather bella OK~~ If barge operations @ dock have ended and weather looks good, will be able to sample today. Rep from a nearby village (?) named Nagai ~~or Simeon~~ will join us for observation. Doesn't arrive @ dock until ~10-1030.

Exponent tech guest
Inenop x3

Channel 3 or 6 to contact dock for emergency

0930 Safety Meeting
~~0950~~

1000 Prepping & Line & Dock

1112 Arrive @ Port

1215 Boat w water. Safety brief.

1220 Leave dock.
Barge ~~Natek~~ currently being loaded @ pier. → Neatak

Dennis
Nicole
~~Maureen~~ Marissa
Naomi Knox

1252 NMM - on station ready to sample

1300 NMM sample w board
Sand and fine gravel. Brown to dark brown.

1314 NMG2 sample w board
Medium gravel and some fine gravel. Brown. Very coarse, no fines.

NMN next

1342 Arrive NMN

1352 NMN sampled Brown sand + silt. Fine.

1402 NMO sampled. Same as NMN sediment. Brown sand + silt. 1" sand layer

1410 NMD field duplicate Composite grab. Same material as above

1428 NMO MS/MSD same material

Barge left. Going to sample 2 cells before next one comes in.

1440 NML - Arrive

1443 NML Course, red, fine gravel

1451 NMJ arrive

1454 ~~AA~~ NMJ Sample

Course gravel medium and fine gravel.

1507 NMAA - arrive

1514 NMAA - composite of 2 grabs. 2nd grab @ 1519. Brown silt and sand. Looser than previous stations. A few bushy clams.

Equipment blank then done

1534 Equipment Blank

1537 Source water sample

Clean + head back to dock

1745 Back at PAC

Samples for EB + Source preserved in Nitric acid. All samples placed in locked refrigerator.

Rita in the Rain

9/5/16

Taking RD checks to Katz today.

Appendix C

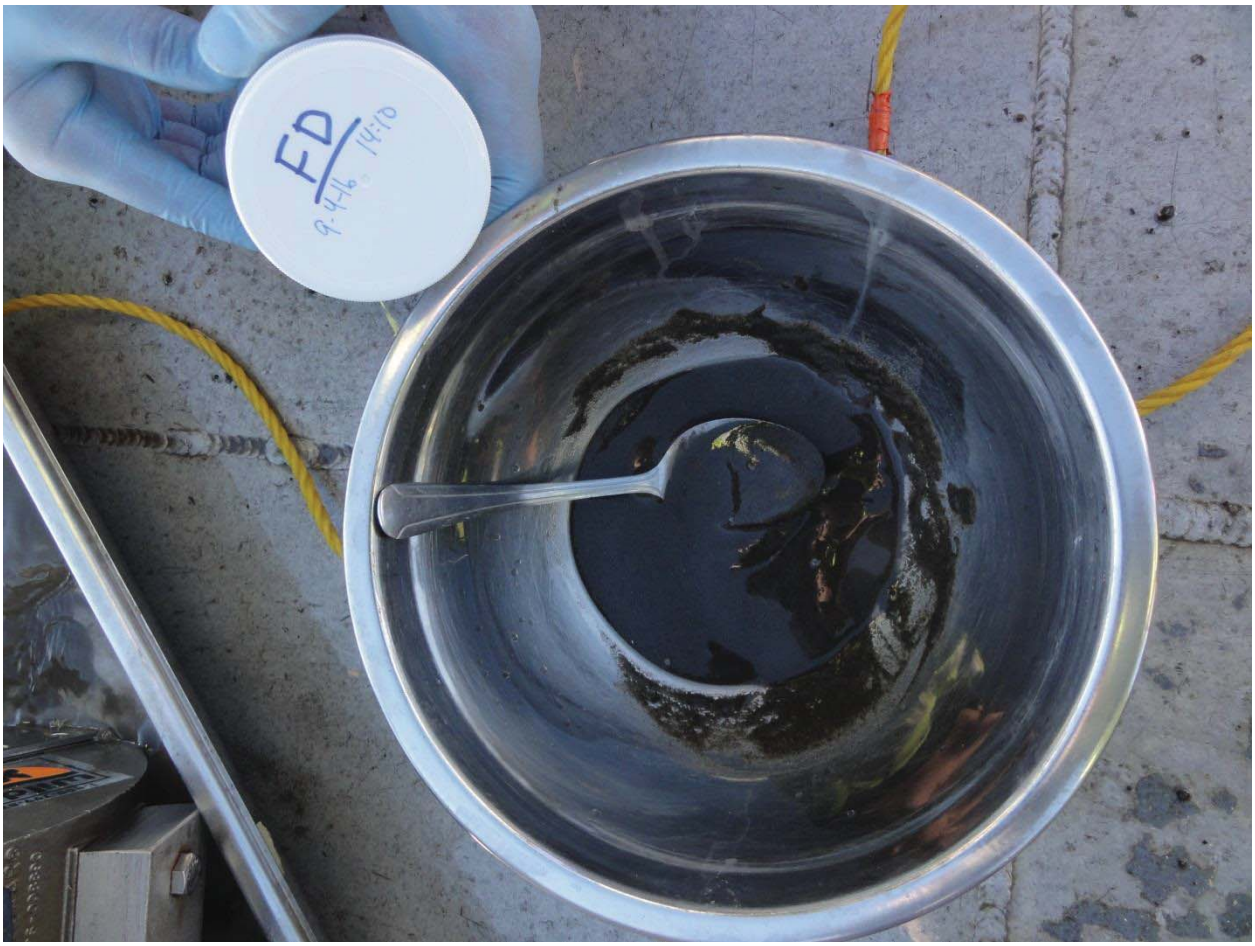
Sediment Photos by Station

Station NMM

Station NMGZ

Station NMN

Station NMO



NMO Field Duplicate

NMO MS/MSD

Station NML

Station NMD

Station NMAA

Appendix D

ACZ Laboratory Reports

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Revised Analytical Report

November 08, 2016

Report to:
Joe Diehl
Teck Alaska Incorporated
P.O. Box 1230

Kotzebue, AK 99752

cc: Rebecca Hager

Bill to:
Accounts Payable
Teck Alaska Incorporated
3105 Lakeshore Drive
Bldg. A - Suite 101
Anchorage, AK 99517

Project ID: 1370966-SVC
ACZ Project ID: L32771

Joe Diehl:

Enclosed are revised analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on September 07, 2016 and originally reported on September 16, 2016. Refer to the case narrative for an explanation of the changes. This project was assigned to ACZ's project number, L32771. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L32771. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after September 16, 2017. If the samples are determined to be hazardous, additional charges apply for disposal (typically less than $10/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical reports for five years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

TECK ALASKA INCORPORATED

Level IV Data Package – L32771
Table of Contents

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Summary

ACZ Project ID: ***L32771***

SAMPLE ID	LAB NO.	SAMPLE DATE	SAMPLE TIME
16-043 EB	L32771-01	9/4/2016	15:34
16-044 SB	L32771-02	9/4/2016	15:37

Teck Alaska Incorporated

November 08, 2016

Project ID: 1370966-SVC
ACZ Project ID: L32771

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 2 miscellaneous samples from Teck Alaska Incorporated on September 7, 2016. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L32771. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports.

This report was revised on 11/8/16 to include Level IV reporting. No other changes were made.

Teck Alaska Incorporated
Project ID: 1370966-SVC
Sample ID: 16-043 EB

ACZ Sample ID: ***L32771-01***
Date Sampled: *09/04/16 15:34*
Date Received: *09/07/16*
Sample Matrix: *Surface Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M200.2 ICP-MS								09/14/16 12:59	mfm

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	09/15/16 23:49	msh
Lead, total	M200.8 ICP-MS	1	0.0011			mg/L	0.0001	0.0005	09/15/16 23:49	msh
Zinc, total	M200.8 ICP-MS	1	0.040			mg/L	0.002	0.005	09/15/16 23:49	msh

Teck Alaska Incorporated
Project ID: 1370966-SVC
Sample ID: 16-044 SB

ACZ Sample ID: ***L32771-02***
Date Sampled: *09/04/16 15:37*
Date Received: *09/07/16*
Sample Matrix: *Surface Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M200.2 ICP-MS								09/14/16 13:10	mfm

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	09/15/16 23:52	msh
Lead, total	M200.8 ICP-MS	1	0.0008			mg/L	0.0001	0.0005	09/15/16 23:52	msh
Zinc, total	M200.8 ICP-MS	1	0.029			mg/L	0.002	0.005	09/15/16 23:52	msh

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1)	EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2)	EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3)	EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4)	EPA SW-846. Test Methods for Evaluating Solid Waste.
(5)	Standard Methods for the Examination of Water and Wastewater.

Comments

(1)	QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2)	Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3)	Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4)	An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5)	If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Teck Alaska Incorporated

ACZ Project ID: ***L32771***

Cadmium, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG409909													
WG409909ICV	ICV	09/15/16 22:15	MS160823-2	.05		.05087	mg/L	102	90	110			
WG409909ICB	ICB	09/15/16 22:18				U	mg/L		-0.0003	0.0003			
WG409768LRB	LRB	09/15/16 22:21				U	mg/L		-0.00022	0.00022			
WG409768LFB	LFB	09/15/16 22:24	MS160826-3	.05005		.04641	mg/L	93	85	115			
WG409909CCV1	CCV	09/15/16 22:49	MS160914-3	.1001		.09883	mg/L	99	90	110			
WG409909CCB1	CCB	09/15/16 22:52				U	mg/L		-0.0003	0.0003			
L32754-03LFM	LFM	09/15/16 23:21	MS160826-3	.05005	U	.04657	mg/L	93	70	130			
L32754-03LFMD	LFMD	09/15/16 23:24	MS160826-3	.05005	U	.04461	mg/L	89	70	130	4	20	
WG409909CCV2	CCV	09/15/16 23:27	MS160914-3	.1001		.09105	mg/L	91	90	110			
WG409909CCB2	CCB	09/15/16 23:30				U	mg/L		-0.0003	0.0003			
WG409909CCV3	CCV	09/15/16 23:55	MS160914-3	.1001		.09548	mg/L	95	90	110			
WG409909CCB3	CCB	09/15/16 23:58				U	mg/L		-0.0003	0.0003			

Lead, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG409909													
WG409909ICV	ICV	09/15/16 22:15	MS160823-2	.05		.05308	mg/L	106	90	110			
WG409909ICB	ICB	09/15/16 22:18				U	mg/L		-0.0003	0.0003			
WG409768LRB	LRB	09/15/16 22:21				U	mg/L		-0.00022	0.00022			
WG409768LFB	LFB	09/15/16 22:24	MS160826-3	.05005		.0467	mg/L	93	85	115			
WG409909CCV1	CCV	09/15/16 22:49	MS160914-3	.25025		.2506	mg/L	100	90	110			
WG409909CCB1	CCB	09/15/16 22:52				U	mg/L		-0.0003	0.0003			
L32754-03LFM	LFM	09/15/16 23:21	MS160826-3	.05005	.0002	.04502	mg/L	90	70	130			
L32754-03LFMD	LFMD	09/15/16 23:24	MS160826-3	.05005	.0002	.04403	mg/L	88	70	130	2	20	
WG409909CCV2	CCV	09/15/16 23:27	MS160914-3	.25025		.2289	mg/L	91	90	110			
WG409909CCB2	CCB	09/15/16 23:30				U	mg/L		-0.0003	0.0003			
WG409909CCV3	CCV	09/15/16 23:55	MS160914-3	.25025		.2378	mg/L	95	90	110			
WG409909CCB3	CCB	09/15/16 23:58				U	mg/L		-0.0003	0.0003			

Zinc, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG409909													
WG409909ICV	ICV	09/15/16 22:15	MS160823-2	.05		.051	mg/L	102	90	110			
WG409909ICB	ICB	09/15/16 22:18				U	mg/L		-0.006	0.006			
WG409768LRB	LRB	09/15/16 22:21				U	mg/L		-0.0044	0.0044			
WG409768LFB	LFB	09/15/16 22:24	MS160826-3	.050135		.0467	mg/L	93	85	115			
WG409909CCV1	CCV	09/15/16 22:49	MS160914-3	.50135		.5039	mg/L	101	90	110			
WG409909CCB1	CCB	09/15/16 22:52				U	mg/L		-0.006	0.006			
L32754-03LFM	LFM	09/15/16 23:21	MS160826-3	.050135	.002	.0503	mg/L	96	70	130			
L32754-03LFMD	LFMD	09/15/16 23:24	MS160826-3	.050135	.002	.0482	mg/L	92	70	130	4	20	
WG409909CCV2	CCV	09/15/16 23:27	MS160914-3	.50135		.4813	mg/L	96	90	110			
WG409909CCB2	CCB	09/15/16 23:30				U	mg/L		-0.006	0.006			
WG409909CCV3	CCV	09/15/16 23:55	MS160914-3	.50135		.4956	mg/L	99	90	110			
WG409909CCB3	CCB	09/15/16 23:58				U	mg/L		-0.006	0.006			

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Extended Qualifier Report

Teck Alaska Incorporated ACZ Project ID: ***L32771***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION

No extended qualifiers associated with this analysis

Certification Qualifiers

Teck Alaska Incorporated ACZ Project ID: ***L32771***

No certification qualifiers associated with this analysis

ICPMS Total 200-CC

QC List Type: QC-ICPMS-200
QCListMatClass: LIQUID
Bench Sheet List: I-ICPMS-T-200
QC Ref: MA-ICPMS-T-200
Group ID: MA-G-MS-T-200-CC
Method Ref: M200.8 C. Cell
SOP Ref: SOPII022

WG409909

ACZ Laboratories, Inc

Instrument ID: ICPMS5
Analyst: MH
ACZ Dept: 33
Create Date: 09/15/2016 16:01
Start Date/Time: 9-15-16
End Date/Time: 9-16-16

SEQ	ACZ ID	Client ID	SubSX	Pri	Prep Dil	EC	TDS	AG TMS 200	AL TMS 200	AS TMS 200	BE TMS 200	CD TMS 200	CO TMS 200	CR TMS 200	CU TMS 200	MN TMS 200	MO TMS 200	PB TMS 200	SB TMS 200	SE TMS 200	TL TMS 200	U TMS 200	ZN TMS 200	Dilution
1	WG409909ICV	MS160823-2			1			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1
2	WG409909ICB	NONE			1			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1
3	WG409768LRB	NONE			1			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1
4	WG409768LFB	MS160826-3			1			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1
5	L32649-01	NSJ2			1	67.7	36		✓							✓								1
6	L32649-02	LG2			1	80.1	52		✓							✓								1
7	L32649-03	CA1			1	76.2	52		✓							✓								1
8	L32649-04	LM02			1	121	66		✓							✓								1
9	L32649-05	SJT2			1	83.9	56		✓							✓								1
10	L32649-05LFM	MS160826-3			1			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1
11	L32649-05LFMD	MS160826-3			1			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1
12	L32649-06	N1			1	62.4	34		✓							✓								1
13	WG409909CCV1	MS160914-3			1			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1
14	WG409909CCB1	NONE			1			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1
15	L32730-01	ARG-1			1	120	112*			✓	✓	✓		✓				✓	✓		✓	✓		1
16	L32730-02	SC-1			5	150	210			✓	✓	✓		✓				✓	✓		✓	✓		5
17	L32752-07	JEFFWAY GULCH SPRING			2	1350	986			✓														2
18	L32752-08	JEFFWAY WFMT ABOVE C			1	1470	1150			✓														1
19	L32754-01	PINALCK@ICCCODMA		50	1	1740*	1500	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		1
20	L32754-02	PINALCK@PRINGLE		50	1	1644	1370				✓	✓	✓	✓	✓						✓			1
21	L32754-03	PINALCK@SEERANCH		50	1	1543	1260				✓	✓	✓	✓	✓						✓			1
22	L32754-03LFM	MS160826-3			1			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1

Report Comments: _____

Internal Comments _____

AREV: MH 4-16-16
Initials, Date

SREV: [signature] 9.16.16
Initials, Date

ICPMS Total 200-CC

QC List Type: QC-ICPMS-200
QCListMatClass: LIQUID
Bench Sheet List: I-ICPMS-T-200
QC Ref: MA-ICPMS-T-200
Group ID: MA-G-MS-T-200-CC
Method Ref: M200.8 C. Cell
SOP Ref: SOPII022

WG409909

ACZ Laboratories, Inc

Instrument ID: ICPMS5
Analyst:
ACZ Dept: 33
Create Date: 09/15/2016 16:01
Start Date/Time:
End Date/Time:

SEQ	ACZ ID	Client ID	SubSX	Pri	Prep Dil	EC	TDS	AG TMS 200	AL TMS 200	AS TMS 200	BE TMS 200	CD TMS 200	CO TMS 200	CR TMS 200	CU TMS 200	MN TMS 200	MO TMS 200	PB TMS 200	SB TMS 200	SE TMS 200	TL TMS 200	U TMS 200	ZN TMS 200	Dilution
23	L32754-03LFMD	MS160826-3			1			☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	1
24	L32759-01	1355-ACCS-ZE		40	1	1050	782	☑	☐	☑	☐	☑	☐	☐	☐	☐	☐	☑	☑	☑	☑	☑	☐	1
25	WG409909CCV2	MS160914-3			1			☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	1
26	WG409909CCB2	NONE			1			☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	1
27	L32759-02	1190-CFTE-EC		40	1	2430	2410	☑	☐	☑	☐	☑	☐	☐	☐	☐	☐	☑	☑	☑	☑	☑	☐	2
28	L32759-03	UGS-16-042		40	1	1400	1130	☑	☐	☑	☐	☑	☐	☐	☐	☐	☐	☑	☑	☑	☑	☑	☐	1
29	L32761-01	INFLUENT			1		1720	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	1
30	L32761-04	EBR3			5		3410	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	5
31	L32771-01	16-043 EB			1			☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☑	1
32	L32771-02	16-044 SB			1			☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☑	1
33	WG409909CCV3	MS160914-3			1			☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	1
34	WG409909CCB3	NONE			1			☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	1

Report Comments: _____

Internal Comments _____

AREV: _____
Initials, Date

SREV: _____
Initials, Date

ICPMS Total 200-CC

WG409909

ACZ Laboratories, Inc

QC List Type: QC-ICPMS-200
QCListMatClass: LIQUID
Bench Sheet List: I-ICPMS-T-200
QC Ref: MA-ICPMS-T-200
Group ID: MA-G-MS-T-200-CC
Method Ref: M200.8 C. Cell
SOP Ref: SOPII022

Instrument ID: ICPMS5
Analyst:
ACZ Dept: 33
Create Date: 09/15/2016 16:01
Start Date/Time:
End Date/Time:

Sample	Login Comments
L32649-01	O(2),P,U,W,RPC,GPC,YG ||
L32649-02	O(2),P,U,W,R,G,YG ||
L32649-03	O(2),P,U,W,R,G,YG ||
L32649-04	O(2),P,U,W,R,G,YG ||
L32649-05	O(2),P,U,W,R,G,YG ||
L32649-06	O(2),P,U,W,R,G,YG ||
L32730-01	P,U,W,RPC,GPC,YG ||
L32730-02	P,U,W,RPC,GPC,YG ||
L32752-07	LU,U,WF,RPC,GFA ||
L32752-08	LU,U,WF,RPC,GFA ||
L32754-01	U,W,RPC,GPC ||
L32754-02	U,W,RPC,GPC ||
L32754-03	U,W,RPC,GPC ||
L32759-01	LA,O,P,U,W,RPC,GPC,YG,B,T ||
L32759-02	LA,O,P,U,W,RPC,GPC,YG,B,T ||
L32759-03	LA,O,P,U,W,RPC,GPC,YG,B,T ||
L32761-01	U,WF,RPC,YG ||
L32761-04	U,WF,RPC,YG ||
L32771-01	RPC(4) ||
L32771-02	RPC(4) ||

Report Comments: _____

Internal Comments _____

AREV: _____
Initials, Date

SREV: _____
Initials, Date

ACZ Laboratories, Inc.

ICPMS DATA REVIEW CHECKLIST

Workgroup:	WG409909
Sample Type:	T200-CC
Analysis Date:	9-15-16
Analyst:	MSL

AREV:	MSL
Date:	9-16-16
SREV:	
Date:	9/16/16

	Yes	No	N/A
1) Is the instrument ID on the bench sheet correct?	✓		
2) Has a passing method tune been performed within 24 hours?	✓		
3) Was the low calibration point dropped? If yes, notify PM of change to PQLs.		✓	
4) Is the linear regression ≥ 0.995 for the analytes of interest?	✓		
5) Was the PQV standard analyzed & evaluated for DW samples ? (Fail in LIMS if no DW sxs in WG.)	✓		
6) Do the dilution factors on the benchsheet match the sequence in the raw data?	✓		
7) Is any sample analyzed on dilution appropriately "D" qualified (not required for o-cal, EC, TDS)?		✓	
8) Is the correct sub-sample type entered on the bench sheet (if different than SOP)?	✓		
9) Are the % Recoveries of the internal standards within the method limits?	✓		
10) Are all of the QC critera listed in LIMS within specified limits?		✓	
11) Are all samples requiring re-analysis / re-digestion at REDO / REDX status?		✓	
12) Are all errors properly crossed out (i.e. single-line, dated & initialed)?	✓		
13) Is a current standard/reagent form attached to the workgroup?	✓		
14) **FOR SREV**: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	✓		

For any of the items listed above that are checked "No" state the corrective action/explanation below.

QC/Sample ID	Analytical Problem	Corrective action
ICV	T/= III	Redo
LRB	Al = T	B7/redo
CCV2	Cr- 89	Redo Sxs

ACZ Labs, Inc.
Standards/Reagents Information
ICPMS, Methods 6020 and 200.8

Calibration Standards

6020/200.8 Stock #1: MS160914-1 SCN
6020/200.8 Stock #2: MS160914-2 SCN
6020/200.8 Stock #3: MS160720-4 SCN

PQV STD: MS160901-3 SCN
Exp. 11/30/2016

INT STD: MS160128-3 SCN
Exp. 1/28/2017

Nitric Acid: 51826 PCN

Hydrochloric Acid: 51742 PCN

VERIFIED: mgh 9-16-16

Workgroup Review and Approval

WG409909

Date Reported: 16-Sep-16
Run ID: R1451560
Date Analyzed: 15-Sep-16
ICAL Workgroup:
Instrument ID: ICPMS5

WG409909ICV

Tag:

Measured: 9/15/2016 10:15:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	FOUND	0.1084	1		mg/L	++	0.001	0.005			
SREV	ALUMINUM	REC	108	1		%	++	0.001	0.005			
SREV	ANTIMONY	FOUND	0.02141	1		mg/L	++	0.0004	0.002			
SREV	ANTIMONY	REC	107	1		%	++	0.0004	0.002			
SREV	ARSENIC	FOUND	0.05401	1		mg/L	++	0.0002	0.001			
SREV	ARSENIC	REC	108	1		%	++	0.0002	0.001			
SREV	BERYLLIUM	FOUND	0.04898	1		mg/L	++	0.00005	0.0003			
SREV	BERYLLIUM	REC	98	1		%	++	0.00005	0.0003			
SREV	CADMIUM	FOUND	0.05087	1		mg/L	++	0.0001	0.0005			
SREV	CADMIUM	REC	102	1		%	++	0.0001	0.0005			
SREV	CHROMIUM	FOUND	0.04989	1		mg/L	++	0.0005	0.002			
SREV	CHROMIUM	REC	100	1		%	++	0.0005	0.002			
SREV	COBALT	FOUND	0.05421	1		mg/L	++	0.00005	0.0003			
SREV	COBALT	REC	108	1		%	++	0.00005	0.0003			
SREV	COPPER	FOUND	0.05072	1		mg/L	++	0.0005	0.003			
SREV	COPPER	REC	101	1		%	++	0.0005	0.003			
SREV	LEAD	FOUND	0.05308	1		mg/L	++	0.0001	0.0005			
SREV	LEAD	REC	106	1		%	++	0.0001	0.0005			
SREV	MANGANESE	FOUND	0.05188	1		mg/L	++	0.0005	0.003			
SREV	MANGANESE	REC	104	1		%	++	0.0005	0.003			
SREV	MOLYBDENUM	FOUND	0.01957	1		mg/L	++	0.0005	0.003			
SREV	MOLYBDENUM	REC	98	1		%	++	0.0005	0.003			
SREV	SELENIUM	FOUND	0.05107	1		mg/L	++	0.0001	0.0003			
SREV	SELENIUM	REC	102	1		%	++	0.0001	0.0003			
SREV	SILVER	FOUND	0.02011	1		mg/L	++	0.00005	0.0003			
SREV	SILVER	REC	100	1		%	++	0.00005	0.0003			
FAIL	THALLIUM	FOUND	0.05534	1		mg/L	++	0.0001	0.0005			
FAIL	THALLIUM	REC	111	1		%	ALRT	0.0001	0.0005			
SREV	URANIUM	FOUND	0.05363	1		mg/L	++	0.0001	0.0005			
SREV	URANIUM	REC	107	1		%	++	0.0001	0.0005			
SREV	ZINC	FOUND	0.051	1		mg/L	++	0.002	0.005			
SREV	ZINC	REC	102	1		%	++	0.002	0.005			

WG409909ICB

Tag:

Measured: 9/15/2016 10:18:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	FOUND		1	U	mg/L	++	0.001	0.005			
SREV	ANTIMONY	FOUND	0.0006	1	B	mg/L	++	0.0004	0.002			
SREV	ARSENIC	FOUND		1	U	mg/L	++	0.0002	0.001			
SREV	BERYLLIUM	FOUND		1	U	mg/L	++	0.00005	0.0003			
SREV	CADMIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	CHROMIUM	FOUND		1	U	mg/L	++	0.0005	0.002			
SREV	COBALT	FOUND		1	U	mg/L	++	0.00005	0.0003			
SREV	COPPER	FOUND		1	U	mg/L	++	0.0005	0.003			
SREV	LEAD	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	MANGANESE	FOUND		1	U	mg/L	++	0.0005	0.003			
SREV	MOLYBDENUM	FOUND		1	U	mg/L	++	0.0005	0.003			
SREV	SELENIUM	FOUND		1	U	mg/L	++	0.0001	0.0003			
SREV	SILVER	FOUND		1	U	mg/L	++	0.00005	0.0003			
SREV	THALLIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	URANIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	ZINC	FOUND		1	U	mg/L	++	0.002	0.005			

WG409768LRB

Tag:

Measured: 9/15/2016 10:21:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	FOUND	0.0058	1		mg/L	ALRT	0.001	0.005		B7	
SREV	ANTIMONY	FOUND		1	U	mg/L	++	0.0004	0.002			
SREV	ARSENIC	FOUND		1	U	mg/L	++	0.0002	0.001			
SREV	BERYLLIUM	FOUND		1	U	mg/L	++	0.00005	0.0003			
SREV	CADMIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	CHROMIUM	FOUND		1	U	mg/L	++	0.0005	0.002			
SREV	COBALT	FOUND		1	U	mg/L	++	0.00005	0.0003			
SREV	COPPER	FOUND		1	U	mg/L	++	0.0005	0.003			
SREV	LEAD	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	MANGANESE	FOUND		1	U	mg/L	++	0.0005	0.003			
SREV	MOLYBDENUM	FOUND		1	U	mg/L	++	0.0005	0.003			
SREV	SELENIUM	FOUND		1	U	mg/L	++	0.0001	0.0003			
SREV	SILVER	FOUND		1	U	mg/L	++	0.00005	0.0003			
SREV	THALLIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	URANIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	ZINC	FOUND		1	U	mg/L	++	0.002	0.005			

WG409768LFB

Tag:

Measured: 9/15/2016 10:24:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	FOUND	0.0494	1		mg/L	++	0.001	0.005			
SREV	ALUMINUM	REC	99	1		%	++	0.001	0.005			
SREV	ANTIMONY	FOUND	0.01052	1		mg/L	++	0.0004	0.002			
SREV	ANTIMONY	REC	105	1		%	++	0.0004	0.002			
SREV	ARSENIC	FOUND	0.05038	1		mg/L	++	0.0002	0.001			
SREV	ARSENIC	REC	101	1		%	++	0.0002	0.001			
SREV	BERYLLIUM	FOUND	0.04628	1		mg/L	++	0.00005	0.0003			
SREV	BERYLLIUM	REC	92	1		%	++	0.00005	0.0003			
SREV	CADMIUM	FOUND	0.04641	1		mg/L	++	0.0001	0.0005			
SREV	CADMIUM	REC	93	1		%	++	0.0001	0.0005			
SREV	CHROMIUM	FOUND	0.0476	1		mg/L	++	0.0005	0.002			
SREV	CHROMIUM	REC	95	1		%	++	0.0005	0.002			
SREV	COBALT	FOUND	0.05023	1		mg/L	++	0.00005	0.0003			
SREV	COBALT	REC	100	1		%	++	0.00005	0.0003			
SREV	COPPER	FOUND	0.04629	1		mg/L	++	0.0005	0.003			
SREV	COPPER	REC	92	1		%	++	0.0005	0.003			
SREV	LEAD	FOUND	0.0467	1		mg/L	++	0.0001	0.0005			
SREV	LEAD	REC	93	1		%	++	0.0001	0.0005			
SREV	MANGANESE	FOUND	0.04826	1		mg/L	++	0.0005	0.003			
SREV	MANGANESE	REC	96	1		%	++	0.0005	0.003			
SREV	MOLYBDENUM	FOUND	0.04589	1		mg/L	++	0.0005	0.003			
SREV	MOLYBDENUM	REC	92	1		%	++	0.0005	0.003			
SREV	SELENIUM	FOUND	0.04641	1		mg/L	++	0.0001	0.0003			
SREV	SELENIUM	REC	93	1		%	++	0.0001	0.0003			
SREV	SILVER	FOUND	0.009396	1		mg/L	++	0.00005	0.0003			
SREV	SILVER	REC	94	1		%	++	0.00005	0.0003			
SREV	THALLIUM	FOUND	0.04991	1		mg/L	++	0.0001	0.0005			
SREV	THALLIUM	REC	100	1		%	++	0.0001	0.0005			
SREV	URANIUM	FOUND	0.05004	1		mg/L	++	0.0001	0.0005			
SREV	URANIUM	REC	100	1		%	++	0.0001	0.0005			
SREV	ZINC	FOUND	0.0467	1		mg/L	++	0.002	0.005			
SREV	ZINC	REC	93	1		%	++	0.002	0.005			

L32649-01

Tag:

Measured: 9/15/2016 10:27:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	-TMS-200	0.194	1		mg/L	++	0.001	0.005		B7	
SREV	MANGANESE	-TMS-200	0.0172	1		mg/L	++	0.0005	0.003			

L32649-02

Tag:

Measured: 9/15/2016 10:30:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	-TMS-200	0.094	1		mg/L	++	0.001	0.005		B7	
SREV	MANGANESE	-TMS-200	0.0116	1		mg/L	++	0.0005	0.003			

L32649-03

Tag:

Measured: 9/15/2016 10:34:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	-TMS-200	0.155	1		mg/L	++	0.001	0.005		B7	
SREV	MANGANESE	-TMS-200	0.0176	1		mg/L	++	0.0005	0.003			

L32649-04

Tag:

Measured: 9/15/2016 10:37:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
REDO	ALUMINUM	-TMS-200	0.022	1		mg/L	++	0.001	0.005			
SREV	MANGANESE	-TMS-200	0.0132	1		mg/L	++	0.0005	0.003			

L32649-05

Tag:

Measured: 9/15/2016 10:40:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
REDO	ALUMINUM	-TMS-200	0.044	1		mg/L	++	0.001	0.005			
NEED	ANTIMONY	REG		1	U	mg/L	++	0.0004	0.002			
NEED	ARSENIC	REG		1	U	mg/L	++	0.0002	0.001			
NEED	BERYLLIUM	REG		1	U	mg/L	++	0.00005	0.0003			
NEED	CADMIUM	REG		1	U	mg/L	++	0.0001	0.0005			
NEED	CHROMIUM	REG		1	U	mg/L	++	0.0005	0.002			
NEED	COBALT	REG	0.00062	1		mg/L	++	0.00005	0.0003			
NEED	COPPER	REG		1	U	mg/L	++	0.0005	0.003			
NEED	LEAD	REG		1	U	mg/L	++	0.0001	0.0005			
SREV	MANGANESE	-TMS-200	0.0179	1		mg/L	++	0.0005	0.003			
NEED	MOLYBDENUM	REG		1	U	mg/L	++	0.0005	0.003			
NEED	SELENIUM	REG		1	U	mg/L	++	0.0001	0.0003			
NEED	SILVER	REG		1	U	mg/L	++	0.00005	0.0003			
NEED	THALLIUM	REG		1	U	mg/L	++	0.0001	0.0005			
NEED	URANIUM	REG		1	U	mg/L	++	0.0001	0.0005			
NEED	ZINC	REG	0.003	1	B	mg/L	++	0.002	0.005			

L32649-05LFM **Tag:** **Measured: 9/15/2016 10:43:00 PM**

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	FOUND	0.1054	1		mg/L	++	0.001	0.005			
SREV	ALUMINUM	REC	123	1		%	++	0.001	0.005			
SREV	ANTIMONY	FOUND	0.01045	1		mg/L	++	0.0004	0.002			
SREV	ANTIMONY	REC	105	1		%	++	0.0004	0.002			
SREV	ARSENIC	FOUND	0.05075	1		mg/L	++	0.0002	0.001			
SREV	ARSENIC	REC	101	1		%	++	0.0002	0.001			
SREV	BERYLLIUM	FOUND	0.04701	1		mg/L	++	0.00005	0.0003			
SREV	BERYLLIUM	REC	94	1		%	++	0.00005	0.0003			
SREV	CADMIUM	FOUND	0.04619	1		mg/L	++	0.0001	0.0005			
SREV	CADMIUM	REC	92	1		%	++	0.0001	0.0005			
SREV	CHROMIUM	FOUND	0.04775	1		mg/L	++	0.0005	0.002			
SREV	CHROMIUM	REC	95	1		%	++	0.0005	0.002			
SREV	COBALT	FOUND	0.0505	1		mg/L	++	0.00005	0.0003			
SREV	COBALT	REC	100	1		%	++	0.00005	0.0003			
SREV	COPPER	FOUND	0.04713	1		mg/L	++	0.0005	0.003			
SREV	COPPER	REC	94	1		%	++	0.0005	0.003			
SREV	LEAD	FOUND	0.04646	1		mg/L	++	0.0001	0.0005			
SREV	LEAD	REC	93	1		%	++	0.0001	0.0005			
SREV	MANGANESE	FOUND	0.06668	1		mg/L	++	0.0005	0.003			
SREV	MANGANESE	REC	97	1		%	++	0.0005	0.003			
SREV	MOLYBDENUM	FOUND	0.04562	1		mg/L	++	0.0005	0.003			
SREV	MOLYBDENUM	REC	91	1		%	++	0.0005	0.003			
SREV	SELENIUM	FOUND	0.04694	1		mg/L	++	0.0001	0.0003			
SREV	SELENIUM	REC	94	1		%	++	0.0001	0.0003			
SREV	SILVER	FOUND	0.009205	1		mg/L	++	0.00005	0.0003			
SREV	SILVER	REC	92	1		%	++	0.00005	0.0003			
SREV	THALLIUM	FOUND	0.04938	1		mg/L	++	0.0001	0.0005			
SREV	THALLIUM	REC	99	1		%	++	0.0001	0.0005			
SREV	URANIUM	FOUND	0.05017	1		mg/L	++	0.0001	0.0005			
SREV	URANIUM	REC	100	1		%	++	0.0001	0.0005			
SREV	ZINC	FOUND	0.05	1		mg/L	++	0.002	0.005			
SREV	ZINC	REC	94	1		%	++	0.002	0.005			

L32649-05LFMD **Tag:** **Measured: 9/15/2016 10:46:00 PM**

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	FOUND	0.0944	1		mg/L	++	0.001	0.005			
SREV	ALUMINUM	REC	101	1		%	++	0.001	0.005			
SREV	ALUMINUM	RPD	11	1		%	++	0.001	0.005			
SREV	ANTIMONY	FOUND	0.01043	1		mg/L	++	0.0004	0.002			
SREV	ANTIMONY	REC	105	1		%	++	0.0004	0.002			
SREV	ANTIMONY	RPD	0	1		%	++	0.0004	0.002			
SREV	ARSENIC	FOUND	0.05015	1		mg/L	++	0.0002	0.001			
SREV	ARSENIC	REC	100	1		%	++	0.0002	0.001			
SREV	ARSENIC	RPD	1	1		%	++	0.0002	0.001			
SREV	BERYLLIUM	FOUND	0.0469	1		mg/L	++	0.00005	0.0003			
SREV	BERYLLIUM	REC	94	1		%	++	0.00005	0.0003			
SREV	BERYLLIUM	RPD	0	1		%	++	0.00005	0.0003			
SREV	CADMIUM	FOUND	0.04617	1		mg/L	++	0.0001	0.0005			
SREV	CADMIUM	REC	92	1		%	++	0.0001	0.0005			
SREV	CADMIUM	RPD	0	1		%	++	0.0001	0.0005			
SREV	CHROMIUM	FOUND	0.04768	1		mg/L	++	0.0005	0.002			
SREV	CHROMIUM	REC	95	1		%	++	0.0005	0.002			
SREV	CHROMIUM	RPD	0	1		%	++	0.0005	0.002			
SREV	COBALT	FOUND	0.05009	1		mg/L	++	0.00005	0.0003			
SREV	COBALT	REC	99	1		%	++	0.00005	0.0003			
SREV	COBALT	RPD	1	1		%	++	0.00005	0.0003			
SREV	COPPER	FOUND	0.04716	1		mg/L	++	0.0005	0.003			
SREV	COPPER	REC	94	1		%	++	0.0005	0.003			
SREV	COPPER	RPD	0	1		%	++	0.0005	0.003			
SREV	LEAD	FOUND	0.04669	1		mg/L	++	0.0001	0.0005			
SREV	LEAD	REC	93	1		%	++	0.0001	0.0005			
SREV	LEAD	RPD	0	1		%	++	0.0001	0.0005			
SREV	MANGANESE	FOUND	0.06632	1		mg/L	++	0.0005	0.003			
SREV	MANGANESE	REC	97	1		%	++	0.0005	0.003			
SREV	MANGANESE	RPD	1	1		%	++	0.0005	0.003			
SREV	MOLYBDENUM	FOUND	0.04572	1		mg/L	++	0.0005	0.003			
SREV	MOLYBDENUM	REC	91	1		%	++	0.0005	0.003			
SREV	MOLYBDENUM	RPD	0	1		%	++	0.0005	0.003			
SREV	SELENIUM	FOUND	0.04671	1		mg/L	++	0.0001	0.0003			
SREV	SELENIUM	REC	93	1		%	++	0.0001	0.0003			
SREV	SELENIUM	RPD	0	1		%	++	0.0001	0.0003			
SREV	SILVER	FOUND	0.009222	1		mg/L	++	0.00005	0.0003			
SREV	SILVER	REC	92	1		%	++	0.00005	0.0003			
SREV	SILVER	RPD	0	1		%	++	0.00005	0.0003			
SREV	THALLIUM	FOUND	0.04949	1		mg/L	++	0.0001	0.0005			
SREV	THALLIUM	REC	99	1		%	++	0.0001	0.0005			
SREV	THALLIUM	RPD	0	1		%	++	0.0001	0.0005			
SREV	URANIUM	FOUND	0.05039	1		mg/L	++	0.0001	0.0005			
SREV	URANIUM	REC	101	1		%	++	0.0001	0.0005			
SREV	URANIUM	RPD	0	1		%	++	0.0001	0.0005			
SREV	ZINC	FOUND	0.0493	1		mg/L	++	0.002	0.005			
SREV	ZINC	REC	92	1		%	++	0.002	0.005			
SREV	ZINC	RPD	1	1		%	++	0.002	0.005			

WG409909CCV1

Tag:

Measured: 9/15/2016 10:49:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	FOUND	0.5043	1		mg/L	++	0.001	0.005			
SREV	ALUMINUM	REC	101	1		%	++	0.001	0.005			
SREV	ANTIMONY	FOUND	0.01218	1		mg/L	++	0.0004	0.002			
SREV	ANTIMONY	REC	98	1		%	++	0.0004	0.002			
SREV	ARSENIC	FOUND	0.09885	1		mg/L	++	0.0002	0.001			
SREV	ARSENIC	REC	99	1		%	++	0.0002	0.001			
SREV	BERYLLIUM	FOUND	0.09441	1		mg/L	++	0.00005	0.0003			
SREV	BERYLLIUM	REC	94	1		%	++	0.00005	0.0003			
SREV	CADMIUM	FOUND	0.09883	1		mg/L	++	0.0001	0.0005			
SREV	CADMIUM	REC	99	1		%	++	0.0001	0.0005			
SREV	CHROMIUM	FOUND	0.09809	1		mg/L	++	0.0005	0.002			
SREV	CHROMIUM	REC	98	1		%	++	0.0005	0.002			
SREV	COBALT	FOUND	0.1005	1		mg/L	++	0.00005	0.0003			
SREV	COBALT	REC	100	1		%	++	0.00005	0.0003			
SREV	COPPER	FOUND	0.2521	1		mg/L	++	0.0005	0.003			
SREV	COPPER	REC	101	1		%	++	0.0005	0.003			
SREV	LEAD	FOUND	0.2506	1		mg/L	++	0.0001	0.0005			
SREV	LEAD	REC	100	1		%	++	0.0001	0.0005			
SREV	MANGANESE	FOUND	0.09947	1		mg/L	++	0.0005	0.003			
SREV	MANGANESE	REC	99	1		%	++	0.0005	0.003			
SREV	MOLYBDENUM	FOUND	0.09886	1		mg/L	++	0.0005	0.003			
SREV	MOLYBDENUM	REC	99	1		%	++	0.0005	0.003			
SREV	SELENIUM	FOUND	0.2504	1		mg/L	++	0.0001	0.0003			
SREV	SELENIUM	REC	100	1		%	++	0.0001	0.0003			
SREV	SILVER	FOUND	0.0243	1		mg/L	++	0.00005	0.0003			
SREV	SILVER	REC	97	1		%	++	0.00005	0.0003			
SREV	THALLIUM	FOUND	0.1016	1		mg/L	++	0.0001	0.0005			
SREV	THALLIUM	REC	101	1		%	++	0.0001	0.0005			
SREV	URANIUM	FOUND	0.1025	1		mg/L	++	0.0001	0.0005			
SREV	URANIUM	REC	103	1		%	++	0.0001	0.0005			
SREV	ZINC	FOUND	0.5039	1		mg/L	++	0.002	0.005			
SREV	ZINC	REC	101	1		%	++	0.002	0.005			

WG409909CCB1

Tag:

Measured: 9/15/2016 10:52:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	FOUND		1	U	mg/L	++	0.001	0.005			
SREV	ANTIMONY	FOUND		1	U	mg/L	++	0.0004	0.002			
SREV	ARSENIC	FOUND		1	U	mg/L	++	0.0002	0.001			
SREV	BERYLLIUM	FOUND		1	U	mg/L	++	0.00005	0.0003			
SREV	CADMIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	CHROMIUM	FOUND		1	U	mg/L	++	0.0005	0.002			
SREV	COBALT	FOUND		1	U	mg/L	++	0.00005	0.0003			
SREV	COPPER	FOUND		1	U	mg/L	++	0.0005	0.003			
SREV	LEAD	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	MANGANESE	FOUND		1	U	mg/L	++	0.0005	0.003			
SREV	MOLYBDENUM	FOUND		1	U	mg/L	++	0.0005	0.003			
SREV	SELENIUM	FOUND	0.00017	1	B	mg/L	++	0.0001	0.0003			
SREV	SILVER	FOUND		1	U	mg/L	++	0.00005	0.0003			
SREV	THALLIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	URANIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	ZINC	FOUND		1	U	mg/L	++	0.002	0.005			

L32649-06

Tag: Measured: 9/15/2016 10:55:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	-TMS-200	0.119	1		mg/L	++	0.001	0.005		B7	
SREV	MANGANESE	-TMS-200	0.0146	1		mg/L	++	0.0005	0.003			

L32730-01

Tag: Measured: 9/15/2016 10:59:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ANTIMONY	-TMS-200		1	U	mg/L	++	0.0004	0.002			
SREV	ARSENIC	-TMS-200	0.0069	1		mg/L	++	0.0002	0.001			
SREV	BERYLLIUM	-TMS-200	0.00098	1		mg/L	++	0.00005	0.0003			
SREV	CADMIUM	-TMS-200	0.0003	1	B	mg/L	++	0.0001	0.0005			
REDO	CHROMIUM	-TMS-200	0.0174	1		mg/L	++	0.0005	0.002			
SREV	LEAD	-TMS-200	0.0142	1		mg/L	++	0.0001	0.0005			
REDO	THALLIUM	-TMS-200	0.0001	1	B	mg/L	++	0.0001	0.0005			
SREV	URANIUM	U-TMS-200	0.0003	1	B	mg/L	++	0.0001	0.0005			

L32730-02

Tag: Measured: 9/15/2016 11:02:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ANTIMONY	-TMS-200		5	U	mg/L	++	0.002	0.01			
SREV	ARSENIC	-TMS-200	0.027	5		mg/L	++	0.001	0.005			
SREV	BERYLLIUM	-TMS-200	0.0077	5		mg/L	++	0.0003	0.001			
SREV	CADMIUM	-TMS-200	0.0009	5	B	mg/L	++	0.0005	0.003			
REDO	CHROMIUM	-TMS-200	0.063	5		mg/L	++	0.003	0.01			
SREV	LEAD	-TMS-200	0.0647	5		mg/L	++	0.0005	0.003			
REDO	THALLIUM	-TMS-200	0.0006	5	B	mg/L	++	0.0005	0.003			
SREV	URANIUM	U-TMS-200	0.0070	5		mg/L	++	0.0005	0.003			

L32752-07

Tag: Measured: 9/15/2016 11:05:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ARSENIC	-TMS-200	0.0010	2	B	mg/L	++	0.0004	0.002			

L32752-08

Tag: Measured: 9/15/2016 11:08:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ARSENIC	-TMS-200	0.0008	1	B	mg/L	++	0.0002	0.001			

L32754-01

Tag: Measured: 9/15/2016 11:11:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ANTIMONY	-TMS-200		1	U	mg/L	++	0.0004	0.002			
SREV	ARSENIC	-TMS-200	0.0013	1		mg/L	++	0.0002	0.001			
SREV	BERYLLIUM	-TMS-200		1	U	mg/L	++	0.00005	0.0003			
SREV	CADMIUM	-TMS-200		1	U	mg/L	++	0.0001	0.0005			
REDO	CHROMIUM	-TMS-200		1	U	mg/L	++	0.0005	0.002			
SREV	COBALT	-TMS-200	0.00066	1		mg/L	++	0.00005	0.0003			
SREV	COPPER	-TMS-200	0.0006	1	B	mg/L	++	0.0005	0.003			
SREV	LEAD	-TMS-200		1	U	mg/L	++	0.0001	0.0005			
SREV	MOLYBDENUM	-TMS-200	0.0020	1	B	mg/L	++	0.0005	0.003			
SREV	SELENIUM	-TMS-200		1	U	mg/L	++	0.0001	0.0003			
SREV	SILVER	-TMS-200		1	U	mg/L	++	0.00005	0.0003			
REDO	THALLIUM	-TMS-200		1	U	mg/L	++	0.0001	0.0005			
SREV	URANIUM	U-TMS-200	0.0003	1	B	mg/L	++	0.0001	0.0005			

L32754-02

Tag:

Measured: 9/15/2016 11:14:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	BERYLLIUM	-TMS-200		1	U	mg/L	++	0.00005	0.0003			
SREV	CADMIUM	-TMS-200		1	U	mg/L	++	0.0001	0.0005			
REDO	CHROMIUM	-TMS-200		1	U	mg/L	++	0.0005	0.002			
SREV	COBALT	-TMS-200	0.00036	1		mg/L	++	0.00005	0.0003			
SREV	COPPER	-TMS-200	0.0034	1		mg/L	++	0.0005	0.003			
REDO	THALLIUM	-TMS-200		1	U	mg/L	++	0.0001	0.0005			

L32754-03

Tag:

Measured: 9/15/2016 11:18:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
NEED	ALUMINUM	REG	0.171	1		mg/L	++	0.001	0.005			
NEED	ANTIMONY	REG		1	U	mg/L	++	0.0004	0.002			
NEED	ARSENIC	REG	0.0004	1	B	mg/L	++	0.0002	0.001			
SREV	BERYLLIUM	-TMS-200		1	U	mg/L	++	0.00005	0.0003			
SREV	CADMIUM	-TMS-200		1	U	mg/L	++	0.0001	0.0005			
REDO	CHROMIUM	-TMS-200	0.0012	1	B	mg/L	++	0.0005	0.002			
SREV	COBALT	-TMS-200	0.00032	1		mg/L	++	0.00005	0.0003			
SREV	COPPER	-TMS-200	0.0014	1	B	mg/L	++	0.0005	0.003			
NEED	LEAD	REG	0.0002	1	B	mg/L	++	0.0001	0.0005			
NEED	MANGANESE	REG	0.0047	1		mg/L	++	0.0005	0.003			
NEED	MOLYBDENUM	REG		1	U	mg/L	++	0.0005	0.003			
NEED	SELENIUM	REG	0.0001	1	B	mg/L	++	0.0001	0.0003			
NEED	SILVER	REG		1	U	mg/L	++	0.00005	0.0003			
REDO	THALLIUM	-TMS-200		1	U	mg/L	++	0.0001	0.0005			
NEED	URANIUM	REG		1	U	mg/L	++	0.0001	0.0005			
NEED	ZINC	REG	0.002	1	B	mg/L	++	0.002	0.005			

L32754-03LFM **Tag:** **Measured: 9/15/2016 11:21:00 PM**

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	FOUND	0.2166	1		mg/L	++	0.001	0.005			
SREV	ALUMINUM	REC	91	1		%	++	0.001	0.005			
SREV	ANTIMONY	FOUND	0.01103	1		mg/L	++	0.0004	0.002			
SREV	ANTIMONY	REC	111	1		%	++	0.0004	0.002			
SREV	ARSENIC	FOUND	0.059	1		mg/L	++	0.0002	0.001			
SREV	ARSENIC	REC	117	1		%	++	0.0002	0.001			
SREV	BERYLLIUM	FOUND	0.05205	1		mg/L	++	0.00005	0.0003			
SREV	BERYLLIUM	REC	104	1		%	++	0.00005	0.0003			
SREV	CADMIUM	FOUND	0.04657	1		mg/L	++	0.0001	0.0005			
SREV	CADMIUM	REC	93	1		%	++	0.0001	0.0005			
SREV	CHROMIUM	FOUND	0.04637	1		mg/L	++	0.0005	0.002			
SREV	CHROMIUM	REC	90	1		%	++	0.0005	0.002			
SREV	COBALT	FOUND	0.04666	1		mg/L	++	0.00005	0.0003			
SREV	COBALT	REC	93	1		%	++	0.00005	0.0003			
SREV	COPPER	FOUND	0.04503	1		mg/L	++	0.0005	0.003			
SREV	COPPER	REC	87	1		%	++	0.0005	0.003			
SREV	LEAD	FOUND	0.04502	1		mg/L	++	0.0001	0.0005			
SREV	LEAD	REC	90	1		%	++	0.0001	0.0005			
SREV	MANGANESE	FOUND	0.05015	1		mg/L	++	0.0005	0.003			
SREV	MANGANESE	REC	91	1		%	++	0.0005	0.003			
SREV	MOLYBDENUM	FOUND	0.0465	1		mg/L	++	0.0005	0.003			
SREV	MOLYBDENUM	REC	93	1		%	++	0.0005	0.003			
SREV	SELENIUM	FOUND	0.04937	1		mg/L	++	0.0001	0.0003			
SREV	SELENIUM	REC	98	1		%	++	0.0001	0.0003			
SREV	SILVER	FOUND	0.008836	1		mg/L	++	0.00005	0.0003			
SREV	SILVER	REC	88	1		%	++	0.00005	0.0003			
SREV	THALLIUM	FOUND	0.04616	1		mg/L	++	0.0001	0.0005			
SREV	THALLIUM	REC	92	1		%	++	0.0001	0.0005			
SREV	URANIUM	FOUND	0.04685	1		mg/L	++	0.0001	0.0005			
SREV	URANIUM	REC	94	1		%	++	0.0001	0.0005			
SREV	ZINC	FOUND	0.0503	1		mg/L	++	0.002	0.005			
SREV	ZINC	REC	96	1		%	++	0.002	0.005			

L32754-03LFMD **Tag:** **Measured: 9/15/2016 11:24:00 PM**

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	FOUND	0.2101	1		mg/L	++	0.001	0.005			
SREV	ALUMINUM	REC	78	1		%	++	0.001	0.005			
SREV	ALUMINUM	RPD	3	1		%	++	0.001	0.005			
SREV	ANTIMONY	FOUND	0.01058	1		mg/L	++	0.0004	0.002			
SREV	ANTIMONY	REC	106	1		%	++	0.0004	0.002			
SREV	ANTIMONY	RPD	4	1		%	++	0.0004	0.002			
SREV	ARSENIC	FOUND	0.05814	1		mg/L	++	0.0002	0.001			
SREV	ARSENIC	REC	115	1		%	++	0.0002	0.001			
SREV	ARSENIC	RPD	1	1		%	++	0.0002	0.001			
SREV	BERYLLIUM	FOUND	0.04965	1		mg/L	++	0.00005	0.0003			
SREV	BERYLLIUM	REC	99	1		%	++	0.00005	0.0003			
SREV	BERYLLIUM	RPD	5	1		%	++	0.00005	0.0003			
SREV	CADMIUM	FOUND	0.04461	1		mg/L	++	0.0001	0.0005			
SREV	CADMIUM	REC	89	1		%	++	0.0001	0.0005			
SREV	CADMIUM	RPD	4	1		%	++	0.0001	0.0005			
SREV	CHROMIUM	FOUND	0.04678	1		mg/L	++	0.0005	0.002			
SREV	CHROMIUM	REC	91	1		%	++	0.0005	0.002			
SREV	CHROMIUM	RPD	1	1		%	++	0.0005	0.002			
SREV	COBALT	FOUND	0.04496	1		mg/L	++	0.00005	0.0003			
SREV	COBALT	REC	89	1		%	++	0.00005	0.0003			
SREV	COBALT	RPD	4	1		%	++	0.00005	0.0003			
SREV	COPPER	FOUND	0.04524	1		mg/L	++	0.0005	0.003			
SREV	COPPER	REC	88	1		%	++	0.0005	0.003			
SREV	COPPER	RPD	0	1		%	++	0.0005	0.003			
SREV	LEAD	FOUND	0.04403	1		mg/L	++	0.0001	0.0005			
SREV	LEAD	REC	88	1		%	++	0.0001	0.0005			
SREV	LEAD	RPD	2	1		%	++	0.0001	0.0005			
SREV	MANGANESE	FOUND	0.04884	1		mg/L	++	0.0005	0.003			
SREV	MANGANESE	REC	88	1		%	++	0.0005	0.003			
SREV	MANGANESE	RPD	3	1		%	++	0.0005	0.003			
SREV	MOLYBDENUM	FOUND	0.04518	1		mg/L	++	0.0005	0.003			
SREV	MOLYBDENUM	REC	90	1		%	++	0.0005	0.003			
SREV	MOLYBDENUM	RPD	3	1		%	++	0.0005	0.003			
SREV	SELENIUM	FOUND	0.04917	1		mg/L	++	0.0001	0.0003			
SREV	SELENIUM	REC	98	1		%	++	0.0001	0.0003			
SREV	SELENIUM	RPD	0	1		%	++	0.0001	0.0003			
SREV	SILVER	FOUND	0.008547	1		mg/L	++	0.00005	0.0003			
SREV	SILVER	REC	85	1		%	++	0.00005	0.0003			
SREV	SILVER	RPD	3	1		%	++	0.00005	0.0003			
SREV	THALLIUM	FOUND	0.04514	1		mg/L	++	0.0001	0.0005			
SREV	THALLIUM	REC	90	1		%	++	0.0001	0.0005			
SREV	THALLIUM	RPD	2	1		%	++	0.0001	0.0005			
SREV	URANIUM	FOUND	0.04558	1		mg/L	++	0.0001	0.0005			
SREV	URANIUM	REC	91	1		%	++	0.0001	0.0005			
SREV	URANIUM	RPD	3	1		%	++	0.0001	0.0005			
SREV	ZINC	FOUND	0.0482	1		mg/L	++	0.002	0.005			
SREV	ZINC	REC	92	1		%	++	0.002	0.005			
SREV	ZINC	RPD	4	1		%	++	0.002	0.005			

WG409909CCV2

Tag:

Measured: 9/15/2016 11:27:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	FOUND	0.4545	1		mg/L	++	0.001	0.005			
SREV	ALUMINUM	REC	91	1		%	++	0.001	0.005			
SREV	ANTIMONY	FOUND	0.01155	1		mg/L	++	0.0004	0.002			
SREV	ANTIMONY	REC	93	1		%	++	0.0004	0.002			
SREV	ARSENIC	FOUND	0.09782	1		mg/L	++	0.0002	0.001			
SREV	ARSENIC	REC	98	1		%	++	0.0002	0.001			
SREV	BERYLLIUM	FOUND	0.09566	1		mg/L	++	0.00005	0.0003			
SREV	BERYLLIUM	REC	95	1		%	++	0.00005	0.0003			
SREV	CADMIUM	FOUND	0.09105	1		mg/L	++	0.0001	0.0005			
SREV	CADMIUM	REC	91	1		%	++	0.0001	0.0005			
FAIL	CHROMIUM	FOUND	0.08918	1		mg/L	++	0.0005	0.002			
FAIL	CHROMIUM	REC	89	1		%	ALRT	0.0005	0.002			
SREV	COBALT	FOUND	0.09208	1		mg/L	++	0.00005	0.0003			
SREV	COBALT	REC	92	1		%	++	0.00005	0.0003			
SREV	COPPER	FOUND	0.2289	1		mg/L	++	0.0005	0.003			
SREV	COPPER	REC	91	1		%	++	0.0005	0.003			
SREV	LEAD	FOUND	0.2289	1		mg/L	++	0.0001	0.0005			
SREV	LEAD	REC	91	1		%	++	0.0001	0.0005			
SREV	MANGANESE	FOUND	0.09179	1		mg/L	++	0.0005	0.003			
SREV	MANGANESE	REC	92	1		%	++	0.0005	0.003			
SREV	MOLYBDENUM	FOUND	0.09165	1		mg/L	++	0.0005	0.003			
SREV	MOLYBDENUM	REC	92	1		%	++	0.0005	0.003			
SREV	SELENIUM	FOUND	0.2378	1		mg/L	++	0.0001	0.0003			
SREV	SELENIUM	REC	95	1		%	++	0.0001	0.0003			
SREV	SILVER	FOUND	0.02256	1		mg/L	++	0.00005	0.0003			
SREV	SILVER	REC	90	1		%	++	0.00005	0.0003			
SREV	THALLIUM	FOUND	0.09313	1		mg/L	++	0.0001	0.0005			
SREV	THALLIUM	REC	93	1		%	++	0.0001	0.0005			
SREV	URANIUM	FOUND	0.09027	1		mg/L	++	0.0001	0.0005			
SREV	URANIUM	REC	90	1		%	++	0.0001	0.0005			
SREV	ZINC	FOUND	0.4813	1		mg/L	++	0.002	0.005			
SREV	ZINC	REC	96	1		%	++	0.002	0.005			

WG409909CCB2

Tag:

Measured: 9/15/2016 11:30:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	FOUND		1	U	mg/L	++	0.001	0.005			
SREV	ANTIMONY	FOUND		1	U	mg/L	++	0.0004	0.002			
SREV	ARSENIC	FOUND		1	U	mg/L	++	0.0002	0.001			
SREV	BERYLLIUM	FOUND		1	U	mg/L	++	0.00005	0.0003			
SREV	CADMIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	CHROMIUM	FOUND		1	U	mg/L	++	0.0005	0.002			
SREV	COBALT	FOUND		1	U	mg/L	++	0.00005	0.0003			
SREV	COPPER	FOUND		1	U	mg/L	++	0.0005	0.003			
SREV	LEAD	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	MANGANESE	FOUND		1	U	mg/L	++	0.0005	0.003			
SREV	MOLYBDENUM	FOUND		1	U	mg/L	++	0.0005	0.003			
SREV	SELENIUM	FOUND	0.00015	1	B	mg/L	++	0.0001	0.0003			
SREV	SILVER	FOUND		1	U	mg/L	++	0.00005	0.0003			
SREV	THALLIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	URANIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	ZINC	FOUND		1	U	mg/L	++	0.002	0.005			

L32759-01

Tag: Measured: 9/15/2016 11:33:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ANTIMONY	-TMS-200	0.0012	1	B	mg/L	++	0.0004	0.002			
SREV	ARSENIC	-TMS-200	0.0062	1		mg/L	++	0.0002	0.001			
SREV	CADMIUM	-TMS-200		1	U	mg/L	++	0.0001	0.0005			
SREV	LEAD	-TMS-200		1	U	mg/L	++	0.0001	0.0005			
SREV	SELENIUM	-TMS-200		1	U	mg/L	++	0.0001	0.0003			
SREV	SILVER	-TMS-200		1	U	mg/L	++	0.00005	0.0003			
REDO	THALLIUM	-TMS-200	0.0001	1	B	mg/L	++	0.0001	0.0005			
SREV	URANIUM	U-TMS-200		1	U	mg/L	++	0.0001	0.0005			

L32759-02

Tag: Measured: 9/15/2016 11:36:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ANTIMONY	-TMS-200	0.0049	2		mg/L	++	0.0008	0.004			
SREV	ARSENIC	-TMS-200	0.0496	2		mg/L	++	0.0004	0.002			
SREV	CADMIUM	-TMS-200		2	U	mg/L	++	0.0002	0.001			
SREV	LEAD	-TMS-200	0.0011	2		mg/L	++	0.0002	0.001			
SREV	SELENIUM	-TMS-200		2	U	mg/L	++	0.0002	0.0005			
SREV	SILVER	-TMS-200		2	U	mg/L	++	0.0001	0.0005			
REDO	THALLIUM	-TMS-200		2	U	mg/L	++	0.0002	0.001			
SREV	URANIUM	U-TMS-200		2	U	mg/L	++	0.0002	0.001			

L32759-03

Tag: Measured: 9/15/2016 11:39:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ANTIMONY	-TMS-200	0.0004	1	B	mg/L	++	0.0004	0.002			
SREV	ARSENIC	-TMS-200	0.0023	1		mg/L	++	0.0002	0.001			
SREV	CADMIUM	-TMS-200		1	U	mg/L	++	0.0001	0.0005			
SREV	LEAD	-TMS-200		1	U	mg/L	++	0.0001	0.0005			
SREV	SELENIUM	-TMS-200		1	U	mg/L	++	0.0001	0.0003			
SREV	SILVER	-TMS-200		1	U	mg/L	++	0.00005	0.0003			
REDO	THALLIUM	-TMS-200		1	U	mg/L	++	0.0001	0.0005			
SREV	URANIUM	U-TMS-200	0.0003	1	B	mg/L	++	0.0001	0.0005			

L32761-01

Tag: Measured: 9/15/2016 11:43:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SELENIUM	-TMS-200	0.0008	1		mg/L	++	0.0001	0.0003			

L32761-04

Tag: Measured: 9/15/2016 11:46:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SELENIUM	-TMS-200		5	U	mg/L	++	0.0005	0.001			

L32771-01

Tag: Measured: 9/15/2016 11:49:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	-TMS-200		1	U	mg/L	++	0.0001	0.0005			
SREV	LEAD	-TMS-200	0.0011	1		mg/L	++	0.0001	0.0005			
SREV	ZINC	-TMS-200	0.040	1		mg/L	++	0.002	0.005			

L32771-02

Tag:

Measured: 9/15/2016 11:52:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	-TMS-200		1	U	mg/L	++	0.0001	0.0005			
SREV	LEAD	-TMS-200	0.0008	1		mg/L	++	0.0001	0.0005			
SREV	ZINC	-TMS-200	0.029	1		mg/L	++	0.002	0.005			

WG409909CCV3

Tag:

Measured: 9/15/2016 11:55:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	FOUND	0.4801	1		mg/L	++	0.001	0.005			
SREV	ALUMINUM	REC	96	1		%	++	0.001	0.005			
SREV	ANTIMONY	FOUND	0.01198	1		mg/L	++	0.0004	0.002			
SREV	ANTIMONY	REC	96	1		%	++	0.0004	0.002			
SREV	ARSENIC	FOUND	0.1008	1		mg/L	++	0.0002	0.001			
SREV	ARSENIC	REC	101	1		%	++	0.0002	0.001			
SREV	BERYLLIUM	FOUND	0.09691	1		mg/L	++	0.00005	0.0003			
SREV	BERYLLIUM	REC	97	1		%	++	0.00005	0.0003			
SREV	CADMIUM	FOUND	0.09548	1		mg/L	++	0.0001	0.0005			
SREV	CADMIUM	REC	95	1		%	++	0.0001	0.0005			
SREV	CHROMIUM	FOUND	0.09221	1		mg/L	++	0.0005	0.002			
SREV	CHROMIUM	REC	92	1		%	++	0.0005	0.002			
SREV	COBALT	FOUND	0.09614	1		mg/L	++	0.00005	0.0003			
SREV	COBALT	REC	96	1		%	++	0.00005	0.0003			
SREV	COPPER	FOUND	0.236	1		mg/L	++	0.0005	0.003			
SREV	COPPER	REC	94	1		%	++	0.0005	0.003			
SREV	LEAD	FOUND	0.2378	1		mg/L	++	0.0001	0.0005			
SREV	LEAD	REC	95	1		%	++	0.0001	0.0005			
SREV	MANGANESE	FOUND	0.09579	1		mg/L	++	0.0005	0.003			
SREV	MANGANESE	REC	96	1		%	++	0.0005	0.003			
SREV	MOLYBDENUM	FOUND	0.09594	1		mg/L	++	0.0005	0.003			
SREV	MOLYBDENUM	REC	96	1		%	++	0.0005	0.003			
SREV	SELENIUM	FOUND	0.2467	1		mg/L	++	0.0001	0.0003			
SREV	SELENIUM	REC	98	1		%	++	0.0001	0.0003			
SREV	SILVER	FOUND	0.0236	1		mg/L	++	0.00005	0.0003			
SREV	SILVER	REC	94	1		%	++	0.00005	0.0003			
SREV	THALLIUM	FOUND	0.09643	1		mg/L	++	0.0001	0.0005			
SREV	THALLIUM	REC	96	1		%	++	0.0001	0.0005			
SREV	URANIUM	FOUND	0.09364	1		mg/L	++	0.0001	0.0005			
SREV	URANIUM	REC	94	1		%	++	0.0001	0.0005			
SREV	ZINC	FOUND	0.4956	1		mg/L	++	0.002	0.005			
SREV	ZINC	REC	99	1		%	++	0.002	0.005			

WG409909CCB3 **Tag:** **Measured: 9/15/2016 11:58:00 PM**

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	ALUMINUM	FOUND		1	U	mg/L	++	0.001	0.005			
SREV	ANTIMONY	FOUND		1	U	mg/L	++	0.0004	0.002			
SREV	ARSENIC	FOUND		1	U	mg/L	++	0.0002	0.001			
SREV	BERYLLIUM	FOUND		1	U	mg/L	++	0.00005	0.0003			
SREV	CADMIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	CHROMIUM	FOUND		1	U	mg/L	++	0.0005	0.002			
SREV	COBALT	FOUND		1	U	mg/L	++	0.00005	0.0003			
SREV	COPPER	FOUND		1	U	mg/L	++	0.0005	0.003			
SREV	LEAD	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	MANGANESE	FOUND		1	U	mg/L	++	0.0005	0.003			
SREV	MOLYBDENUM	FOUND		1	U	mg/L	++	0.0005	0.003			
SREV	SELENIUM	FOUND	0.00018	1	B	mg/L	++	0.0001	0.0003			
SREV	SILVER	FOUND		1	U	mg/L	++	0.00005	0.0003			
SREV	THALLIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	URANIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	ZINC	FOUND		1	U	mg/L	++	0.002	0.005			

Calibration Coefficients

Sample Name: **ICV**
Date Acquired: **Sep 15 2016 10:15 pm**
Acq. Method: **ACZ.M**
Current Method Pa**ICPCHEM\1\DATA\wg409909.b**
Calibration Path**ICPCHEM\1\DATA\wg409909.b**

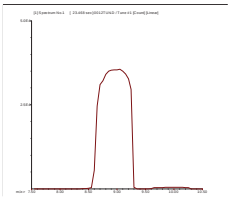
Element Name	Mass	Calibration Corr Coef	Tune Step	IS Ref
Be	9	0.9997	3	6
B	11	1.0000	3	6
Al	27	1.0000	3	72
V	51	1.0000	2	45
Cr	52	0.9999	2	115
Mn	55	1.0000	3	72
Fe	56	1.0000	1	45
Co	59	1.0000	3	72
Ni	60	0.9999	2	45
Cu	63	0.9998	2	45
Zn	66	1.0000	3	72
As	75	1.0000	2	45
Se	78	1.0000	1	45
Mo	98	1.0000	3	115
Ag	107	1.0000	3	115
Cd	111	1.0000	3	115
Sn	118	1.0000	3	115
Sb	121	0.9999	3	115
Te	125	1.0000	3	115
Cs	133	1.0000	3	115
Ba	137	0.9999	3	115
Tl	205	1.0000	3	209
Pb	208	1.0000	3	209
Th	232	1.0000	3	209
U	238	1.0000	3	209

200.8 QC Tune Report

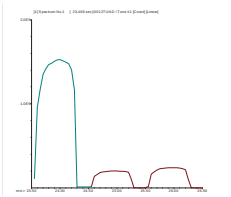
Data File: C:\ICPCHEM\1\DATA\160915bt.b\0012TUN.D
Date Acquired: Sep 15 2016 12:20 pm
Acq. Method: TN200_8.M
Operator: scp
Sample Name: 200.8 Tune
Misc Info:
Vial Number: 1201
Current Method: C:\ICPCHEM\1\METHODS\TN200_8.M

RSD (%)

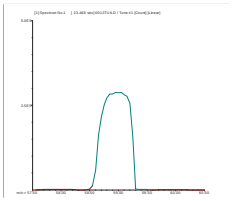
Element	Actual	Required	Flag
9 Be	1.16	5.00	
24 Mg	1.44	5.00	
59 Co	0.97	5.00	
115 In	0.73	5.00	
208 Pb	0.89	5.00	



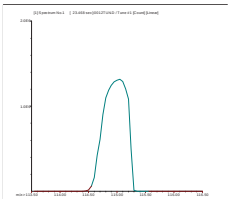
9 Be
Mass Calib.
Actual: 8.95
Required: 8.90 - 9.10
Flag:
Peak Width
Actual: 0.65
Required: 0.90
Flag:



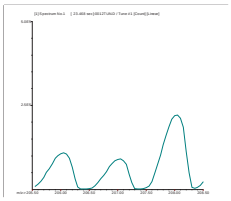
24 Mg
Mass Calib.
Actual: 24.00
Required: 23.90 - 24.10
Flag:
Peak Width
Actual: 0.65
Required: 0.90
Flag:



59 Co
Mass Calib.
Actual: 58.95
Required: 58.90 - 59.10
Flag:
Peak Width
Actual: 0.65
Required: 0.90
Flag:



115 In
Mass Calib.
Actual: 115.00
Required: 114.90 - 115.10
Flag:
Peak Width
Actual: 0.65
Required: 0.90
Flag:



208 Pb
Mass Calib.
Actual: 208.00
Required: 207.90 - 208.10
Flag:
Peak Width
Actual: 0.60
Required: 0.90
Flag:

Tune Result: Pass

Calibration Blank QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\001CAL
Date Acquired: Sep 15 2016 09:53 pm
Operator:
Sample Name: Calblk
Misc Info:
Vial Number: 1101
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal Update: Sep 15 2016 09:55 pm
Sample Type: CalBlk
Total Dil Factor: 1.00

QC&ISTD Elements

Element		CPS Mean		SD	RSD(%)
6	Li	979859.50	A	28190.00	2.88
9	Be	85.56	P	21.17	24.74
11	B	7578.79	P	171.10	2.26
27	Al	23298.93	P	422.30	1.81
45	Sc	2583292.00	A	27340.00	1.06
45	Sc	593127.19	P	1018.00	0.17
45	Sc	6225168.00	A	111100.00	1.78
51	V	2533.65	P	45.82	1.81
52	Cr	1870.18	P	51.33	2.74
55	Mn	19866.15	P	458.30	2.31
56	Fe	13929.40	P	238.60	1.71
59	Co	301.12	P	25.02	8.31
60	Ni	102.23	P	13.47	13.18
63	Cu	10333.95	P	55.16	0.53
66	Zn	2979.29	P	62.58	2.10
72	Ge	770555.00	P	1928.00	0.25
72	Ge	293190.91	P	3132.00	1.07
72	Ge	1450461.00	A	17410.00	1.20
74	Ge	1095011.00	A	13880.00	1.27
74	Ge	427822.91	P	3951.00	0.92
74	Ge	1987875.00	A	15960.00	0.80
75	As	191.12	P	18.36	9.61
78	Se	26.67	P	3.76	14.09
98	Mo	466.61	P	42.69	9.15
99			P		
106	Cd		P		
107	Ag	141.12	P	13.47	9.55
108	Cd		P		
111	Cd	38.75	P	20.74	53.53
115	In	3665558.00	A	36600.00	1.00
115	In	1184000.00	A	16980.00	1.43
115	In	4557575.00	A	49840.00	1.09
118	Sn	1931.31	P	80.04	4.14
121	Sb	2691.97	P	157.70	5.86
125	Te	54.45	P	18.36	33.72
133	Cs	1220.10	P	43.59	3.57
137	Ba	224.45	P	25.46	11.34
159	Tb	5874054.00	A	28180.00	0.48
205	Tl	240.01	P	32.83	13.68
206	(Pb)		P		
207	(Pb)		P		
208	Pb	1094.50	P	126.20	11.53
209	Bi	6316019.00	A	25980.00	0.41
232	Th	12783.32	P	651.30	5.09
238	U	468.91	P	25.02	5.34

Calibration Blank QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\002CAL
Date Acquired: Sep 15 2016 09:56 pm
Operator:
Sample Name: Calblk
Misc Info:
Vial Number: 1101
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal Update: Sep 15 2016 09:55 pm
Sample Type: CalBlk
Total Dil Factor: 1.00

QC&ISTD Elements

Element		CPS Mean		SD	RSD(%)
6	Li	986430.50	A	19920.00	2.02
9	Be	77.78	P	8.39	10.79
11	B	7233.08	P	183.90	2.54
27	Al	25065.41	P	3414.00	13.62
45	Sc	2521502.00	A	10290.00	0.41
45	Sc	598256.50	P	9323.00	1.56
45	Sc	6255148.00	A	61300.00	0.98
51	V	2401.39	P	35.33	1.47
52	Cr	1813.51	P	141.60	7.81
55	Mn	19732.60	P	417.20	2.11
56	Fe	11982.24	P	202.30	1.69
59	Co	218.90	P	27.96	12.77
60	Ni	108.89	P	11.71	10.75
63	Cu	10610.79	P	143.90	1.36
66	Zn	2910.41	P	21.88	0.75
72	Ge	759323.31	P	3571.00	0.47
72	Ge	293904.59	P	2788.00	0.95
72	Ge	1461369.00	A	20780.00	1.42
74	Ge	1072904.00	A	5853.00	0.55
74	Ge	431606.59	P	2276.00	0.53
74	Ge	2007982.00	A	12650.00	0.63
75	As	191.12	P	32.89	17.21
78	Se	18.78	P	2.67	14.24
98	Mo	419.54	P	31.90	7.60
99			P		
106	Cd		P		
107	Ag	105.56	P	8.39	7.95
108	Cd		P		
111	Cd	39.80	P	22.32	56.08
115	In	3634993.00	A	4636.00	0.13
115	In	1190027.00	A	21480.00	1.81
115	In	4565374.00	A	14860.00	0.33
118	Sn	1719.06	P	15.74	0.92
121	Sb	2135.20	P	61.94	2.90
125	Te	42.22	P	11.71	27.73
133	Cs	1145.65	P	27.15	2.37
137	Ba	197.79	P	27.15	13.73
159	Tb	5911172.00	A	36050.00	0.61
205	Tl	200.01	P	14.53	7.26
206	(Pb)		P		
207	(Pb)		P		
208	Pb	837.82	P	60.50	7.22
209	Bi	6360572.00	A	15470.00	0.24
232	Th	8822.14	P	294.20	3.33
238	U	336.68	P	33.83	10.05

Calibration Blank QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\003CAL
Date Acquired: Sep 15 2016 09:59 pm
Operator:
Sample Name: Calblk
Misc Info:
Vial Number: 1102
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal Update: Sep 15 2016 09:58 pm
Sample Type: CalBlk
Total Dil Factor: 1.00

QC&ISTD Elements

Element		CPS Mean		SD	RSD(%)
6	Li	973727.19	A	8149.00	0.84
9	Be	161.12	P	5.09	3.16
11	B	7012.95	P	329.70	4.70
27	Al	31097.56	P	1809.00	5.82
45	Sc	2490209.00	A	12960.00	0.52
45	Sc	595751.63	P	8879.00	1.49
45	Sc	6201481.00	A	20630.00	0.33
51	V	2526.97	P	81.87	3.24
52	Cr	1910.18	P	47.03	2.46
55	Mn	21112.38	P	595.60	2.82
56	Fe	18284.39	P	178.00	0.97
59	Co	634.48	P	35.65	5.62
60	Ni	191.12	P	29.88	15.63
63	Cu	11698.37	P	444.00	3.80
66	Zn	5442.30	P	50.61	0.93
72	Ge	755907.13	M	2294.00	0.30
72	Ge	293685.19	P	2539.00	0.86
72	Ge	1450449.00	A	22350.00	1.54
74	Ge	1070347.00	A	3296.00	0.31
74	Ge	430775.69	P	5650.00	1.31
74	Ge	1984674.00	A	23580.00	1.19
75	As	161.12	P	18.36	11.40
78	Se	30.89	P	2.78	8.99
98	Mo	537.16	P	11.24	2.09
99			P		
106	Cd		P		
107	Ag	174.45	P	23.41	13.42
108	Cd		P		
111	Cd	100.49	P	14.28	14.21
115	In	3596183.00	A	14980.00	0.42
115	In	1187034.00	A	2123.00	0.18
115	In	4498589.00	A	23540.00	0.52
118	Sn	1941.31	P	126.80	6.53
121	Sb	1917.39	P	45.26	2.36
125	Te	47.78	P	12.62	26.41
133	Cs	1733.51	P	8.82	0.51
137	Ba	403.35	P	52.92	13.12
159	Tb	5855025.00	A	51720.00	0.88
205	Tl	511.14	P	22.20	4.34
206	(Pb)		P		
207	(Pb)		P		
208	Pb	2153.48	P	46.20	2.15
209	Bi	6279629.00	A	68160.00	1.09
232	Th	7107.73	P	141.20	1.99
238	U	852.28	P	99.02	11.62

Calibration Standard QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\004CALS.D\004CALS.D#
Date Acquired: Sep 15 2016 10:02 pm
Operator:
Sample Name: PQV Std
Misc Info:
Vial Number: 1103
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal Update: Sep 15 2016 10:01 pm
Sample Type: CalStd
Total Dil Factor: 1.00

QC&ISTD Elements

Element	CPS Mean		SD	RSD(%)
6 Li	974273.00	A	5133.00	0.53
9 Be	777.83	P	48.80	6.27
11 B	8710.54	P	83.72	0.96
27 Al	96372.97	P	882.30	0.92
45 Sc	2495132.00	A	22290.00	0.89
45 Sc	594538.13	P	9330.00	1.57
45 Sc	6112374.00	A	44920.00	0.73
51 V	7394.31	P	137.10	1.85
52 Cr	13783.51	P	218.50	1.59
55 Mn	75336.49	P	538.40	0.71
56 Fe	118580.50	P	594.40	0.50
59 Co	6193.72	P	141.20	2.28
60 Ni	7105.29	P	92.94	1.31
63 Cu	23891.15	P	532.70	2.23
66 Zn	20954.49	P	314.00	1.50
72 Ge	750760.13	P	5474.00	0.73
72 Ge	293370.59	P	2963.00	1.01
72 Ge	1434809.00	A	18290.00	1.27
74 Ge	1062951.00	A	6780.00	0.64
74 Ge	426745.59	P	6734.00	1.58
74 Ge	1964220.00	A	24810.00	1.26
75 As	1085.63	P	53.37	4.92
78 Se	103.00	P	7.53	7.32
98 Mo	25357.16	P	534.60	2.11
99		P		
106 Cd		P		
107 Ag	5055.52	P	174.60	3.45
108 Cd		P		
111 Cd	1669.22	P	21.29	1.28
115 In	3600449.00	A	8140.00	0.23
115 In	1190905.00	A	6984.00	0.59
115 In	4483699.00	A	51190.00	1.14
118 Sn	6573.98	P	102.50	1.56
121 Sb	31365.52	P	143.70	0.46
125 Te	2411.41	P	103.00	4.27
133 Cs	38817.75	P	471.80	1.22
137 Ba	12603.88	P	178.60	1.42
159 Tb	5810671.00	A	9805.00	0.17
205 Tl	12016.91	P	111.80	0.93
206 (Pb)		P		
207 (Pb)		P		
208 Pb	17429.54	P	337.20	1.93
209 Bi	6230979.00	A	82380.00	1.32
232 Th	163700.50	P	1588.00	0.97
238 U	15161.48	P	416.90	2.75

ISTD Elements

Element	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	974273.00	0.53	973727.19	100.1	59.5 - 120.4	
45 Sc	2495131.80	0.89	2490209.30	100.2	59.5 - 120.4	
45 Sc	594538.13	1.57	595751.63	99.8	59.5 - 120.4	
45 Sc	6112373.50	0.73	6201481.00	98.6	59.5 - 120.4	
72 Ge	750760.13	0.73	755907.06	99.3	59.5 - 120.4	
72 Ge	293370.63	1.01	293685.22	99.9	59.5 - 120.4	
72 Ge	1434808.90	1.27	1450449.40	98.9	59.5 - 120.4	
74 Ge	1062951.10	0.64	1070347.30	99.3	59.5 - 120.4	
74 Ge	426745.66	1.58	430775.66	99.1	59.5 - 120.4	
74 Ge	1964220.10	1.26	1984674.40	99.0	59.5 - 120.4	
115 In	3600448.80	0.23	3596182.80	100.1	59.5 - 120.4	
115 In	1190904.90	0.59	1187034.00	100.3	59.5 - 120.4	
115 In	4483699.00	1.14	4498589.00	99.7	59.5 - 120.4	
159 Tb	5810670.50	0.17	5855025.00	99.2	59.5 - 120.4	
209 Bi	6230979.50	1.32	6279628.50	99.2	59.5 - 120.4	

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

--- :Element Failures --- :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Data Results:
Analytes: Pass
ISTD: Pass

Calibration Standard QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\005CALS.D\005CALS.D#
Date Acquired: Sep 15 2016 10:06 pm
Operator:
Sample Name: Level 3 Std
Misc Info:
Vial Number: 1104
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal Update: Sep 15 2016 10:04 pm
Sample Type: CalStd
Total Dil Factor: 1.00

QC&ISTD Elements

Element	CPS Mean		SD	RSD(%)
6 Li	1010391.00	A	20130.00	1.99
9 Be	60420.31	P	354.20	0.59
11 B	11116.66	P	175.90	1.58
27 Al	1718939.00	A	14780.00	0.86
45 Sc	2583257.00	A	12020.00	0.47
45 Sc	608678.63	P	2586.00	0.42
45 Sc	6348239.00	A	76950.00	1.21
51 V	124802.30	P	402.80	0.32
52 Cr	131149.20	P	1001.00	0.76
55 Mn	654450.38	P	4174.00	0.64
56 Fe	1252261.00	A	3851.00	0.31
59 Co	521544.69	P	4580.00	0.88
60 Ni	126443.60	P	1057.00	0.84
63 Cu	392914.41	P	1069.00	0.27
66 Zn	408769.41	P	927.10	0.23
72 Ge	765945.38	P	2071.00	0.27
72 Ge	301512.91	P	1555.00	0.52
72 Ge	1505963.00	A	16040.00	1.07
74 Ge	1095813.00	A	6572.00	0.60
74 Ge	438838.91	P	5933.00	1.35
74 Ge	2042159.00	A	16130.00	0.79
75 As	19363.44	P	321.60	1.66
78 Se	20287.49	P	26.30	0.13
98 Mo	213840.59	P	1035.00	0.48
99		P		
106 Cd		P		
107 Ag	85933.74	P	271.50	0.32
108 Cd		P		
111 Cd	72176.30	P	1269.00	1.76
115 In	3695009.00	A	38630.00	1.05
115 In	1209436.00	A	5127.00	0.42
115 In	4664545.00	A	44930.00	0.96
118 Sn	213589.70	P	251.90	0.12
121 Sb	36375.26	P	223.20	0.61
125 Te	12792.89	P	218.80	1.71
133 Cs	823755.81	P	3430.00	0.42
137 Ba	280077.41	P	518.60	0.19
159 Tb	6039461.00	A	25420.00	0.42
205 Tl	534109.38	P	3193.00	0.60
206 (Pb)		P		
207 (Pb)		P		
208 Pb	1793444.00	M	7562.00	0.42
209 Bi	6491939.00	A	46620.00	0.72
232 Th	687176.31	P	6000.00	0.87
238 U	687848.63	P	7766.00	1.13

ISTD Elements

Element	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	1010390.90	1.99	973727.19	103.8	59.5 - 120.4	
45 Sc	2583256.80	0.47	2490209.30	103.7	59.5 - 120.4	
45 Sc	608678.56	0.42	595751.63	102.2	59.5 - 120.4	
45 Sc	6348239.50	1.21	6201481.00	102.4	59.5 - 120.4	
72 Ge	765945.44	0.27	755907.06	101.3	59.5 - 120.4	
72 Ge	301512.94	0.52	293685.22	102.7	59.5 - 120.4	
72 Ge	1505962.80	1.07	1450449.40	103.8	59.5 - 120.4	
74 Ge	1095812.60	0.60	1070347.30	102.4	59.5 - 120.4	
74 Ge	438838.94	1.35	430775.66	101.9	59.5 - 120.4	
74 Ge	2042158.50	0.79	1984674.40	102.9	59.5 - 120.4	
115 In	3695009.00	1.05	3596182.80	102.7	59.5 - 120.4	
115 In	1209436.50	0.42	1187034.00	101.9	59.5 - 120.4	
115 In	4664545.50	0.96	4498589.00	103.7	59.5 - 120.4	
159 Tb	6039460.50	0.42	5855025.00	103.2	59.5 - 120.4	
209 Bi	6491938.50	0.72	6279628.50	103.4	59.5 - 120.4	

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

--- :Element Failures --- :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Data Results:
Analytes: Pass
ISTD: Pass

Calibration Standard QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\006CALS.D\006CALS.D#
Date Acquired: Sep 15 2016 10:09 pm
Operator:
Sample Name: Level 4 Std
Misc Info:
Vial Number: 1105
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal Update: Sep 15 2016 10:07 pm
Sample Type: CalStd
Total Dil Factor: 1.00

QC&ISTD Elements

Element	CPS Mean		SD	RSD(%)
6 Li	1025082.00	A	26680.00	2.60
9 Be	301798.81	P	7339.00	2.43
11 B	26048.52	P	656.60	2.52
27 Al	8190457.00	A	173100.00	2.11
45 Sc	2629048.00	A	13890.00	0.53
45 Sc	620110.00	P	7728.00	1.25
45 Sc	6573098.00	A	73650.00	1.12
51 V	583753.88	P	5930.00	1.02
52 Cr	638800.13	P	7324.00	1.15
55 Mn	3226482.00	A	49640.00	1.54
56 Fe	5923075.00	A	44570.00	0.75
59 Co	2638526.00	A	28610.00	1.08
60 Ni	621718.00	P	5919.00	0.95
63 Cu	1682332.00	A	17750.00	1.06
66 Zn	2049423.00	A	32090.00	1.57
72 Ge	778937.63	P	6679.00	0.86
72 Ge	304630.69	P	3891.00	1.28
72 Ge	1539900.00	A	22490.00	1.46
74 Ge	1121134.00	A	2349.00	0.21
74 Ge	446593.41	P	1801.00	0.40
74 Ge	2111796.00	A	26380.00	1.25
75 As	93570.31	P	886.00	0.95
78 Se	96824.49	P	88.88	0.09
98 Mo	1107510.00	A	14700.00	1.33
99		P		
106 Cd		P		
107 Ag	434048.41	P	2185.00	0.50
108 Cd		P		
111 Cd	359163.31	P	1541.00	0.43
115 In	3781106.00	A	15520.00	0.41
115 In	1247670.00	A	15120.00	1.21
115 In	4798193.00	A	22400.00	0.47
118 Sn	1054837.00	A	10040.00	0.95
121 Sb	175362.91	P	815.60	0.47
125 Te	61722.40	P	581.00	0.94
133 Cs	4165439.00	A	22890.00	0.55
137 Ba	1394353.00	A	13480.00	0.97
159 Tb	6289368.00	A	39130.00	0.62
205 Tl	2696710.00	A	11080.00	0.41
206 (Pb)		A		
207 (Pb)		A		
208 Pb	9245540.00	A	49610.00	0.54
209 Bi	6872695.00	A	49790.00	0.72
232 Th	3653731.00	A	13730.00	0.38
238 U	3489483.00	A	37080.00	1.06

ISTD Elements

Element	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	1025081.80	2.60	973727.19	105.3	59.5 - 120.4	
45 Sc	2629047.80	0.53	2490209.30	105.6	59.5 - 120.4	
45 Sc	620110.06	1.25	595751.63	104.1	59.5 - 120.4	
45 Sc	6573098.00	1.12	6201481.00	106.0	59.5 - 120.4	
72 Ge	778937.56	0.86	755907.06	103.0	59.5 - 120.4	
72 Ge	304630.69	1.28	293685.22	103.7	59.5 - 120.4	
72 Ge	1539899.90	1.46	1450449.40	106.2	59.5 - 120.4	
74 Ge	1121133.90	0.21	1070347.30	104.7	59.5 - 120.4	
74 Ge	446593.44	0.40	430775.66	103.7	59.5 - 120.4	
74 Ge	2111796.00	1.25	1984674.40	106.4	59.5 - 120.4	
115 In	3781106.30	0.41	3596182.80	105.1	59.5 - 120.4	
115 In	1247670.30	1.21	1187034.00	105.1	59.5 - 120.4	
115 In	4798193.00	0.47	4498589.00	106.7	59.5 - 120.4	
159 Tb	6289368.00	0.62	5855025.00	107.4	59.5 - 120.4	
209 Bi	6872695.00	0.72	6279628.50	109.4	59.5 - 120.4	

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

--- :Element Failures --- :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Data Results:
Analytes: Pass
ISTD: Pass

Calibration Standard QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\007CALS.D\007CALS.D#
Date Acquired: Sep 15 2016 10:12 pm
Operator:
Sample Name: Level 5 Std
Misc Info:
Vial Number: 1106
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal Update: Sep 15 2016 10:10 pm
Sample Type: CalStd
Total Dil Factor: 1.00

QC&ISTD Elements

Element	CPS Mean		SD	RSD(%)
6 Li	1051534.00	A	13660.00	1.30
9 Be	648919.00	A	11620.00	1.79
11 B	45513.17	P	1112.00	2.44
27 Al	16585120.00	A	208200.00	1.26
45 Sc	2684152.00	A	21910.00	0.82
45 Sc	637202.19	P	7555.00	1.19
45 Sc	6671670.00	A	88580.00	1.33
51 V	1200235.00	A	13560.00	1.13
52 Cr	1329039.00	A	18090.00	1.36
55 Mn	6517652.00	A	73860.00	1.13
56 Fe	11981640.00	A	79040.00	0.66
59 Co	5320286.00	A	31830.00	0.60
60 Ni	1316531.00	A	5405.00	0.41
63 Cu	3350570.00	A	18690.00	0.56
66 Zn	4089939.00	A	12600.00	0.31
72 Ge	790235.19	M	1534.00	0.19
72 Ge	310763.69	P	2620.00	0.84
72 Ge	1562456.00	A	12180.00	0.78
74 Ge	1142956.00	A	3570.00	0.31
74 Ge	459152.41	P	2699.00	0.59
74 Ge	2134967.00	A	9265.00	0.43
75 As	192479.30	P	1530.00	0.79
78 Se	196745.09	P	1312.00	0.67
98 Mo	2228206.00	A	14200.00	0.64
99		P		
106 Cd		P		
107 Ag	899740.19	A	7878.00	0.88
108 Cd		P		
111 Cd	738461.31	P	2965.00	0.40
115 In	3843908.00	A	9547.00	0.25
115 In	1262956.00	A	5155.00	0.41
115 In	4878989.00	A	25050.00	0.51
118 Sn	2127722.00	A	4082.00	0.19
121 Sb	360547.00	P	1481.00	0.41
125 Te	126111.20	P	632.60	0.50
133 Cs	8483778.00	A	36430.00	0.43
137 Ba	2782108.00	A	11770.00	0.42
159 Tb	6334548.00	A	13010.00	0.21
205 Tl	5417962.00	A	66440.00	1.23
206 (Pb)		A		
207 (Pb)		A		
208 Pb	18686960.00	A	179500.00	0.96
209 Bi	6986373.00	A	90440.00	1.29
232 Th	7351502.00	A	137300.00	1.87
238 U	6996293.00	A	123500.00	1.77

ISTD Elements

Element	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	1051534.10	1.30	973727.19	108.0	59.5 - 120.4	
45 Sc	2684152.00	0.82	2490209.30	107.8	59.5 - 120.4	
45 Sc	637202.19	1.19	595751.63	107.0	59.5 - 120.4	
45 Sc	6671670.50	1.33	6201481.00	107.6	59.5 - 120.4	
72 Ge	790235.25	0.19	755907.06	104.5	59.5 - 120.4	
72 Ge	310763.75	0.84	293685.22	105.8	59.5 - 120.4	
72 Ge	1562456.30	0.78	1450449.40	107.7	59.5 - 120.4	
74 Ge	1142956.50	0.31	1070347.30	106.8	59.5 - 120.4	
74 Ge	459152.44	0.59	430775.66	106.6	59.5 - 120.4	
74 Ge	2134967.50	0.43	1984674.40	107.6	59.5 - 120.4	
115 In	3843908.30	0.25	3596182.80	106.9	59.5 - 120.4	
115 In	1262956.50	0.41	1187034.00	106.4	59.5 - 120.4	
115 In	4878989.00	0.51	4498589.00	108.5	59.5 - 120.4	
159 Tb	6334548.00	0.21	5855025.00	108.2	59.5 - 120.4	
209 Bi	6986373.00	1.29	6279628.50	111.3	59.5 - 120.4	

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

--- :Element Failures --- :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Data Results:
Analytes: Pass
ISTD: Pass

Initial Calibration Verification (CCV) QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\008_QCS.D\008_QCS.D#
Date Acquired: Sep 15 2016 10:15 pm
Operator:
Sample Name: ICV
Misc Info:
Vial Number: 1107
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal Update: Sep 15 2016 10:13 pm
Sample Type: QCS
Total Dil Factor: 1.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc. ppb	RSD(%)	Expected	Rec(%)	QC Range(%)	Flag
9 Be	6	3	48.980	0.98	50.00	98.0	89 - 110	
11 B	6	3	20.610	1.15	20.00	103.1	89 - 110	
27 Al	72	3	108.400	1.33	100.00	108.4	89 - 110	
51 V	45	2	49.770	1.00	50.00	99.5	89 - 110	
52 Cr	45	2	50.280	1.14	50.00	100.6	89 - 110	
55 Mn	72	3	51.880	0.35	50.00	103.8	89 - 110	
56 Fe	45	1	106.800	1.34	100.00	106.8	89 - 110	
59 Co	72	3	54.210	0.53	50.00	108.4	89 - 110	
60 Ni	45	2	50.030	0.69	50.00	100.1	89 - 110	
63 Cu	45	2	50.720	0.77	50.00	101.4	89 - 110	
66 Zn	72	3	51.000	0.70	50.00	102.0	89 - 110	
75 As	45	2	54.010	1.23	50.00	108.0	89 - 110	
78 Se	45	1	51.070	1.10	50.00	102.1	89 - 110	
98 Mo	115	3	19.570	0.82	20.00	97.9	89 - 110	
107 Ag	115	3	20.110	0.52	20.00	100.6	89 - 110	
111 Cd	115	3	50.870	0.24	50.00	101.7	89 - 110	
118 Sn	115	3	49.520	0.49	50.00	99.0	89 - 110	
121 Sb	115	3	21.410	0.30	20.00	107.1	89 - 110	
125 Te	115	3	51.970	1.73	50.00	103.9	89 - 110	
133 Cs	115	3	51.750	0.64	50.00	103.5	89 - 110	
137 Ba	115	3	50.470	0.94	50.00	100.9	89 - 110	
205 Tl	209	3	55.340	1.89	50.00	110.7	89 - 110	Fail
208 Pb	209	3	53.080	0.45	50.00	106.2	89 - 110	
232 Th	209	3	53.380	0.84	50.00	106.8	89 - 110	
238 U	209	3	53.630	0.47	50.00	107.3	89 - 110	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1037082	3.04	973727	106.5	60 - 120	
45 Sc	1	2688603	1.08	2490209	108.0	60 - 120	
45 Sc	2	633572	0.38	595752	106.3	60 - 120	
45 Sc	3	6576118	1.02	6201481	106.0	60 - 120	
72 Ge	1	803791	1.59	755907	106.3	60 - 120	
72 Ge	2	310428	0.47	293685	105.7	60 - 120	
72 Ge	3	1540936	0.85	1450449	106.2	60 - 120	
74 Ge	1	1143200	0.81	1070347	106.8	60 - 120	
74 Ge	2	450981	0.66	430776	104.7	60 - 120	
74 Ge	3	2105135	0.97	1984674	106.1	60 - 120	
115 In	1	3858271	0.61	3596183	107.3	60 - 120	
115 In	2	1269216	0.20	1187034	106.9	60 - 120	
115 In	3	4852261	0.24	4498589	107.9	60 - 120	
159 Tb	3	6297143	1.55	5855025	107.6	60 - 120	
209 Bi	3	6860603	0.33	6279629	109.3	60 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

1 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Continuing Calibration Blank (CCB) QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\009_CCB.D\009_CCB.D#
Date Acquired: Sep 15 2016 10:18 pm
Operator:
Sample Name: ICB
Misc Info:
Vial Number: 1102
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal Update: Sep 15 2016 10:13 pm
Sample Type: CCB
Total Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc.	RSD(%)	High Limit	Flag
9 Be	6	3	0.014 ppb	96.68	0.150	
11 B	6	3	0.269 ppb	25.67	1.500	
27 Al	72	3	-0.033 ppb	133.32	3.000	
51 V	45	2	-0.022 ppb	89.06	0.600	
52 Cr	45	2	0.015 ppb	115.75	1.500	
55 Mn	72	3	-0.032 ppb	28.35	1.500	
56 Fe	45	1	-0.118 ppb	5.20	12.000	
59 Co	72	3	0.023 ppb	19.55	0.150	
60 Ni	45	2	0.050 ppb	25.27	1.800	
63 Cu	45	2	0.039 ppb	75.38	1.500	
66 Zn	72	3	-0.039 ppb	128.43	6.000	
75 As	45	2	0.093 ppb	29.44	0.600	
78 Se	45	1	0.078 ppb	14.84	0.300	
98 Mo	115	3	0.021 ppb	20.09	1.500	
107 Ag	115	3	0.008 ppb	21.25	0.150	
111 Cd	115	3	0.015 ppb	90.41	0.300	
118 Sn	115	3	0.186 ppb	9.11	0.300	
121 Sb	115	3	0.597 ppb	2.41	1.200	
125 Te	115	3	0.016 ppb	255.10	3.000	
133 Cs	115	3	0.018 ppb	13.52	0.600	
137 Ba	115	3	0.033 ppb	17.23	1.500	
205 Tl	209	3	0.033 ppb	6.76	0.300	
208 Pb	209	3	0.046 ppb	8.52	0.300	
232 Th	209	3	1.021 ppb	7.53	3.000	
238 U	209	3	0.041 ppb	11.72	0.300	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1036585	1.74	973727	106.5	60 - 120	
45 Sc	1	2676293	0.40	2490209	107.5	60 - 120	
45 Sc	2	625148	1.35	595752	104.9	60 - 120	
45 Sc	3	6536136	0.13	6201481	105.4	60 - 120	
72 Ge	1	806671	0.35	755907	106.7	60 - 120	
72 Ge	2	306545	1.52	293685	104.4	60 - 120	
72 Ge	3	1524112	0.27	1450449	105.1	60 - 120	
74 Ge	1	1136634	0.60	1070347	106.2	60 - 120	
74 Ge	2	450974	1.04	430776	104.7	60 - 120	
74 Ge	3	2090143	0.75	1984674	105.3	60 - 120	
115 In	1	3835618	0.27	3596183	106.7	60 - 120	
115 In	2	1254673	1.81	1187034	105.7	60 - 120	
115 In	3	4822216	0.55	4498589	107.2	60 - 120	
159 Tb	3	6241053	1.18	5855025	106.6	60 - 120	
209 Bi	3	6793965	0.97	6279629	108.2	60 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\010SMPL.D\010SMPL.D#
Date Acquired: Sep 15 2016 10:21 pm
Acq. Method: ACZ.M
Operator:
Sample Name: WG409768LRB
Misc Info:
Vial Number: 3301
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-0.017	-0.017	ppb	79.21	200.00	
11 B	6	3	-0.052	-0.052	ppb	288.81	20.00	
27 Al	72	3	5.819	5.819	ppb	1.78	1000.00	
51 V	45	2	-0.063	-0.063	ppb	60.77	200.00	
52 Cr	45	2	-0.031	-0.031	ppb	25.98	200.00	
55 Mn	72	3	-0.117	-0.117	ppb	12.48	200.00	
56 Fe	45	1	2.849	2.849	ppb	1.04	1000.00	
59 Co	72	3	-0.011	-0.011	ppb	7.76	200.00	
60 Ni	45	2	-0.037	-0.037	ppb	15.43	500.00	
63 Cu	45	2	-0.493	-0.493	ppb	11.77	500.00	
66 Zn	72	3	0.518	0.518	ppb	12.48	1000.00	
75 As	45	2	0.064	0.064	ppb	30.86	200.00	
78 Se	45	1	-0.022	-0.022	ppb	33.62	500.00	
98 Mo	115	3	-0.002	-0.002	ppb	121.61	200.00	
107 Ag	115	3	0.000	0.000	ppb	409.92	50.00	
111 Cd	115	3	-0.003	-0.003	ppb	352.63	200.00	
118 Sn	115	3	-0.033	-0.033	ppb	8.52	200.00	
121 Sb	115	3	0.153	0.153	ppb	14.04	25.00	
125 Te	115	3	-0.005	-0.005	ppb	470.15	200.00	
133 Cs	115	3	-0.013	-0.013	ppb	14.33	200.00	
137 Ba	115	3	-0.019	-0.019	ppb	11.48	500.00	
205 Tl	209	3	-0.008	-0.008	ppb	11.14	200.00	
208 Pb	209	3	-0.026	-0.026	ppb	0.42	500.00	
232 Th	209	3	0.397	0.397	ppb	6.42	200.00	
238 U	209	3	-0.010	-0.010	ppb	14.00	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1056440	1.75	973727	108.5	59.5 - 120	
45 Sc	1	2664201	0.76	2490209	107.0	59.5 - 120	
45 Sc	2	633664	1.23	595752	106.4	59.5 - 120	
45 Sc	3	6591549	1.00	6201481	106.3	59.5 - 120	
72 Ge	1	804629	1.43	755907	106.4	59.5 - 120	
72 Ge	2	310962	1.29	293685	105.9	59.5 - 120	
72 Ge	3	1548052	0.94	1450449	106.7	59.5 - 120	
74 Ge	1	1143578	0.93	1070347	106.8	59.5 - 120	
74 Ge	2	453897	1.08	430776	105.4	59.5 - 120	
74 Ge	3	2104251	1.04	1984674	106.0	59.5 - 120	
115 In	1	3868456	1.00	3596183	107.6	59.5 - 120	
115 In	2	1274696	1.06	1187034	107.4	59.5 - 120	
115 In	3	4870087	0.69	4498589	108.3	59.5 - 120	
159 Tb	3	6343140	0.34	5855025	108.3	59.5 - 120	
209 Bi	3	6955876	1.18	6279629	110.8	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\011SMPL.D\011SMPL.D#
Date Acquired: Sep 15 2016 10:24 pm
Acq. Method: ACZ.M
Operator:
Sample Name: WG409768LFB
Misc Info:
Vial Number: 3302
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	46.280	46.280	ppb	1.15	200.00	
11 B	6	3	9.209	9.209	ppb	1.64	20.00	
27 Al	72	3	49.440	49.440	ppb	0.83	1000.00	
51 V	45	2	47.890	47.890	ppb	0.35	200.00	
52 Cr	45	2	47.600	47.600	ppb	0.09	200.00	
55 Mn	72	3	48.260	48.260	ppb	1.61	200.00	
56 Fe	45	1	47.160	47.160	ppb	0.05	1000.00	
59 Co	72	3	50.230	50.230	ppb	1.43	200.00	
60 Ni	45	2	46.780	46.780	ppb	0.68	500.00	
63 Cu	45	2	46.290	46.290	ppb	0.57	500.00	
66 Zn	72	3	46.680	46.680	ppb	1.40	1000.00	
75 As	45	2	50.380	50.380	ppb	0.71	200.00	
78 Se	45	1	46.410	46.410	ppb	0.90	500.00	
98 Mo	115	3	45.890	45.890	ppb	0.17	200.00	
107 Ag	115	3	9.396	9.396	ppb	0.46	50.00	
111 Cd	115	3	46.410	46.410	ppb	0.33	200.00	
118 Sn	115	3	46.290	46.290	ppb	0.50	200.00	
121 Sb	115	3	10.520	10.520	ppb	0.71	25.00	
125 Te	115	3	47.590	47.590	ppb	0.85	200.00	
133 Cs	115	3	48.410	48.410	ppb	0.48	200.00	
137 Ba	115	3	47.160	47.160	ppb	0.29	500.00	
205 Tl	209	3	49.910	49.910	ppb	0.43	200.00	
208 Pb	209	3	46.700	46.700	ppb	1.14	500.00	
232 Th	209	3	49.630	49.630	ppb	1.01	200.00	
238 U	209	3	50.040	50.040	ppb	1.26	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1077267	1.95	973727	110.6	59.5 - 120	
45 Sc	1	2783227	0.43	2490209	111.8	59.5 - 120	
45 Sc	2	653399	0.70	595752	109.7	59.5 - 120	
45 Sc	3	6748894	0.87	6201481	108.8	59.5 - 120	
72 Ge	1	842060	1.16	755907	111.4	59.5 - 120	
72 Ge	2	321064	0.52	293685	109.3	59.5 - 120	
72 Ge	3	1581567	1.62	1450449	109.0	59.5 - 120	
74 Ge	1	1182914	0.90	1070347	110.5	59.5 - 120	
74 Ge	2	466904	0.46	430776	108.4	59.5 - 120	
74 Ge	3	2160868	1.03	1984674	108.9	59.5 - 120	
115 In	1	4019535	0.78	3596183	111.8	59.5 - 120	
115 In	2	1309500	0.60	1187034	110.3	59.5 - 120	
115 In	3	4993336	0.19	4498589	111.0	59.5 - 120	
159 Tb	3	6538871	0.41	5855025	111.7	59.5 - 120	
209 Bi	3	7112570	0.63	6279629	113.3	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\012SMPL.D\012SMPL.D#
Date Acquired: Sep 15 2016 10:27 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32649-01
Misc Info:
Vial Number: 3303
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-0.007	-0.007	ppb	107.17	200.00	
11 B	6	3	7.194	7.194	ppb	9.02	20.00	
27 Al	72	3	194.300	194.300	ppb	10.09	1000.00	
51 V	45	2	1.130	1.130	ppb	3.92	200.00	
52 Cr	45	2	0.100	0.100	ppb	11.90	200.00	
55 Mn	72	3	17.190	17.190	ppb	6.49	200.00	
56 Fe	45	1	379.900	379.900	ppb	0.68	1000.00	
59 Co	72	3	0.293	0.293	ppb	6.56	200.00	
60 Ni	45	2	0.046	0.046	ppb	6.67	500.00	
63 Cu	45	2	0.874	0.874	ppb	7.03	500.00	
66 Zn	72	3	0.797	0.797	ppb	15.52	1000.00	
75 As	45	2	0.160	0.160	ppb	18.78	200.00	
78 Se	45	1	0.093	0.093	ppb	15.84	500.00	
98 Mo	115	3	0.182	0.182	ppb	7.44	200.00	
107 Ag	115	3	0.001	0.001	ppb	136.08	50.00	
111 Cd	115	3	-0.008	-0.008	ppb	87.11	200.00	
118 Sn	115	3	0.021	0.021	ppb	36.23	200.00	
121 Sb	115	3	0.071	0.071	ppb	28.67	25.00	
125 Te	115	3	0.028	0.028	ppb	94.58	200.00	
133 Cs	115	3	0.011	0.011	ppb	35.92	200.00	
137 Ba	115	3	18.180	18.180	ppb	6.67	500.00	
205 Tl	209	3	0.017	0.017	ppb	37.66	200.00	
208 Pb	209	3	0.009	0.009	ppb	49.67	500.00	
232 Th	209	3	0.591	0.591	ppb	5.22	200.00	
238 U	209	3	0.003	0.003	ppb	118.18	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1041810	5.52	973727	107.0	59.5 - 120	
45 Sc	1	2781051	0.57	2490209	111.7	59.5 - 120	
45 Sc	2	651565	0.99	595752	109.4	59.5 - 120	
45 Sc	3	6659063	3.25	6201481	107.4	59.5 - 120	
72 Ge	1	845519	0.67	755907	111.9	59.5 - 120	
72 Ge	2	320741	0.65	293685	109.2	59.5 - 120	
72 Ge	3	1551780	5.15	1450449	107.0	59.5 - 120	
74 Ge	1	1188602	0.58	1070347	111.0	59.5 - 120	
74 Ge	2	466838	0.66	430776	108.4	59.5 - 120	
74 Ge	3	2119812	4.46	1984674	106.8	59.5 - 120	
115 In	1	4012992	0.41	3596183	111.6	59.5 - 120	
115 In	2	1313341	0.68	1187034	110.6	59.5 - 120	
115 In	3	4869185	5.29	4498589	108.2	59.5 - 120	
159 Tb	3	6345374	5.59	5855025	108.4	59.5 - 120	
209 Bi	3	6944689	5.68	6279629	110.6	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\013SMPL.D\013SMPL.D#
Date Acquired: Sep 15 2016 10:30 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32649-02
Misc Info:
Vial Number: 3304
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-0.009	-0.009	ppb	54.99	200.00	
11 B	6	3	8.349	8.349	ppb	2.39	20.00	
27 Al	72	3	93.750	93.750	ppb	2.92	1000.00	
51 V	45	2	0.204	0.204	ppb	14.50	200.00	
52 Cr	45	2	0.117	0.117	ppb	12.12	200.00	
55 Mn	72	3	11.570	11.570	ppb	0.59	200.00	
56 Fe	45	1	175.100	175.100	ppb	1.03	1000.00	
59 Co	72	3	0.077	0.077	ppb	0.47	200.00	
60 Ni	45	2	0.111	0.111	ppb	14.02	500.00	
63 Cu	45	2	0.235	0.235	ppb	4.79	500.00	
66 Zn	72	3	10.360	10.360	ppb	0.46	1000.00	
75 As	45	2	0.172	0.172	ppb	17.52	200.00	
78 Se	45	1	0.078	0.078	ppb	7.95	500.00	
98 Mo	115	3	0.016	0.016	ppb	48.04	200.00	
107 Ag	115	3	-0.004	-0.004	ppb	34.11	50.00	
111 Cd	115	3	-0.011	-0.011	ppb	69.73	200.00	
118 Sn	115	3	-0.055	-0.055	ppb	7.23	200.00	
121 Sb	115	3	0.041	0.041	ppb	23.25	25.00	
125 Te	115	3	0.011	0.011	ppb	400.56	200.00	
133 Cs	115	3	-0.004	-0.004	ppb	60.59	200.00	
137 Ba	115	3	37.840	37.840	ppb	0.47	500.00	
205 Tl	209	3	0.011	0.011	ppb	55.55	200.00	
208 Pb	209	3	0.013	0.013	ppb	50.23	500.00	
232 Th	209	3	0.247	0.247	ppb	3.59	200.00	
238 U	209	3	-0.012	-0.012	ppb	30.02	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1076256	0.85	973727	110.5	59.5 - 120	
45 Sc	1	2753749	0.37	2490209	110.6	59.5 - 120	
45 Sc	2	654778	1.77	595752	109.9	59.5 - 120	
45 Sc	3	6828951	1.39	6201481	110.1	59.5 - 120	
72 Ge	1	833005	0.59	755907	110.2	59.5 - 120	
72 Ge	2	320001	1.63	293685	109.0	59.5 - 120	
72 Ge	3	1599479	0.61	1450449	110.3	59.5 - 120	
74 Ge	1	1184183	0.56	1070347	110.6	59.5 - 120	
74 Ge	2	470651	1.00	430776	109.3	59.5 - 120	
74 Ge	3	2191178	0.88	1984674	110.4	59.5 - 120	
115 In	1	3996655	1.35	3596183	111.1	59.5 - 120	
115 In	2	1316721	1.19	1187034	110.9	59.5 - 120	
115 In	3	5004326	0.90	4498589	111.2	59.5 - 120	
159 Tb	3	6590051	0.44	5855025	112.6	59.5 - 120	
209 Bi	3	7183078	1.05	6279629	114.4	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\014SMPL.D\014SMPL.D#
Date Acquired: Sep 15 2016 10:34 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32649-03
Misc Info:
Vial Number: 3305
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-0.024	-0.024	ppb	16.81	200.00	
11 B	6	3	7.748	7.748	ppb	2.05	20.00	
27 Al	72	3	155.400	155.400	ppb	1.92	1000.00	
51 V	45	2	0.562	0.562	ppb	3.76	200.00	
52 Cr	45	2	0.085	0.085	ppb	18.84	200.00	
55 Mn	72	3	17.570	17.570	ppb	0.62	200.00	
56 Fe	45	1	293.500	293.500	ppb	2.56	1000.00	
59 Co	72	3	0.073	0.073	ppb	7.50	200.00	
60 Ni	45	2	0.017	0.017	ppb	13.94	500.00	
63 Cu	45	2	-0.047	-0.047	ppb	58.43	500.00	
66 Zn	72	3	7.462	7.462	ppb	2.39	1000.00	
75 As	45	2	0.373	0.373	ppb	13.08	200.00	
78 Se	45	1	0.062	0.062	ppb	7.11	500.00	
98 Mo	115	3	0.060	0.060	ppb	19.27	200.00	
107 Ag	115	3	-0.003	-0.003	ppb	27.08	50.00	
111 Cd	115	3	-0.013	-0.013	ppb	40.85	200.00	
118 Sn	115	3	-0.060	-0.060	ppb	9.16	200.00	
121 Sb	115	3	0.032	0.032	ppb	15.23	25.00	
125 Te	115	3	-0.022	-0.022	ppb	113.19	200.00	
133 Cs	115	3	-0.007	-0.007	ppb	7.78	200.00	
137 Ba	115	3	48.250	48.250	ppb	0.95	500.00	
205 Tl	209	3	-0.007	-0.007	ppb	18.06	200.00	
208 Pb	209	3	-0.007	-0.007	ppb	44.33	500.00	
232 Th	209	3	0.115	0.115	ppb	5.65	200.00	
238 U	209	3	-0.018	-0.018	ppb	8.46	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1072388	0.86	973727	110.1	59.5 - 120	
45 Sc	1	2739986	0.12	2490209	110.0	59.5 - 120	
45 Sc	2	650845	1.15	595752	109.2	59.5 - 120	
45 Sc	3	6751563	0.46	6201481	108.9	59.5 - 120	
72 Ge	1	821761	1.43	755907	108.7	59.5 - 120	
72 Ge	2	319840	1.34	293685	108.9	59.5 - 120	
72 Ge	3	1580137	1.02	1450449	108.9	59.5 - 120	
74 Ge	1	1171456	0.70	1070347	109.4	59.5 - 120	
74 Ge	2	467341	1.59	430776	108.5	59.5 - 120	
74 Ge	3	2160670	0.97	1984674	108.9	59.5 - 120	
115 In	1	3972265	1.04	3596183	110.5	59.5 - 120	
115 In	2	1303521	1.43	1187034	109.8	59.5 - 120	
115 In	3	4971906	0.67	4498589	110.5	59.5 - 120	
159 Tb	3	6521901	0.39	5855025	111.4	59.5 - 120	
209 Bi	3	7130933	1.27	6279629	113.6	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\015SMPL.D\015SMPL.D#
Date Acquired: Sep 15 2016 10:37 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32649-04
Misc Info:
Vial Number: 3306
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-0.029	-0.029	ppb	22.19	200.00	
11 B	6	3	6.078	6.078	ppb	3.99	20.00	
27 Al	72	3	21.550	21.550	ppb	2.31	1000.00	
51 V	45	2	0.535	0.535	ppb	5.66	200.00	
52 Cr	45	2	0.162	0.162	ppb	5.48	200.00	
55 Mn	72	3	13.210	13.210	ppb	1.00	200.00	
56 Fe	45	1	121.200	121.200	ppb	0.53	1000.00	
59 Co	72	3	0.063	0.063	ppb	5.37	200.00	
60 Ni	45	2	-0.016	-0.016	ppb	14.49	500.00	
63 Cu	45	2	0.454	0.454	ppb	10.49	500.00	
66 Zn	72	3	3.523	3.523	ppb	1.68	1000.00	
75 As	45	2	0.091	0.091	ppb	71.32	200.00	
78 Se	45	1	0.057	0.057	ppb	21.78	500.00	
98 Mo	115	3	0.429	0.429	ppb	3.83	200.00	
107 Ag	115	3	-0.003	-0.003	ppb	14.82	50.00	
111 Cd	115	3	-0.003	-0.003	ppb	106.37	200.00	
118 Sn	115	3	-0.075	-0.075	ppb	2.57	200.00	
121 Sb	115	3	0.031	0.031	ppb	39.38	25.00	
125 Te	115	3	-0.031	-0.031	ppb	58.57	200.00	
133 Cs	115	3	-0.009	-0.009	ppb	31.23	200.00	
137 Ba	115	3	22.650	22.650	ppb	0.40	500.00	
205 Tl	209	3	-0.012	-0.012	ppb	8.27	200.00	
208 Pb	209	3	-0.024	-0.024	ppb	13.63	500.00	
232 Th	209	3	0.046	0.046	ppb	15.48	200.00	
238 U	209	3	-0.018	-0.018	ppb	6.49	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1064705	2.57	973727	109.3	59.5 - 120	
45 Sc	1	2724494	0.70	2490209	109.4	59.5 - 120	
45 Sc	2	644477	0.74	595752	108.2	59.5 - 120	
45 Sc	3	6710946	0.55	6201481	108.2	59.5 - 120	
72 Ge	1	831785	0.69	755907	110.0	59.5 - 120	
72 Ge	2	318359	1.12	293685	108.4	59.5 - 120	
72 Ge	3	1583295	0.69	1450449	109.2	59.5 - 120	
74 Ge	1	1165176	0.50	1070347	108.9	59.5 - 120	
74 Ge	2	467558	1.12	430776	108.5	59.5 - 120	
74 Ge	3	2152709	0.74	1984674	108.5	59.5 - 120	
115 In	1	3952433	0.19	3596183	109.9	59.5 - 120	
115 In	2	1295979	1.42	1187034	109.2	59.5 - 120	
115 In	3	4989687	0.10	4498589	110.9	59.5 - 120	
159 Tb	3	6438926	0.06	5855025	110.0	59.5 - 120	
209 Bi	3	7072057	0.51	6279629	112.6	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\016SMPL.D\016SMPL.D#
Date Acquired: Sep 15 2016 10:40 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32649-05
Misc Info:
Vial Number: 3307
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-0.032	-0.032	ppb	16.50	200.00	
11 B	6	3	5.602	5.602	ppb	3.07	20.00	
27 Al	72	3	43.920	43.920	ppb	0.55	1000.00	
51 V	45	2	0.920	0.920	ppb	2.95	200.00	
52 Cr	45	2	0.099	0.099	ppb	22.29	200.00	
55 Mn	72	3	17.860	17.860	ppb	0.32	200.00	
56 Fe	45	1	287.600	287.600	ppb	0.90	1000.00	
59 Co	72	3	0.617	0.617	ppb	1.52	200.00	
60 Ni	45	2	-0.011	-0.011	ppb	74.12	500.00	
63 Cu	45	2	0.226	0.226	ppb	8.59	500.00	
66 Zn	72	3	2.859	2.859	ppb	2.82	1000.00	
75 As	45	2	0.132	0.132	ppb	23.23	200.00	
78 Se	45	1	0.013	0.013	ppb	17.68	500.00	
98 Mo	115	3	0.261	0.261	ppb	1.02	200.00	
107 Ag	115	3	-0.003	-0.003	ppb	44.83	50.00	
111 Cd	115	3	-0.019	-0.019	ppb	48.33	200.00	
118 Sn	115	3	-0.087	-0.087	ppb	9.37	200.00	
121 Sb	115	3	0.035	0.035	ppb	5.53	25.00	
125 Te	115	3	-0.031	-0.031	ppb	8.41	200.00	
133 Cs	115	3	-0.013	-0.013	ppb	9.35	200.00	
137 Ba	115	3	21.340	21.340	ppb	0.31	500.00	
205 Tl	209	3	-0.012	-0.012	ppb	7.03	200.00	
208 Pb	209	3	0.043	0.043	ppb	6.24	500.00	
232 Th	209	3	0.001	0.001	ppb	337.79	200.00	
238 U	209	3	-0.021	-0.021	ppb	3.46	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1042301	3.02	973727	107.0	59.5 - 120	
45 Sc	1	2674335	0.50	2490209	107.4	59.5 - 120	
45 Sc	2	633639	0.97	595752	106.4	59.5 - 120	
45 Sc	3	6577094	2.17	6201481	106.1	59.5 - 120	
72 Ge	1	804852	1.28	755907	106.5	59.5 - 120	
72 Ge	2	312461	1.33	293685	106.4	59.5 - 120	
72 Ge	3	1555584	1.78	1450449	107.2	59.5 - 120	
74 Ge	1	1145191	0.26	1070347	107.0	59.5 - 120	
74 Ge	2	452660	1.36	430776	105.1	59.5 - 120	
74 Ge	3	2109492	1.64	1984674	106.3	59.5 - 120	
115 In	1	3856998	0.30	3596183	107.3	59.5 - 120	
115 In	2	1261485	1.36	1187034	106.3	59.5 - 120	
115 In	3	4857230	1.22	4498589	108.0	59.5 - 120	
159 Tb	3	6358869	0.30	5855025	108.6	59.5 - 120	
209 Bi	3	7033688	0.88	6279629	112.0	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\017SMPL.D\017SMPL.D#
Date Acquired: Sep 15 2016 10:43 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32649-05LFM
Misc Info:
Vial Number: 3308
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	47.010	47.010	ppb	1.32	200.00	
11 B	6	3	14.780	14.780	ppb	0.25	20.00	
27 Al	72	3	105.400	105.400	ppb	0.67	1000.00	
51 V	45	2	49.230	49.230	ppb	0.79	200.00	
52 Cr	45	2	47.750	47.750	ppb	0.95	200.00	
55 Mn	72	3	66.680	66.680	ppb	0.89	200.00	
56 Fe	45	1	335.800	335.800	ppb	0.61	1000.00	
59 Co	72	3	50.500	50.500	ppb	0.24	200.00	
60 Ni	45	2	46.300	46.300	ppb	1.21	500.00	
63 Cu	45	2	47.130	47.130	ppb	0.85	500.00	
66 Zn	72	3	50.040	50.040	ppb	0.99	1000.00	
75 As	45	2	50.750	50.750	ppb	0.82	200.00	
78 Se	45	1	46.940	46.940	ppb	0.61	500.00	
98 Mo	115	3	45.620	45.620	ppb	0.23	200.00	
107 Ag	115	3	9.205	9.205	ppb	0.73	50.00	
111 Cd	115	3	46.190	46.190	ppb	1.17	200.00	
118 Sn	115	3	46.090	46.090	ppb	0.76	200.00	
121 Sb	115	3	10.450	10.450	ppb	0.95	25.00	
125 Te	115	3	47.630	47.630	ppb	2.36	200.00	
133 Cs	115	3	47.780	47.780	ppb	1.15	200.00	
137 Ba	115	3	67.690	67.690	ppb	0.57	500.00	
205 Tl	209	3	49.380	49.380	ppb	0.54	200.00	
208 Pb	209	3	46.460	46.460	ppb	1.04	500.00	
232 Th	209	3	49.480	49.480	ppb	0.49	200.00	
238 U	209	3	50.170	50.170	ppb	0.85	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1050909	2.92	973727	107.9	59.5 - 120	
45 Sc	1	2665748	0.88	2490209	107.0	59.5 - 120	
45 Sc	2	632929	0.88	595752	106.2	59.5 - 120	
45 Sc	3	6650603	1.14	6201481	107.2	59.5 - 120	
72 Ge	1	806233	2.03	755907	106.7	59.5 - 120	
72 Ge	2	310243	1.30	293685	105.6	59.5 - 120	
72 Ge	3	1551527	1.43	1450449	107.0	59.5 - 120	
74 Ge	1	1136797	1.27	1070347	106.2	59.5 - 120	
74 Ge	2	454839	1.19	430776	105.6	59.5 - 120	
74 Ge	3	2126041	1.32	1984674	107.1	59.5 - 120	
115 In	1	3871411	1.20	3596183	107.7	59.5 - 120	
115 In	2	1275951	1.36	1187034	107.5	59.5 - 120	
115 In	3	4938346	1.04	4498589	109.8	59.5 - 120	
159 Tb	3	6418232	0.70	5855025	109.6	59.5 - 120	
209 Bi	3	7071979	0.57	6279629	112.6	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\018SMPL.D\018SMPL.D#
Date Acquired: Sep 15 2016 10:46 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32649-05LFMD
Misc Info:
Vial Number: 3309
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	46.900	46.900	ppb	1.47	200.00	
11 B	6	3	14.800	14.800	ppb	0.82	20.00	
27 Al	72	3	94.400	94.400	ppb	2.48	1000.00	
51 V	45	2	48.830	48.830	ppb	0.23	200.00	
52 Cr	45	2	47.680	47.680	ppb	0.76	200.00	
55 Mn	72	3	66.320	66.320	ppb	0.60	200.00	
56 Fe	45	1	330.700	330.700	ppb	0.43	1000.00	
59 Co	72	3	50.090	50.090	ppb	0.21	200.00	
60 Ni	45	2	46.700	46.700	ppb	0.18	500.00	
63 Cu	45	2	47.160	47.160	ppb	0.28	500.00	
66 Zn	72	3	49.320	49.320	ppb	0.45	1000.00	
75 As	45	2	50.150	50.150	ppb	0.58	200.00	
78 Se	45	1	46.710	46.710	ppb	0.82	500.00	
98 Mo	115	3	45.720	45.720	ppb	0.89	200.00	
107 Ag	115	3	9.222	9.222	ppb	1.57	50.00	
111 Cd	115	3	46.170	46.170	ppb	0.58	200.00	
118 Sn	115	3	46.210	46.210	ppb	1.27	200.00	
121 Sb	115	3	10.430	10.430	ppb	1.17	25.00	
125 Te	115	3	47.960	47.960	ppb	2.09	200.00	
133 Cs	115	3	48.150	48.150	ppb	1.41	200.00	
137 Ba	115	3	68.110	68.110	ppb	1.15	500.00	
205 Tl	209	3	49.490	49.490	ppb	0.38	200.00	
208 Pb	209	3	46.690	46.690	ppb	1.23	500.00	
232 Th	209	3	50.150	50.150	ppb	0.12	200.00	
238 U	209	3	50.390	50.390	ppb	0.27	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1070022	2.06	973727	109.9	59.5 - 120	
45 Sc	1	2731492	0.61	2490209	109.7	59.5 - 120	
45 Sc	2	645638	0.49	595752	108.4	59.5 - 120	
45 Sc	3	6725492	0.94	6201481	108.4	59.5 - 120	
72 Ge	1	820949	2.41	755907	108.6	59.5 - 120	
72 Ge	2	315929	0.60	293685	107.6	59.5 - 120	
72 Ge	3	1583995	0.42	1450449	109.2	59.5 - 120	
74 Ge	1	1168989	0.39	1070347	109.2	59.5 - 120	
74 Ge	2	462369	0.93	430776	107.3	59.5 - 120	
74 Ge	3	2150092	0.47	1984674	108.3	59.5 - 120	
115 In	1	3948133	1.51	3596183	109.8	59.5 - 120	
115 In	2	1297774	0.65	1187034	109.3	59.5 - 120	
115 In	3	4991346	1.01	4498589	111.0	59.5 - 120	
159 Tb	3	6515028	0.29	5855025	111.3	59.5 - 120	
209 Bi	3	7174991	0.37	6279629	114.3	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Continuing Calibration Verification (CCV) QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\019_CCV.D\019_CCV.D#
Date Acquired: Sep 15 2016 10:49 pm
Operator:
Sample Name: CCV
Misc Info:
Vial Number: 1105
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal Update: Sep 15 2016 10:13 pm
Sample Type: CCV
Total Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc. ppb	RSD(%)	Expected	Rec(%)	QC Range(%)	Flag
9 Be	6	3	94.410	0.70	100.00	94.4	89 - 110	
11 B	6	3	9.875	2.45	10.00	98.8	89 - 110	
27 Al	72	3	504.300	0.45	500.00	100.9	89 - 110	
51 V	45	2	99.080	0.36	100.00	99.1	89 - 110	
52 Cr	45	2	98.090	0.15	100.00	98.1	89 - 110	
55 Mn	72	3	99.470	0.61	100.00	99.5	89 - 110	
56 Fe	45	1	497.500	0.58	500.00	99.5	89 - 110	
59 Co	72	3	100.500	0.90	100.00	100.5	89 - 110	
60 Ni	45	2	242.200	0.51	250.00	96.9	89 - 110	
63 Cu	45	2	252.100	0.90	250.00	100.8	89 - 110	
66 Zn	72	3	503.900	0.62	500.00	100.8	89 - 110	
75 As	45	2	98.850	0.59	100.00	98.9	89 - 110	
78 Se	45	1	250.400	0.48	250.00	100.2	89 - 110	
98 Mo	115	3	98.860	0.51	100.00	98.9	89 - 110	
107 Ag	115	3	24.300	0.39	25.00	97.2	89 - 110	
111 Cd	115	3	98.830	0.40	100.00	98.8	89 - 110	
118 Sn	115	3	100.100	0.89	100.00	100.1	89 - 110	
121 Sb	115	3	12.180	0.86	12.50	97.4	89 - 110	
125 Te	115	3	99.600	0.53	100.00	99.6	89 - 110	
133 Cs	115	3	99.150	0.69	100.00	99.2	89 - 110	
137 Ba	115	3	252.400	1.33	250.00	101.0	89 - 110	
205 Tl	209	3	101.600	0.16	100.00	101.6	89 - 110	
208 Pb	209	3	250.600	0.25	250.00	100.2	89 - 110	
232 Th	209	3	101.700	0.44	100.00	101.7	89 - 110	
238 U	209	3	102.500	0.75	100.00	102.5	89 - 110	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1076636	2.41	973727	110.6	60 - 120	
45 Sc	1	2715193	0.56	2490209	109.0	60 - 120	
45 Sc	2	641723	0.86	595752	107.7	60 - 120	
45 Sc	3	6706265	0.94	6201481	108.1	60 - 120	
72 Ge	1	810541	1.53	755907	107.2	60 - 120	
72 Ge	2	312215	0.05	293685	106.3	60 - 120	
72 Ge	3	1568730	0.92	1450449	108.2	60 - 120	
74 Ge	1	1149558	1.06	1070347	107.4	60 - 120	
74 Ge	2	457449	0.54	430776	106.2	60 - 120	
74 Ge	3	2140871	0.50	1984674	107.9	60 - 120	
115 In	1	3891977	0.98	3596183	108.2	60 - 120	
115 In	2	1290048	0.80	1187034	108.7	60 - 120	
115 In	3	4951678	0.22	4498589	110.1	60 - 120	
159 Tb	3	6534543	0.84	5855025	111.6	60 - 120	
209 Bi	3	7114381	0.50	6279629	113.3	60 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Continuing Calibration Blank (CCB) QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\020_CCB.D\020_CCB.D#
Date Acquired: Sep 15 2016 10:52 pm
Operator:
Sample Name: CCB
Misc Info:
Vial Number: 1102
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal Update: Sep 15 2016 10:13 pm
Sample Type: CCB
Total Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc.	RSD(%)	High Limit	Flag
9 Be	6	3	0.026 ppb	35.80	0.150	
11 B	6	3	-0.015 ppb	359.79	1.500	
27 Al	72	3	0.014 ppb	282.40	3.000	
51 V	45	2	0.037 ppb	87.33	0.600	
52 Cr	45	2	0.005 ppb	328.86	1.500	
55 Mn	72	3	-0.069 ppb	7.86	1.500	
56 Fe	45	1	-0.084 ppb	51.81	12.000	
59 Co	72	3	0.025 ppb	8.63	0.150	
60 Ni	45	2	0.073 ppb	20.53	1.800	
63 Cu	45	2	-0.234 ppb	6.38	1.500	
66 Zn	72	3	-0.026 ppb	150.73	6.000	
75 As	45	2	0.123 ppb	10.81	0.600	
78 Se	45	1	0.173 ppb	18.00	0.300	
98 Mo	115	3	0.034 ppb	4.94	1.500	
107 Ag	115	3	0.006 ppb	25.08	0.150	
111 Cd	115	3	0.018 ppb	16.88	0.300	
118 Sn	115	3	0.149 ppb	10.65	0.300	
121 Sb	115	3	0.330 ppb	1.31	1.200	
125 Te	115	3	0.086 ppb	17.25	3.000	
133 Cs	115	3	0.026 ppb	11.76	0.600	
137 Ba	115	3	0.059 ppb	24.45	1.500	
205 Tl	209	3	0.042 ppb	3.93	0.300	
208 Pb	209	3	0.059 ppb	21.08	0.300	
232 Th	209	3	0.918 ppb	8.53	3.000	
238 U	209	3	0.042 ppb	2.19	0.300	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1095881	0.94	973727	112.5	60 - 120	
45 Sc	1	2739942	0.95	2490209	110.0	60 - 120	
45 Sc	2	651006	1.03	595752	109.3	60 - 120	
45 Sc	3	6747014	0.75	6201481	108.8	60 - 120	
72 Ge	1	823180	0.94	755907	108.9	60 - 120	
72 Ge	2	318952	1.05	293685	108.6	60 - 120	
72 Ge	3	1581005	0.21	1450449	109.0	60 - 120	
74 Ge	1	1162741	0.87	1070347	108.6	60 - 120	
74 Ge	2	462067	0.32	430776	107.3	60 - 120	
74 Ge	3	2158476	0.56	1984674	108.8	60 - 120	
115 In	1	3965159	0.05	3596183	110.3	60 - 120	
115 In	2	1302235	0.69	1187034	109.7	60 - 120	
115 In	3	5064906	0.99	4498589	112.6	60 - 120	
159 Tb	3	6617148	0.64	5855025	113.0	60 - 120	
209 Bi	3	7237245	1.28	6279629	115.2	60 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\021SMPL.D\021SMPL.D#
Date Acquired: Sep 15 2016 10:55 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32649-06
Misc Info:
Vial Number: 3310
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-0.012	-0.012	ppb	57.93	200.00	
11 B	6	3	5.884	5.884	ppb	5.19	20.00	
27 Al	72	3	118.800	118.800	ppb	1.55	1000.00	
51 V	45	2	0.772	0.772	ppb	2.16	200.00	
52 Cr	45	2	0.095	0.095	ppb	12.43	200.00	
55 Mn	72	3	14.640	14.640	ppb	1.02	200.00	
56 Fe	45	1	260.900	260.900	ppb	0.69	1000.00	
59 Co	72	3	0.173	0.173	ppb	4.66	200.00	
60 Ni	45	2	0.038	0.038	ppb	16.47	500.00	
63 Cu	45	2	0.366	0.366	ppb	5.81	500.00	
66 Zn	72	3	2.562	2.562	ppb	1.46	1000.00	
75 As	45	2	0.118	0.118	ppb	25.51	200.00	
78 Se	45	1	0.056	0.056	ppb	12.91	500.00	
98 Mo	115	3	0.059	0.059	ppb	17.07	200.00	
107 Ag	115	3	-0.001	-0.001	ppb	115.83	50.00	
111 Cd	115	3	-0.009	-0.009	ppb	59.51	200.00	
118 Sn	115	3	-0.022	-0.022	ppb	8.66	200.00	
121 Sb	115	3	0.082	0.082	ppb	5.03	25.00	
125 Te	115	3	0.003	0.003	ppb	522.71	200.00	
133 Cs	115	3	-0.006	-0.006	ppb	28.39	200.00	
137 Ba	115	3	15.960	15.960	ppb	1.80	500.00	
205 Tl	209	3	-0.004	-0.004	ppb	33.75	200.00	
208 Pb	209	3	0.017	0.017	ppb	9.04	500.00	
232 Th	209	3	0.325	0.325	ppb	7.00	200.00	
238 U	209	3	-0.009	-0.009	ppb	21.44	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1095951	2.35	973727	112.6	59.5 - 120	
45 Sc	1	2751771	1.05	2490209	110.5	59.5 - 120	
45 Sc	2	654521	0.73	595752	109.9	59.5 - 120	
45 Sc	3	6836894	1.05	6201481	110.2	59.5 - 120	
72 Ge	1	833190	1.06	755907	110.2	59.5 - 120	
72 Ge	2	324965	0.68	293685	110.7	59.5 - 120	
72 Ge	3	1598444	0.56	1450449	110.2	59.5 - 120	
74 Ge	1	1177753	1.14	1070347	110.0	59.5 - 120	
74 Ge	2	476767	0.39	430776	110.7	59.5 - 120	
74 Ge	3	2179740	0.48	1984674	109.8	59.5 - 120	
115 In	1	4027860	1.04	3596183	112.0	59.5 - 120	
115 In	2	1323481	0.62	1187034	111.5	59.5 - 120	
115 In	3	5037160	0.78	4498589	112.0	59.5 - 120	
159 Tb	3	6632496	0.43	5855025	113.3	59.5 - 120	
209 Bi	3	7298632	0.23	6279629	116.2	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\022SMPL.D\022SMPL.D#
Date Acquired: Sep 15 2016 10:59 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32730-01
Misc Info:
Vial Number: 3311
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	0.984	0.984	ppb	1.94	200.00	
11 B	6	3	23.480	23.480	ppb	1.31	20.00	OCAL
27 Al	72	3	22,240.000	22240.000	ppb	1.50	1000.00	OCAL
51 V	45	2	30.310	30.310	ppb	1.84	200.00	
52 Cr	45	2	17.420	17.420	ppb	1.85	200.00	
55 Mn	72	3	189.300	189.300	ppb	0.42	200.00	
56 Fe	45	1	14,050.000	14050.000	ppb	0.17	1000.00	OCAL
59 Co	72	3	6.086	6.086	ppb	0.42	200.00	
60 Ni	45	2	15.260	15.260	ppb	2.28	500.00	
63 Cu	45	2	294.400	294.400	ppb	1.69	500.00	
66 Zn	72	3	65.240	65.240	ppb	0.42	1000.00	
75 As	45	2	6.860	6.860	ppb	3.14	200.00	
78 Se	45	1	0.640	0.640	ppb	3.94	500.00	
98 Mo	115	3	3.246	3.246	ppb	1.38	200.00	
107 Ag	115	3	0.135	0.135	ppb	3.30	50.00	
111 Cd	115	3	0.273	0.273	ppb	5.11	200.00	
118 Sn	115	3	0.794	0.794	ppb	2.11	200.00	
121 Sb	115	3	0.326	0.326	ppb	3.05	25.00	
125 Te	115	3	0.128	0.128	ppb	17.63	200.00	
133 Cs	115	3	2.299	2.299	ppb	1.92	200.00	
137 Ba	115	3	153.200	153.200	ppb	1.25	500.00	
205 Tl	209	3	0.126	0.126	ppb	2.24	200.00	
208 Pb	209	3	14.180	14.180	ppb	0.59	500.00	
232 Th	209	3	3.328	3.328	ppb	1.51	200.00	
238 U	209	3	0.339	0.339	ppb	1.31	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1081360	1.55	973727	111.1	59.5 - 120	
45 Sc	1	2842149	0.33	2490209	114.1	59.5 - 120	
45 Sc	2	679861	2.62	595752	114.1	59.5 - 120	
45 Sc	3	7187493	1.42	6201481	115.9	59.5 - 120	
72 Ge	1	836098	0.92	755907	110.6	59.5 - 120	
72 Ge	2	322473	0.89	293685	109.8	59.5 - 120	
72 Ge	3	1603379	0.40	1450449	110.5	59.5 - 120	
74 Ge	1	1173260	0.60	1070347	109.6	59.5 - 120	
74 Ge	2	468579	0.65	430776	108.8	59.5 - 120	
74 Ge	3	2189797	0.24	1984674	110.3	59.5 - 120	
115 In	1	3950940	0.16	3596183	109.9	59.5 - 120	
115 In	2	1313961	0.20	1187034	110.7	59.5 - 120	
115 In	3	5030948	1.14	4498589	111.8	59.5 - 120	
159 Tb	3	6648891	0.30	5855025	113.6	59.5 - 120	
209 Bi	3	7203068	0.83	6279629	114.7	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

3 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\023SMPL.D\023SMPL.D#
Date Acquired: Sep 15 2016 11:02 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32730-02
Misc Info:
Vial Number: 3312
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 5.00
Autodil Factor: Undiluted
Final Dil Factor: 5.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	7.670	1.534	ppb	1.92	200.00	
11 B	6	3	30.150	6.030	ppb	1.09	20.00	
27 Al	72	3	85,600.000	17120.000	ppb	1.22	1000.00	OCAL
51 V	45	2	125.350	25.070	ppb	0.52	200.00	
52 Cr	45	2	63.250	12.650	ppb	0.84	200.00	
55 Mn	72	3	1,253.000	250.600	ppb	0.41	200.00	OCAL
56 Fe	45	1	68,050.000	13610.000	ppb	0.71	1000.00	OCAL
59 Co	72	3	30.860	6.172	ppb	0.78	200.00	
60 Ni	45	2	74.600	14.920	ppb	0.84	500.00	
63 Cu	45	2	1,756.500	351.300	ppb	0.19	500.00	
66 Zn	72	3	403.400	80.680	ppb	0.41	1000.00	
75 As	45	2	26.955	5.391	ppb	0.32	200.00	
78 Se	45	1	1.166	0.233	ppb	10.38	500.00	
98 Mo	115	3	13.895	2.779	ppb	0.62	200.00	
107 Ag	115	3	0.753	0.151	ppb	3.66	50.00	
111 Cd	115	3	0.937	0.187	ppb	2.60	200.00	
118 Sn	115	3	1.942	0.388	ppb	4.00	200.00	
121 Sb	115	3	0.591	0.118	ppb	4.65	25.00	
125 Te	115	3	0.582	0.116	ppb	20.83	200.00	
133 Cs	115	3	20.820	4.164	ppb	0.79	200.00	
137 Ba	115	3	621.000	124.200	ppb	0.89	500.00	
205 Tl	209	3	0.591	0.118	ppb	4.37	200.00	
208 Pb	209	3	64.700	12.940	ppb	1.98	500.00	
232 Th	209	3	21.760	4.352	ppb	1.11	200.00	
238 U	209	3	7.005	1.401	ppb	1.63	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1091398	1.94	973727	112.1	59.5 - 120	
45 Sc	1	2860819	0.54	2490209	114.9	59.5 - 120	
45 Sc	2	679498	0.90	595752	114.1	59.5 - 120	
45 Sc	3	7187958	1.19	6201481	115.9	59.5 - 120	
72 Ge	1	852628	0.81	755907	112.8	59.5 - 120	
72 Ge	2	324721	0.60	293685	110.6	59.5 - 120	
72 Ge	3	1634461	0.67	1450449	112.7	59.5 - 120	
74 Ge	1	1194238	0.50	1070347	111.6	59.5 - 120	
74 Ge	2	474684	0.62	430776	110.2	59.5 - 120	
74 Ge	3	2215105	0.73	1984674	111.6	59.5 - 120	
115 In	1	4031740	0.15	3596183	112.1	59.5 - 120	
115 In	2	1329263	1.03	1187034	112.0	59.5 - 120	
115 In	3	5113106	0.63	4498589	113.7	59.5 - 120	
159 Tb	3	6701133	0.90	5855025	114.5	59.5 - 120	
209 Bi	3	7262513	1.80	6279629	115.7	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

3 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\024SMPL.D\024SMPL.D#
Date Acquired: Sep 15 2016 11:05 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32752-07
Misc Info:
Vial Number: 3401
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 2.00
Autodil Factor: Undiluted
Final Dil Factor: 2.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-0.035	-0.017	ppb	48.17	200.00	
11 B	6	3	118.560	59.280	ppb	0.71	20.00	OCAL
27 Al	72	3	252.600	126.300	ppb	7.54	1000.00	
51 V	45	2	1.062	0.531	ppb	18.29	200.00	
52 Cr	45	2	0.340	0.170	ppb	7.45	200.00	
55 Mn	72	3	117.080	58.540	ppb	0.92	200.00	
56 Fe	45	1	528.600	264.300	ppb	0.31	1000.00	
59 Co	72	3	0.547	0.274	ppb	2.78	200.00	
60 Ni	45	2	1.042	0.521	ppb	6.76	500.00	
63 Cu	45	2	-0.481	-0.241	ppb	38.12	500.00	
66 Zn	72	3	2.450	1.225	ppb	4.36	1000.00	
75 As	45	2	0.954	0.477	ppb	5.63	200.00	
78 Se	45	1	0.382	0.191	ppb	9.24	500.00	
98 Mo	115	3	0.473	0.236	ppb	2.69	200.00	
107 Ag	115	3	0.000	0.000	ppb	3026.00	50.00	
111 Cd	115	3	-0.019	-0.010	ppb	57.35	200.00	
118 Sn	115	3	-0.191	-0.095	ppb	4.36	200.00	
121 Sb	115	3	0.072	0.036	ppb	5.97	25.00	
125 Te	115	3	-0.012	-0.006	ppb	315.35	200.00	
133 Cs	115	3	0.025	0.012	ppb	16.67	200.00	
137 Ba	115	3	73.400	36.700	ppb	1.12	500.00	
205 Tl	209	3	-0.020	-0.010	ppb	8.35	200.00	
208 Pb	209	3	0.176	0.088	ppb	2.31	500.00	
232 Th	209	3	0.215	0.107	ppb	7.50	200.00	
238 U	209	3	2.586	1.293	ppb	0.31	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1059346	1.63	973727	108.8	59.5 - 120	
45 Sc	1	2801785	0.32	2490209	112.5	59.5 - 120	
45 Sc	2	639982	4.64	595752	107.4	59.5 - 120	
45 Sc	3	6787561	0.93	6201481	109.5	59.5 - 120	
72 Ge	1	837969	1.31	755907	110.9	59.5 - 120	
72 Ge	2	313563	4.07	293685	106.8	59.5 - 120	
72 Ge	3	1589233	0.25	1450449	109.6	59.5 - 120	
74 Ge	1	1177856	0.11	1070347	110.0	59.5 - 120	
74 Ge	2	455129	4.00	430776	105.7	59.5 - 120	
74 Ge	3	2177417	0.17	1984674	109.7	59.5 - 120	
115 In	1	3888550	0.48	3596183	108.1	59.5 - 120	
115 In	2	1246474	5.64	1187034	105.0	59.5 - 120	
115 In	3	4945912	0.35	4498589	109.9	59.5 - 120	
159 Tb	3	6487184	0.44	5855025	110.8	59.5 - 120	
209 Bi	3	6815790	1.13	6279629	108.5	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

1 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\025SMPL.D\025SMPL.D#
Date Acquired: Sep 15 2016 11:08 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32752-08
Misc Info:
Vial Number: 3402
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-0.003	-0.003	ppb	109.28	200.00	
11 B	6	3	102.600	102.600	ppb	1.07	20.00	OCAL
27 Al	72	3	227.400	227.400	ppb	1.35	1000.00	
51 V	45	2	1.005	1.005	ppb	3.47	200.00	
52 Cr	45	2	0.306	0.306	ppb	6.07	200.00	
55 Mn	72	3	105.300	105.300	ppb	0.82	200.00	
56 Fe	45	1	495.100	495.100	ppb	0.34	1000.00	
59 Co	72	3	0.429	0.429	ppb	2.10	200.00	
60 Ni	45	2	0.991	0.991	ppb	1.83	500.00	
63 Cu	45	2	-0.043	-0.043	ppb	48.84	500.00	
66 Zn	72	3	2.123	2.123	ppb	3.84	1000.00	
75 As	45	2	0.754	0.754	ppb	9.08	200.00	
78 Se	45	1	0.640	0.640	ppb	1.33	500.00	
98 Mo	115	3	0.516	0.516	ppb	3.42	200.00	
107 Ag	115	3	0.002	0.002	ppb	25.26	50.00	
111 Cd	115	3	0.002	0.002	ppb	336.40	200.00	
118 Sn	115	3	-0.083	-0.083	ppb	8.59	200.00	
121 Sb	115	3	0.104	0.104	ppb	3.73	25.00	
125 Te	115	3	0.020	0.020	ppb	69.69	200.00	
133 Cs	115	3	0.056	0.056	ppb	11.56	200.00	
137 Ba	115	3	64.980	64.980	ppb	0.39	500.00	
205 Tl	209	3	0.002	0.002	ppb	103.79	200.00	
208 Pb	209	3	0.230	0.230	ppb	2.59	500.00	
232 Th	209	3	0.136	0.136	ppb	3.69	200.00	
238 U	209	3	3.378	3.378	ppb	1.15	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	1009040	1.60	973727	103.6	59.5 - 120	
45 Sc	1	2652603	0.45	2490209	106.5	59.5 - 120	
45 Sc	2	627436	0.16	595752	105.3	59.5 - 120	
45 Sc	3	6387343	1.56	6201481	103.0	59.5 - 120	
72 Ge	1	779929	0.69	755907	103.2	59.5 - 120	
72 Ge	2	304666	0.43	293685	103.7	59.5 - 120	
72 Ge	3	1491881	1.31	1450449	102.9	59.5 - 120	
74 Ge	1	1127111	0.43	1070347	105.3	59.5 - 120	
74 Ge	2	444661	0.37	430776	103.2	59.5 - 120	
74 Ge	3	2030851	1.26	1984674	102.3	59.5 - 120	
115 In	1	3699586	1.26	3596183	102.9	59.5 - 120	
115 In	2	1217738	0.94	1187034	102.6	59.5 - 120	
115 In	3	4526684	0.92	4498589	100.6	59.5 - 120	
159 Tb	3	5995371	0.69	5855025	102.4	59.5 - 120	
209 Bi	3	6180514	0.81	6279629	98.4	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

1 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\026SMPL.D\026SMPL.D#
Date Acquired: Sep 15 2016 11:11 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32754-01
Misc Info:
Vial Number: 3403
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-0.009	-0.009	ppb	87.28	200.00	
11 B	6	3	51.180	51.180	ppb	2.72	20.00	OCAL
27 Al	72	3	24.430	24.430	ppb	1.71	1000.00	
51 V	45	2	0.568	0.568	ppb	2.15	200.00	
52 Cr	45	2	0.157	0.157	ppb	4.62	200.00	
55 Mn	72	3	704.100	704.100	ppb	0.50	200.00	OCAL
56 Fe	45	1	76.980	76.980	ppb	1.31	1000.00	
59 Co	72	3	0.659	0.659	ppb	0.96	200.00	
60 Ni	45	2	1.068	1.068	ppb	5.57	500.00	
63 Cu	45	2	0.560	0.560	ppb	3.94	500.00	
66 Zn	72	3	1.894	1.894	ppb	3.14	1000.00	
75 As	45	2	1.298	1.298	ppb	2.79	200.00	
78 Se	45	1	0.090	0.090	ppb	13.25	500.00	
98 Mo	115	3	2.049	2.049	ppb	1.30	200.00	
107 Ag	115	3	-0.001	-0.001	ppb	131.31	50.00	
111 Cd	115	3	-0.001	-0.001	ppb	557.02	200.00	
118 Sn	115	3	-0.102	-0.102	ppb	10.29	200.00	
121 Sb	115	3	0.047	0.047	ppb	24.73	25.00	
125 Te	115	3	0.036	0.036	ppb	85.76	200.00	
133 Cs	115	3	0.061	0.061	ppb	10.45	200.00	
137 Ba	115	3	23.270	23.270	ppb	0.94	500.00	
205 Tl	209	3	0.006	0.006	ppb	85.12	200.00	
208 Pb	209	3	0.011	0.011	ppb	91.38	500.00	
232 Th	209	3	0.042	0.042	ppb	13.52	200.00	
238 U	209	3	0.324	0.324	ppb	1.59	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	916801	2.72	973727	94.2	59.5 - 120	
45 Sc	1	2652370	0.69	2490209	106.5	59.5 - 120	
45 Sc	2	588214	1.34	595752	98.7	59.5 - 120	
45 Sc	3	6172927	1.61	6201481	99.5	59.5 - 120	
72 Ge	1	782412	1.17	755907	103.5	59.5 - 120	
72 Ge	2	289431	0.71	293685	98.6	59.5 - 120	
72 Ge	3	1442787	1.69	1450449	99.5	59.5 - 120	
74 Ge	1	1113858	0.69	1070347	104.1	59.5 - 120	
74 Ge	2	422853	1.78	430776	98.2	59.5 - 120	
74 Ge	3	1967230	1.77	1984674	99.1	59.5 - 120	
115 In	1	3699272	0.78	3596183	102.9	59.5 - 120	
115 In	2	1145225	2.91	1187034	96.5	59.5 - 120	
115 In	3	4360951	1.94	4498589	96.9	59.5 - 120	
159 Tb	3	5677956	2.78	5855025	97.0	59.5 - 120	
209 Bi	3	5745345	3.39	6279629	91.5	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

2 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\027SMPL.D\027SMPL.D#
Date Acquired: Sep 15 2016 11:14 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32754-02
Misc Info:
Vial Number: 3404
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-0.003	-0.003	ppb	365.49	200.00	
11 B	6	3	49.750	49.750	ppb	0.46	20.00	OCAL
27 Al	72	3	174.600	174.600	ppb	3.89	1000.00	
51 V	45	2	0.624	0.624	ppb	3.34	200.00	
52 Cr	45	2	0.339	0.339	ppb	9.52	200.00	
55 Mn	72	3	284.900	284.900	ppb	1.72	200.00	OCAL
56 Fe	45	1	162.000	162.000	ppb	0.87	1000.00	
59 Co	72	3	0.360	0.360	ppb	4.62	200.00	
60 Ni	45	2	0.604	0.604	ppb	3.37	500.00	
63 Cu	45	2	3.447	3.447	ppb	1.20	500.00	
66 Zn	72	3	2.121	2.121	ppb	1.80	1000.00	
75 As	45	2	0.977	0.977	ppb	1.16	200.00	
78 Se	45	1	0.066	0.066	ppb	11.53	500.00	
98 Mo	115	3	1.460	1.460	ppb	1.40	200.00	
107 Ag	115	3	0.001	0.001	ppb	66.74	50.00	
111 Cd	115	3	-0.005	-0.005	ppb	215.21	200.00	
118 Sn	115	3	-0.096	-0.096	ppb	2.96	200.00	
121 Sb	115	3	0.030	0.030	ppb	8.73	25.00	
125 Te	115	3	0.044	0.044	ppb	97.65	200.00	
133 Cs	115	3	0.123	0.123	ppb	3.49	200.00	
137 Ba	115	3	15.430	15.430	ppb	2.19	500.00	
205 Tl	209	3	-0.010	-0.010	ppb	10.61	200.00	
208 Pb	209	3	0.162	0.162	ppb	4.12	500.00	
232 Th	209	3	0.074	0.074	ppb	19.17	200.00	
238 U	209	3	0.018	0.018	ppb	12.44	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	691160	1.56	973727	71.0	59.5 - 120	
45 Sc	1	2152187	2.96	2490209	86.4	59.5 - 120	
45 Sc	2	530370	0.56	595752	89.0	59.5 - 120	
45 Sc	3	4869918	0.45	6201481	78.5	59.5 - 120	
72 Ge	1	642328	2.72	755907	85.0	59.5 - 120	
72 Ge	2	265536	1.19	293685	90.4	59.5 - 120	
72 Ge	3	1151585	0.71	1450449	79.4	59.5 - 120	
74 Ge	1	912096	3.02	1070347	85.2	59.5 - 120	
74 Ge	2	386317	1.67	430776	89.7	59.5 - 120	
74 Ge	3	1582688	1.41	1984674	79.7	59.5 - 120	
115 In	1	3010102	3.58	3596183	83.7	59.5 - 120	
115 In	2	1026127	2.40	1187034	86.4	59.5 - 120	
115 In	3	3417927	1.19	4498589	76.0	59.5 - 120	
159 Tb	3	4362711	1.77	5855025	74.5	59.5 - 120	
209 Bi	3	4382821	3.02	6279629	69.8	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

2 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\028SMPL.D\028SMPL.D#
Date Acquired: Sep 15 2016 11:18 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32754-03
Misc Info:
Vial Number: 3405
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-0.006	-0.006	ppb	158.55	200.00	
11 B	6	3	45.110	45.110	ppb	0.69	20.00	OCAL
27 Al	72	3	170.500	170.500	ppb	0.59	1000.00	
51 V	45	2	1.077	1.077	ppb	5.16	200.00	
52 Cr	45	2	1.159	1.159	ppb	2.50	200.00	
55 Mn	72	3	4.727	4.727	ppb	0.95	200.00	
56 Fe	45	1	174.900	174.900	ppb	0.22	1000.00	
59 Co	72	3	0.319	0.319	ppb	0.63	200.00	
60 Ni	45	2	0.515	0.515	ppb	1.14	500.00	
63 Cu	45	2	1.368	1.368	ppb	5.80	500.00	
66 Zn	72	3	2.136	2.136	ppb	4.65	1000.00	
75 As	45	2	0.382	0.382	ppb	9.19	200.00	
78 Se	45	1	0.120	0.120	ppb	22.58	500.00	
98 Mo	115	3	0.311	0.311	ppb	1.01	200.00	
107 Ag	115	3	0.001	0.001	ppb	98.42	50.00	
111 Cd	115	3	-0.001	-0.001	ppb	1705.30	200.00	
118 Sn	115	3	-0.110	-0.110	ppb	6.36	200.00	
121 Sb	115	3	0.024	0.024	ppb	27.16	25.00	
125 Te	115	3	0.032	0.032	ppb	147.53	200.00	
133 Cs	115	3	0.246	0.246	ppb	0.56	200.00	
137 Ba	115	3	5.042	5.042	ppb	1.38	500.00	
205 Tl	209	3	0.004	0.004	ppb	29.74	200.00	
208 Pb	209	3	0.186	0.186	ppb	6.54	500.00	
232 Th	209	3	-0.007	-0.007	ppb	134.18	200.00	
238 U	209	3	-0.017	-0.017	ppb	11.57	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	642399	1.45	973727	66.0	59.5 - 120	
45 Sc	1	1954230	2.45	2490209	78.5	59.5 - 120	
45 Sc	2	459004	2.13	595752	77.0	59.5 - 120	
45 Sc	3	4596121	1.13	6201481	74.1	59.5 - 120	
72 Ge	1	589766	2.86	755907	78.0	59.5 - 120	
72 Ge	2	228463	1.35	293685	77.8	59.5 - 120	
72 Ge	3	1103293	0.82	1450449	76.1	59.5 - 120	
74 Ge	1	847010	3.86	1070347	79.1	59.5 - 120	
74 Ge	2	333398	2.26	430776	77.4	59.5 - 120	
74 Ge	3	1496268	0.39	1984674	75.4	59.5 - 120	
115 In	1	2762376	2.34	3596183	76.8	59.5 - 120	
115 In	2	875411	2.21	1187034	73.7	59.5 - 120	
115 In	3	3240684	0.40	4498589	72.0	59.5 - 120	
159 Tb	3	4087372	0.54	5855025	69.8	59.5 - 120	
209 Bi	3	4043022	1.63	6279629	64.4	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

1 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\029SMPL.D\029SMPL.D#
Date Acquired: Sep 15 2016 11:21 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32754-03LFM
Misc Info:
Vial Number: 3406
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	52.050	52.050	ppb	2.00	200.00	
11 B	6	3	57.690	57.690	ppb	1.42	20.00	OCAL
27 Al	72	3	216.600	216.600	ppb	2.09	1000.00	
51 V	45	2	48.830	48.830	ppb	0.35	200.00	
52 Cr	45	2	46.370	46.370	ppb	0.54	200.00	
55 Mn	72	3	50.150	50.150	ppb	1.47	200.00	
56 Fe	45	1	209.800	209.800	ppb	2.22	1000.00	
59 Co	72	3	46.660	46.660	ppb	1.99	200.00	
60 Ni	45	2	44.130	44.130	ppb	0.71	500.00	
63 Cu	45	2	45.030	45.030	ppb	0.64	500.00	
66 Zn	72	3	50.290	50.290	ppb	0.96	1000.00	
75 As	45	2	59.000	59.000	ppb	1.17	200.00	
78 Se	45	1	49.370	49.370	ppb	2.20	500.00	
98 Mo	115	3	46.500	46.500	ppb	1.56	200.00	
107 Ag	115	3	8.836	8.836	ppb	2.49	50.00	
111 Cd	115	3	46.570	46.570	ppb	1.80	200.00	
118 Sn	115	3	45.160	45.160	ppb	1.71	200.00	
121 Sb	115	3	11.030	11.030	ppb	2.05	25.00	
125 Te	115	3	54.870	54.870	ppb	0.34	200.00	
133 Cs	115	3	46.980	46.980	ppb	2.89	200.00	
137 Ba	115	3	51.370	51.370	ppb	2.71	500.00	
205 Tl	209	3	46.160	46.160	ppb	0.65	200.00	
208 Pb	209	3	45.020	45.020	ppb	0.99	500.00	
232 Th	209	3	47.240	47.240	ppb	0.95	200.00	
238 U	209	3	46.850	46.850	ppb	0.25	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	661720	7.35	973727	68.0	59.5 - 120	
45 Sc	1	2076125	1.99	2490209	83.4	59.5 - 120	
45 Sc	2	492735	0.89	595752	82.7	59.5 - 120	
45 Sc	3	4907231	7.66	6201481	79.1	59.5 - 120	
72 Ge	1	615078	1.42	755907	81.4	59.5 - 120	
72 Ge	2	246120	0.13	293685	83.8	59.5 - 120	
72 Ge	3	1160270	7.45	1450449	80.0	59.5 - 120	
74 Ge	1	884074	1.46	1070347	82.6	59.5 - 120	
74 Ge	2	360444	0.93	430776	83.7	59.5 - 120	
74 Ge	3	1586634	8.01	1984674	79.9	59.5 - 120	
115 In	1	2891948	2.16	3596183	80.4	59.5 - 120	
115 In	2	946175	0.22	1187034	79.7	59.5 - 120	
115 In	3	3411075	8.32	4498589	75.8	59.5 - 120	
159 Tb	3	4293189	8.31	5855025	73.3	59.5 - 120	
209 Bi	3	4217023	7.58	6279629	67.2	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

1 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\030SMPL.D\030SMPL.D#
Date Acquired: Sep 15 2016 11:24 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32754-03LFMD
Misc Info:
Vial Number: 3407
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	49.650	49.650	ppb	4.40	200.00	
11 B	6	3	54.270	54.270	ppb	4.28	20.00	OCAL
27 Al	72	3	210.100	210.100	ppb	4.22	1000.00	
51 V	45	2	49.140	49.140	ppb	0.51	200.00	
52 Cr	45	2	46.780	46.780	ppb	1.07	200.00	
55 Mn	72	3	48.840	48.840	ppb	2.19	200.00	
56 Fe	45	1	205.000	205.000	ppb	1.50	1000.00	
59 Co	72	3	44.960	44.960	ppb	3.31	200.00	
60 Ni	45	2	44.330	44.330	ppb	1.16	500.00	
63 Cu	45	2	45.240	45.240	ppb	0.69	500.00	
66 Zn	72	3	48.150	48.150	ppb	3.01	1000.00	
75 As	45	2	58.140	58.140	ppb	1.20	200.00	
78 Se	45	1	49.170	49.170	ppb	0.46	500.00	
98 Mo	115	3	45.180	45.180	ppb	2.88	200.00	
107 Ag	115	3	8.547	8.547	ppb	3.19	50.00	
111 Cd	115	3	44.610	44.610	ppb	3.75	200.00	
118 Sn	115	3	43.740	43.740	ppb	3.51	200.00	
121 Sb	115	3	10.580	10.580	ppb	2.96	25.00	
125 Te	115	3	51.140	51.140	ppb	3.97	200.00	
133 Cs	115	3	45.670	45.670	ppb	2.87	200.00	
137 Ba	115	3	49.710	49.710	ppb	3.00	500.00	
205 Tl	209	3	45.140	45.140	ppb	2.70	200.00	
208 Pb	209	3	44.030	44.030	ppb	2.64	500.00	
232 Th	209	3	46.240	46.240	ppb	3.99	200.00	
238 U	209	3	45.580	45.580	ppb	5.40	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	649318	4.18	973727	66.7	59.5 - 120	
45 Sc	1	2064046	1.23	2490209	82.9	59.5 - 120	
45 Sc	2	467810	2.06	595752	78.5	59.5 - 120	
45 Sc	3	4767021	2.63	6201481	76.9	59.5 - 120	
72 Ge	1	615538	1.15	755907	81.4	59.5 - 120	
72 Ge	2	235151	2.39	293685	80.1	59.5 - 120	
72 Ge	3	1120512	4.12	1450449	77.3	59.5 - 120	
74 Ge	1	883837	0.67	1070347	82.6	59.5 - 120	
74 Ge	2	340822	1.87	430776	79.1	59.5 - 120	
74 Ge	3	1535034	3.85	1984674	77.3	59.5 - 120	
115 In	1	2880092	0.95	3596183	80.1	59.5 - 120	
115 In	2	884744	1.81	1187034	74.5	59.5 - 120	
115 In	3	3337568	3.89	4498589	74.2	59.5 - 120	
159 Tb	3	4227593	3.31	5855025	72.2	59.5 - 120	
209 Bi	3	4182239	4.17	6279629	66.6	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

1 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Continuing Calibration Verification (CCV) QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\031_CCV.D\031_CCV.D#
Date Acquired: Sep 15 2016 11:27 pm
Operator:
Sample Name: CCV
Misc Info:
Vial Number: 1105
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal Update: Sep 15 2016 10:13 pm
Sample Type: CCV
Total Dil Factor: 1.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc. ppb	RSD(%)	Expected	Rec(%)	QC Range(%)	Flag
9 Be	6	3	95.660	0.75	100.00	95.7	89 - 110	
11 B	6	3	11.530	1.95	10.00	115.3	89 - 110	Fail
27 Al	72	3	454.500	0.25	500.00	90.9	89 - 110	
51 V	45	2	90.640	0.42	100.00	90.6	89 - 110	
52 Cr	45	2	88.980	0.89	100.00	89.0	89 - 110	Fail
55 Mn	72	3	91.790	0.58	100.00	91.8	89 - 110	
56 Fe	45	1	455.400	1.98	500.00	91.1	89 - 110	
59 Co	72	3	92.080	1.01	100.00	92.1	89 - 110	
60 Ni	45	2	220.100	0.43	250.00	88.0	89 - 110	Fail
63 Cu	45	2	228.900	0.60	250.00	91.6	89 - 110	
66 Zn	72	3	481.300	0.24	500.00	96.3	89 - 110	
75 As	45	2	97.820	0.43	100.00	97.8	89 - 110	
78 Se	45	1	237.800	1.76	250.00	95.1	89 - 110	
98 Mo	115	3	91.650	1.45	100.00	91.7	89 - 110	
107 Ag	115	3	22.560	1.00	25.00	90.2	89 - 110	
111 Cd	115	3	91.050	1.20	100.00	91.1	89 - 110	
118 Sn	115	3	88.540	0.63	100.00	88.5	89 - 110	Fail
121 Sb	115	3	11.550	0.45	12.50	92.4	89 - 110	
125 Te	115	3	96.550	1.21	100.00	96.6	89 - 110	
133 Cs	115	3	91.900	0.66	100.00	91.9	89 - 110	
137 Ba	115	3	231.900	0.72	250.00	92.8	89 - 110	
205 Tl	209	3	93.130	0.48	100.00	93.1	89 - 110	
208 Pb	209	3	228.900	1.66	250.00	91.6	89 - 110	
232 Th	209	3	90.460	1.02	100.00	90.5	89 - 110	
238 U	209	3	90.270	1.63	100.00	90.3	89 - 110	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	849737	4.29	973727	87.3	60 - 120	
45 Sc	1	2301319	3.65	2490209	92.4	60 - 120	
45 Sc	2	562281	0.20	595752	94.4	60 - 120	
45 Sc	3	5954219	2.89	6201481	96.0	60 - 120	
72 Ge	1	680079	2.53	755907	90.0	60 - 120	
72 Ge	2	275505	0.81	293685	93.8	60 - 120	
72 Ge	3	1382528	3.47	1450449	95.3	60 - 120	
74 Ge	1	978747	2.92	1070347	91.4	60 - 120	
74 Ge	2	404718	1.03	430776	94.0	60 - 120	
74 Ge	3	1904535	2.50	1984674	96.0	60 - 120	
115 In	1	3288980	3.11	3596183	91.5	60 - 120	
115 In	2	1115208	1.08	1187034	93.9	60 - 120	
115 In	3	4288111	2.43	4498589	95.3	60 - 120	
159 Tb	3	5522911	1.87	5855025	94.3	60 - 120	
209 Bi	3	5808180	1.99	6279629	92.5	60 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

4 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Continuing Calibration Blank (CCB) QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\032_CCB.D\032_CCB.D#
Date Acquired: Sep 15 2016 11:30 pm
Operator:
Sample Name: CCB
Misc Info:
Vial Number: 1102
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal Update: Sep 15 2016 10:13 pm
Sample Type: CCB
Total Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc.	RSD(%)	High Limit	Flag
9 Be	6	3	0.022 ppb	64.81	0.150	
11 B	6	3	0.687 ppb	18.05	1.500	
27 Al	72	3	0.024 ppb	103.07	3.000	
51 V	45	2	0.046 ppb	11.07	0.600	
52 Cr	45	2	0.036 ppb	42.66	1.500	
55 Mn	72	3	-0.075 ppb	9.10	1.500	
56 Fe	45	1	-0.127 ppb	22.68	12.000	
59 Co	72	3	0.024 ppb	13.47	0.150	
60 Ni	45	2	0.087 ppb	8.28	1.800	
63 Cu	45	2	-0.517 ppb	5.66	1.500	
66 Zn	72	3	-0.047 ppb	70.71	6.000	
75 As	45	2	0.127 ppb	41.74	0.600	
78 Se	45	1	0.149 ppb	11.68	0.300	
98 Mo	115	3	0.025 ppb	10.32	1.500	
107 Ag	115	3	0.005 ppb	38.46	0.150	
111 Cd	115	3	0.017 ppb	65.66	0.300	
118 Sn	115	3	0.146 ppb	6.97	0.300	
121 Sb	115	3	0.306 ppb	2.39	1.200	
125 Te	115	3	0.053 ppb	1.30	3.000	
133 Cs	115	3	0.029 ppb	3.77	0.600	
137 Ba	115	3	0.044 ppb	39.38	1.500	
205 Tl	209	3	0.036 ppb	7.17	0.300	
208 Pb	209	3	0.059 ppb	11.54	0.300	
232 Th	209	3	0.898 ppb	9.19	3.000	
238 U	209	3	0.043 ppb	9.77	0.300	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	923655	2.16	973727	94.9	60 - 120	
45 Sc	1	2604240	0.43	2490209	104.6	60 - 120	
45 Sc	2	620956	1.16	595752	104.2	60 - 120	
45 Sc	3	6246383	1.14	6201481	100.7	60 - 120	
72 Ge	1	772095	0.32	755907	102.1	60 - 120	
72 Ge	2	300979	0.64	293685	102.5	60 - 120	
72 Ge	3	1461587	1.09	1450449	100.8	60 - 120	
74 Ge	1	1097299	0.27	1070347	102.5	60 - 120	
74 Ge	2	438517	1.21	430776	101.8	60 - 120	
74 Ge	3	2004631	1.00	1984674	101.0	60 - 120	
115 In	1	3711538	0.86	3596183	103.2	60 - 120	
115 In	2	1227215	0.70	1187034	103.4	60 - 120	
115 In	3	4581190	0.51	4498589	101.8	60 - 120	
159 Tb	3	5828124	0.19	5855025	99.5	60 - 120	
209 Bi	3	6134466	0.42	6279629	97.7	60 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\033SMPL.D\033SMPL.D#
Date Acquired: Sep 15 2016 11:33 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32759-01
Misc Info:
Vial Number: 3408
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	0.087	0.087	ppb	14.10	200.00	
11 B	6	3	29.060	29.060	ppb	1.65	20.00	OCAL
27 Al	72	3	35.470	35.470	ppb	1.29	1000.00	
51 V	45	2	0.067	0.067	ppb	38.58	200.00	
52 Cr	45	2	0.072	0.072	ppb	43.15	200.00	
55 Mn	72	3	683.600	683.600	ppb	0.98	200.00	OCAL
56 Fe	45	1	493.700	493.700	ppb	0.53	1000.00	
59 Co	72	3	0.182	0.182	ppb	3.62	200.00	
60 Ni	45	2	0.015	0.015	ppb	72.74	500.00	
63 Cu	45	2	-0.605	-0.605	ppb	6.64	500.00	
66 Zn	72	3	0.792	0.792	ppb	7.23	1000.00	
75 As	45	2	6.191	6.191	ppb	1.97	200.00	
78 Se	45	1	0.011	0.011	ppb	148.20	500.00	
98 Mo	115	3	0.887	0.887	ppb	1.45	200.00	
107 Ag	115	3	-0.001	-0.001	ppb	68.85	50.00	
111 Cd	115	3	0.005	0.005	ppb	110.41	200.00	
118 Sn	115	3	-0.035	-0.035	ppb	9.63	200.00	
121 Sb	115	3	1.206	1.206	ppb	2.68	25.00	
125 Te	115	3	0.071	0.071	ppb	30.78	200.00	
133 Cs	115	3	7.107	7.107	ppb	1.08	200.00	
137 Ba	115	3	30.620	30.620	ppb	1.21	500.00	
205 Tl	209	3	0.139	0.139	ppb	7.25	200.00	
208 Pb	209	3	0.039	0.039	ppb	4.21	500.00	
232 Th	209	3	0.378	0.378	ppb	7.75	200.00	
238 U	209	3	0.097	0.097	ppb	0.70	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	824940	3.50	973727	84.7	59.5 - 120	
45 Sc	1	2412139	0.79	2490209	96.9	59.5 - 120	
45 Sc	2	572348	1.44	595752	96.1	59.5 - 120	
45 Sc	3	5825742	3.46	6201481	93.9	59.5 - 120	
72 Ge	1	710755	0.80	755907	94.0	59.5 - 120	
72 Ge	2	282094	1.24	293685	96.1	59.5 - 120	
72 Ge	3	1352427	3.07	1450449	93.2	59.5 - 120	
74 Ge	1	1020130	0.92	1070347	95.3	59.5 - 120	
74 Ge	2	409917	1.65	430776	95.2	59.5 - 120	
74 Ge	3	1855023	3.72	1984674	93.5	59.5 - 120	
115 In	1	3396311	0.51	3596183	94.4	59.5 - 120	
115 In	2	1113641	0.79	1187034	93.8	59.5 - 120	
115 In	3	4114925	3.81	4498589	91.5	59.5 - 120	
159 Tb	3	5293444	3.60	5855025	90.4	59.5 - 120	
209 Bi	3	5380808	4.25	6279629	85.7	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

2 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\034SMPL.D\034SMPL.D#
Date Acquired: Sep 15 2016 11:36 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32759-02
Misc Info:
Vial Number: 3409
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 2.00
Autodil Factor: Undiluted
Final Dil Factor: 2.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	0.029	0.015	ppb	25.40	200.00	
11 B	6	3	63.300	31.650	ppb	3.54	20.00	OCAL
27 Al	72	3	58.220	29.110	ppb	1.71	1000.00	
51 V	45	2	-0.105	-0.052	ppb	26.11	200.00	
52 Cr	45	2	0.303	0.151	ppb	11.01	200.00	
55 Mn	72	3	179.660	89.830	ppb	0.77	200.00	
56 Fe	45	1	914.600	457.300	ppb	1.06	1000.00	
59 Co	72	3	0.572	0.286	ppb	4.67	200.00	
60 Ni	45	2	0.089	0.045	ppb	38.25	500.00	
63 Cu	45	2	-1.265	-0.632	ppb	12.11	500.00	
66 Zn	72	3	1.675	0.838	ppb	11.67	1000.00	
75 As	45	2	49.620	24.810	ppb	0.53	200.00	
78 Se	45	1	-0.018	-0.009	ppb	147.46	500.00	
98 Mo	115	3	1.192	0.596	ppb	4.58	200.00	
107 Ag	115	3	0.008	0.004	ppb	176.12	50.00	
111 Cd	115	3	-0.014	-0.007	ppb	90.22	200.00	
118 Sn	115	3	-0.178	-0.089	ppb	16.13	200.00	
121 Sb	115	3	4.882	2.441	ppb	0.77	25.00	
125 Te	115	3	0.267	0.134	ppb	29.42	200.00	
133 Cs	115	3	18.434	9.217	ppb	1.26	200.00	
137 Ba	115	3	12.182	6.091	ppb	1.78	500.00	
205 Tl	209	3	0.161	0.081	ppb	5.37	200.00	
208 Pb	209	3	1.113	0.556	ppb	3.94	500.00	
232 Th	209	3	0.332	0.166	ppb	9.60	200.00	
238 U	209	3	0.062	0.031	ppb	3.24	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	667131	1.25	973727	68.5	59.5 - 120	
45 Sc	1	2146451	3.15	2490209	86.2	59.5 - 120	
45 Sc	2	540858	5.30	595752	90.8	59.5 - 120	
45 Sc	3	5105131	0.46	6201481	82.3	59.5 - 120	
72 Ge	1	643981	3.46	755907	85.2	59.5 - 120	
72 Ge	2	269970	4.76	293685	91.9	59.5 - 120	
72 Ge	3	1220914	0.91	1450449	84.2	59.5 - 120	
74 Ge	1	928245	2.69	1070347	86.7	59.5 - 120	
74 Ge	2	393211	4.22	430776	91.3	59.5 - 120	
74 Ge	3	1669825	0.59	1984674	84.1	59.5 - 120	
115 In	1	2995005	3.86	3596183	83.3	59.5 - 120	
115 In	2	1023078	4.60	1187034	86.2	59.5 - 120	
115 In	3	3547524	0.85	4498589	78.9	59.5 - 120	
159 Tb	3	4483528	0.10	5855025	76.6	59.5 - 120	
209 Bi	3	4352664	1.00	6279629	69.3	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

1 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\035SMPL.D\035SMPL.D#
Date Acquired: Sep 15 2016 11:39 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32759-03
Misc Info:
Vial Number: 3410
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	0.241	0.241	ppb	3.82	200.00	
11 B	6	3	42.790	42.790	ppb	2.10	20.00	OCAL
27 Al	72	3	16.290	16.290	ppb	1.15	1000.00	
51 V	45	2	-0.007	-0.007	ppb	236.75	200.00	
52 Cr	45	2	0.129	0.129	ppb	8.67	200.00	
55 Mn	72	3	177.500	177.500	ppb	0.81	200.00	
56 Fe	45	1	6,825.000	6825.000	ppb	0.75	1000.00	OCAL
59 Co	72	3	0.213	0.213	ppb	1.62	200.00	
60 Ni	45	2	-0.007	-0.007	ppb	203.03	500.00	
63 Cu	45	2	-0.730	-0.730	ppb	1.54	500.00	
66 Zn	72	3	1.224	1.224	ppb	1.07	1000.00	
75 As	45	2	2.277	2.277	ppb	3.21	200.00	
78 Se	45	1	-0.001	-0.001	ppb	1065.00	500.00	
98 Mo	115	3	3.976	3.976	ppb	0.35	200.00	
107 Ag	115	3	-0.002	-0.002	ppb	23.75	50.00	
111 Cd	115	3	-0.011	-0.011	ppb	12.49	200.00	
118 Sn	115	3	-0.071	-0.071	ppb	12.92	200.00	
121 Sb	115	3	0.432	0.432	ppb	1.81	25.00	
125 Te	115	3	0.089	0.089	ppb	11.73	200.00	
133 Cs	115	3	3.156	3.156	ppb	0.33	200.00	
137 Ba	115	3	94.240	94.240	ppb	0.33	500.00	
205 Tl	209	3	-0.006	-0.006	ppb	19.00	200.00	
208 Pb	209	3	-0.030	-0.030	ppb	8.81	500.00	
232 Th	209	3	0.150	0.150	ppb	6.66	200.00	
238 U	209	3	0.337	0.337	ppb	0.60	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	687488	0.44	973727	70.6	59.5 - 120	
45 Sc	1	2128083	1.28	2490209	85.5	59.5 - 120	
45 Sc	2	505741	3.47	595752	84.9	59.5 - 120	
45 Sc	3	5025619	0.90	6201481	81.0	59.5 - 120	
72 Ge	1	624499	1.76	755907	82.6	59.5 - 120	
72 Ge	2	250440	3.76	293685	85.3	59.5 - 120	
72 Ge	3	1180973	1.44	1450449	81.4	59.5 - 120	
74 Ge	1	895046	3.02	1070347	83.6	59.5 - 120	
74 Ge	2	366820	3.06	430776	85.2	59.5 - 120	
74 Ge	3	1620260	0.72	1984674	81.6	59.5 - 120	
115 In	1	2968101	1.97	3596183	82.5	59.5 - 120	
115 In	2	978666	2.32	1187034	82.4	59.5 - 120	
115 In	3	3517877	0.46	4498589	78.2	59.5 - 120	
159 Tb	3	4452929	1.02	5855025	76.1	59.5 - 120	
209 Bi	3	4445964	1.55	6279629	70.8	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

2 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\036SMPL.D\036SMPL.D#
Date Acquired: Sep 15 2016 11:43 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32761-01
Misc Info:
Vial Number: 3411
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	0.048	0.048	ppb	33.89	200.00	
11 B	6	3	172.500	172.500	ppb	5.10	20.00	OCAL
27 Al	72	3	809.800	809.800	ppb	3.40	1000.00	
51 V	45	2	9.425	9.425	ppb	1.66	200.00	
52 Cr	45	2	3.404	3.404	ppb	1.66	200.00	
55 Mn	72	3	283.200	283.200	ppb	0.31	200.00	OCAL
56 Fe	45	1	564.400	564.400	ppb	1.72	1000.00	
59 Co	72	3	0.730	0.730	ppb	3.84	200.00	
60 Ni	45	2	1.013	1.013	ppb	1.62	500.00	
63 Cu	45	2	1.187	1.187	ppb	13.16	500.00	
66 Zn	72	3	38.730	38.730	ppb	1.53	1000.00	
75 As	45	2	13.400	13.400	ppb	2.14	200.00	
78 Se	45	1	0.769	0.769	ppb	2.27	500.00	
98 Mo	115	3	49.240	49.240	ppb	0.50	200.00	
107 Ag	115	3	1.047	1.047	ppb	2.02	50.00	
111 Cd	115	3	0.393	0.393	ppb	4.21	200.00	
118 Sn	115	3	2.527	2.527	ppb	1.17	200.00	
121 Sb	115	3	30.350	30.350	ppb	1.28	25.00	OCAL
125 Te	115	3	0.124	0.124	ppb	62.21	200.00	
133 Cs	115	3	10.770	10.770	ppb	1.14	200.00	
137 Ba	115	3	46.720	46.720	ppb	0.95	500.00	
205 Tl	209	3	0.354	0.354	ppb	1.49	200.00	
208 Pb	209	3	30.990	30.990	ppb	0.90	500.00	
232 Th	209	3	0.116	0.116	ppb	5.23	200.00	
238 U	209	3	0.367	0.367	ppb	1.16	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	611907	3.11	973727	62.8	59.5 - 120	
45 Sc	1	2065096	1.18	2490209	82.9	59.5 - 120	
45 Sc	2	468139	6.17	595752	78.6	59.5 - 120	
45 Sc	3	4714008	3.26	6201481	76.0	59.5 - 120	
72 Ge	1	618875	1.32	755907	81.9	59.5 - 120	
72 Ge	2	231774	5.61	293685	78.9	59.5 - 120	
72 Ge	3	1122318	3.11	1450449	77.4	59.5 - 120	
74 Ge	1	883459	1.44	1070347	82.5	59.5 - 120	
74 Ge	2	337204	4.89	430776	78.3	59.5 - 120	
74 Ge	3	1533166	3.59	1984674	77.3	59.5 - 120	
115 In	1	2845980	1.10	3596183	79.1	59.5 - 120	
115 In	2	863275	5.29	1187034	72.7	59.5 - 120	
115 In	3	3231342	2.90	4498589	71.8	59.5 - 120	
159 Tb	3	4072462	1.69	5855025	69.6	59.5 - 120	
209 Bi	3	3890938	2.47	6279629	62.0	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

3 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\037SMPL.D\037SMPL.D#
Date Acquired: Sep 15 2016 11:46 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32761-04
Misc Info:
Vial Number: 3412
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 5.00
Autodil Factor: Undiluted
Final Dil Factor: 5.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-0.100	-0.020	ppb	8.71	200.00	
11 B	6	3	358.900	71.780	ppb	0.91	20.00	OCAL
27 Al	72	3	104.500	20.900	ppb	0.68	1000.00	
51 V	45	2	4.760	0.952	ppb	1.49	200.00	
52 Cr	45	2	3.837	0.767	ppb	3.40	200.00	
55 Mn	72	3	518.000	103.600	ppb	0.40	200.00	
56 Fe	45	1	884.500	176.900	ppb	0.30	1000.00	
59 Co	72	3	3.979	0.796	ppb	1.68	200.00	
60 Ni	45	2	7.390	1.478	ppb	4.99	500.00	
63 Cu	45	2	32.875	6.575	ppb	3.82	500.00	
66 Zn	72	3	32.035	6.407	ppb	1.15	1000.00	
75 As	45	2	1.587	0.317	ppb	9.68	200.00	
78 Se	45	1	0.198	0.040	ppb	5.04	500.00	
98 Mo	115	3	2.627	0.525	ppb	2.49	200.00	
107 Ag	115	3	0.012	0.002	ppb	82.16	50.00	
111 Cd	115	3	0.030	0.006	ppb	36.06	200.00	
118 Sn	115	3	-0.119	-0.024	ppb	53.99	200.00	
121 Sb	115	3	1.633	0.327	ppb	1.25	25.00	
125 Te	115	3	-0.047	-0.009	ppb	244.31	200.00	
133 Cs	115	3	11.440	2.288	ppb	0.59	200.00	
137 Ba	115	3	249.300	49.860	ppb	1.47	500.00	
205 Tl	209	3	-0.058	-0.012	ppb	6.05	200.00	
208 Pb	209	3	1.882	0.376	ppb	2.94	500.00	
232 Th	209	3	-0.204	-0.041	ppb	21.92	200.00	
238 U	209	3	-0.059	-0.012	ppb	3.23	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	808073	2.96	973727	83.0	59.5 - 120	
45 Sc	1	2251598	0.19	2490209	90.4	59.5 - 120	
45 Sc	2	526397	3.19	595752	88.4	59.5 - 120	
45 Sc	3	5556193	2.40	6201481	89.6	59.5 - 120	
72 Ge	1	675568	1.56	755907	89.4	59.5 - 120	
72 Ge	2	270241	2.14	293685	92.0	59.5 - 120	
72 Ge	3	1318417	1.42	1450449	90.9	59.5 - 120	
74 Ge	1	975921	1.01	1070347	91.2	59.5 - 120	
74 Ge	2	393895	1.86	430776	91.4	59.5 - 120	
74 Ge	3	1802304	1.62	1984674	90.8	59.5 - 120	
115 In	1	3080265	0.62	3596183	85.7	59.5 - 120	
115 In	2	1033466	1.13	1187034	87.1	59.5 - 120	
115 In	3	3879572	1.76	4498589	86.2	59.5 - 120	
159 Tb	3	4958163	1.24	5855025	84.7	59.5 - 120	
209 Bi	3	4988450	1.08	6279629	79.4	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

1 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\038SMPL.D\038SMPL.D#
Date Acquired: Sep 15 2016 11:49 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32771-01
Misc Info:
Vial Number: 3501
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-0.020	-0.020	ppb	22.15	200.00	
11 B	6	3	3.483	3.483	ppb	10.36	20.00	
27 Al	72	3	1.379	1.379	ppb	26.55	1000.00	
51 V	45	2	-0.024	-0.024	ppb	38.70	200.00	
52 Cr	45	2	0.257	0.257	ppb	7.34	200.00	
55 Mn	72	3	0.499	0.499	ppb	1.85	200.00	
56 Fe	45	1	7.572	7.572	ppb	1.02	1000.00	
59 Co	72	3	0.017	0.017	ppb	21.95	200.00	
60 Ni	45	2	2.286	2.286	ppb	1.88	500.00	
63 Cu	45	2	34.520	34.520	ppb	1.00	500.00	
66 Zn	72	3	40.210	40.210	ppb	0.48	1000.00	
75 As	45	2	0.137	0.137	ppb	27.93	200.00	
78 Se	45	1	-0.025	-0.025	ppb	21.87	500.00	
98 Mo	115	3	-0.005	-0.005	ppb	137.44	200.00	
107 Ag	115	3	0.000	0.000	ppb	602.86	50.00	
111 Cd	115	3	-0.005	-0.005	ppb	207.14	200.00	
118 Sn	115	3	1.392	1.392	ppb	1.21	200.00	
121 Sb	115	3	-0.001	-0.001	ppb	415.19	25.00	
125 Te	115	3	0.004	0.004	ppb	1187.30	200.00	
133 Cs	115	3	-0.007	-0.007	ppb	50.63	200.00	
137 Ba	115	3	6.271	6.271	ppb	0.17	500.00	
205 Tl	209	3	-0.016	-0.016	ppb	1.92	200.00	
208 Pb	209	3	1.083	1.083	ppb	1.69	500.00	
232 Th	209	3	-0.084	-0.084	ppb	5.56	200.00	
238 U	209	3	-0.022	-0.022	ppb	1.39	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	889602	3.13	973727	91.4	59.5 - 120	
45 Sc	1	2367487	0.70	2490209	95.1	59.5 - 120	
45 Sc	2	563200	2.25	595752	94.5	59.5 - 120	
45 Sc	3	5910574	1.02	6201481	95.3	59.5 - 120	
72 Ge	1	719119	0.34	755907	95.1	59.5 - 120	
72 Ge	2	279019	2.10	293685	95.0	59.5 - 120	
72 Ge	3	1395147	0.75	1450449	96.2	59.5 - 120	
74 Ge	1	1015675	0.21	1070347	94.9	59.5 - 120	
74 Ge	2	408564	1.63	430776	94.8	59.5 - 120	
74 Ge	3	1921935	1.23	1984674	96.8	59.5 - 120	
115 In	1	3325374	1.09	3596183	92.5	59.5 - 120	
115 In	2	1101028	1.59	1187034	92.8	59.5 - 120	
115 In	3	4201051	0.64	4498589	93.4	59.5 - 120	
159 Tb	3	5353246	0.38	5855025	91.4	59.5 - 120	
209 Bi	3	5577928	0.69	6279629	88.8	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\039SMPL.D\039SMPL.D#
Date Acquired: Sep 15 2016 11:52 pm
Acq. Method: ACZ.M
Operator:
Sample Name: L32771-02
Misc Info:
Vial Number: 3502
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal. Update: Sep 15 2016 10:13 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-0.025	-0.025	ppb	47.12	200.00	
11 B	6	3	2.210	2.210	ppb	11.28	20.00	
27 Al	72	3	0.826	0.826	ppb	8.27	1000.00	
51 V	45	2	-0.027	-0.027	ppb	23.66	200.00	
52 Cr	45	2	0.119	0.119	ppb	26.73	200.00	
55 Mn	72	3	-0.060	-0.060	ppb	29.19	200.00	
56 Fe	45	1	0.627	0.627	ppb	3.07	1000.00	
59 Co	72	3	-0.017	-0.017	ppb	1.04	200.00	
60 Ni	45	2	0.013	0.013	ppb	46.03	500.00	
63 Cu	45	2	34.190	34.190	ppb	2.47	500.00	
66 Zn	72	3	29.480	29.480	ppb	0.98	1000.00	
75 As	45	2	0.142	0.142	ppb	19.75	200.00	
78 Se	45	1	-0.037	-0.037	ppb	11.34	500.00	
98 Mo	115	3	-0.028	-0.028	ppb	12.42	200.00	
107 Ag	115	3	-0.001	-0.001	ppb	164.10	50.00	
111 Cd	115	3	-0.008	-0.008	ppb	47.31	200.00	
118 Sn	115	3	-0.094	-0.094	ppb	8.18	200.00	
121 Sb	115	3	-0.015	-0.015	ppb	18.70	25.00	
125 Te	115	3	-0.034	-0.034	ppb	35.29	200.00	
133 Cs	115	3	-0.014	-0.014	ppb	11.80	200.00	
137 Ba	115	3	2.214	2.214	ppb	2.09	500.00	
205 Tl	209	3	-0.016	-0.016	ppb	3.31	200.00	
208 Pb	209	3	0.774	0.774	ppb	1.78	500.00	
232 Th	209	3	-0.091	-0.091	ppb	7.75	200.00	
238 U	209	3	-0.023	-0.023	ppb	1.34	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	943141	0.99	973727	96.9	59.5 - 120	
45 Sc	1	2494599	0.06	2490209	100.2	59.5 - 120	
45 Sc	2	607102	2.69	595752	101.9	59.5 - 120	
45 Sc	3	6234405	0.28	6201481	100.5	59.5 - 120	
72 Ge	1	757569	0.69	755907	100.2	59.5 - 120	
72 Ge	2	298049	1.30	293685	101.5	59.5 - 120	
72 Ge	3	1466504	0.43	1450449	101.1	59.5 - 120	
74 Ge	1	1067120	0.59	1070347	99.7	59.5 - 120	
74 Ge	2	434568	1.92	430776	100.9	59.5 - 120	
74 Ge	3	1996953	0.33	1984674	100.6	59.5 - 120	
115 In	1	3537010	0.78	3596183	98.4	59.5 - 120	
115 In	2	1184949	1.80	1187034	99.8	59.5 - 120	
115 In	3	4471236	0.19	4498589	99.4	59.5 - 120	
159 Tb	3	5711391	1.11	5855025	97.5	59.5 - 120	
209 Bi	3	6027871	1.02	6279629	96.0	59.5 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Continuing Calibration Verification (CCV) QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\040_CCV.D\040_CCV.D#
Date Acquired: Sep 15 2016 11:55 pm
Operator:
Sample Name: CCV
Misc Info:
Vial Number: 1105
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal Update: Sep 15 2016 10:13 pm
Sample Type: CCV
Total Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc. ppb	RSD(%)	Expected	Rec(%)	QC Range(%)	Flag
9 Be	6	3	96.910	0.69	100.00	96.9	89 - 110	
11 B	6	3	10.810	2.85	10.00	108.1	89 - 110	
27 Al	72	3	480.100	0.34	500.00	96.0	89 - 110	
51 V	45	2	93.820	0.59	100.00	93.8	89 - 110	
52 Cr	45	2	92.210	0.44	100.00	92.2	89 - 110	
55 Mn	72	3	95.790	0.50	100.00	95.8	89 - 110	
56 Fe	45	1	468.600	0.73	500.00	93.7	89 - 110	
59 Co	72	3	96.140	1.38	100.00	96.1	89 - 110	
60 Ni	45	2	227.900	0.40	250.00	91.2	89 - 110	
63 Cu	45	2	236.000	0.77	250.00	94.4	89 - 110	
66 Zn	72	3	495.600	0.80	500.00	99.1	89 - 110	
75 As	45	2	100.800	1.47	100.00	100.8	89 - 110	
78 Se	45	1	246.700	0.65	250.00	98.7	89 - 110	
98 Mo	115	3	95.940	0.91	100.00	95.9	89 - 110	
107 Ag	115	3	23.600	0.79	25.00	94.4	89 - 110	
111 Cd	115	3	95.480	0.59	100.00	95.5	89 - 110	
118 Sn	115	3	95.370	0.50	100.00	95.4	89 - 110	
121 Sb	115	3	11.980	0.52	12.50	95.8	89 - 110	
125 Te	115	3	101.200	0.96	100.00	101.2	89 - 110	
133 Cs	115	3	95.550	0.62	100.00	95.6	89 - 110	
137 Ba	115	3	243.100	1.31	250.00	97.2	89 - 110	
205 Tl	209	3	96.430	0.86	100.00	96.4	89 - 110	
208 Pb	209	3	237.800	0.52	250.00	95.1	89 - 110	
232 Th	209	3	93.400	0.47	100.00	93.4	89 - 110	
238 U	209	3	93.640	0.46	100.00	93.6	89 - 110	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	958675	2.25	973727	98.5	60 - 120	
45 Sc	1	2591417	0.51	2490209	104.1	60 - 120	
45 Sc	2	623112	1.01	595752	104.6	60 - 120	
45 Sc	3	6409314	1.89	6201481	103.4	60 - 120	
72 Ge	1	770038	0.59	755907	101.9	60 - 120	
72 Ge	2	301820	0.84	293685	102.8	60 - 120	
72 Ge	3	1481930	1.77	1450449	102.2	60 - 120	
74 Ge	1	1107912	1.00	1070347	103.5	60 - 120	
74 Ge	2	440857	1.01	430776	102.3	60 - 120	
74 Ge	3	2033238	1.04	1984674	102.4	60 - 120	
115 In	1	3704316	0.58	3596183	103.0	60 - 120	
115 In	2	1224070	0.15	1187034	103.1	60 - 120	
115 In	3	4572741	1.11	4498589	101.6	60 - 120	
159 Tb	3	5897663	0.83	5855025	100.7	60 - 120	
209 Bi	3	6271447	0.36	6279629	99.9	60 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Continuing Calibration Blank (CCB) QC Report

Data File: C:\ICPCHEM\1\DATA\wg409909.b\041_CCB.D\041_CCB.D#
Date Acquired: Sep 15 2016 11:58 pm
Operator:
Sample Name: CCB
Misc Info:
Vial Number: 1102
Current Method: C:\ICPCHEM\1\METHODS\ACZ.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ.C
Last Cal Update: Sep 15 2016 10:13 pm
Sample Type: CCB
Total Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc.	RSD(%)	High Limit	Flag
9 Be	6	3	0.022 ppb	22.87	0.150	
11 B	6	3	0.562 ppb	14.87	1.500	
27 Al	72	3	0.341 ppb	153.03	3.000	
51 V	45	2	0.068 ppb	15.08	0.600	
52 Cr	45	2	0.044 ppb	82.88	1.500	
55 Mn	72	3	-0.067 ppb	8.84	1.500	
56 Fe	45	1	-0.044 ppb	80.19	12.000	
59 Co	72	3	0.029 ppb	14.90	0.150	
60 Ni	45	2	0.116 ppb	21.55	1.800	
63 Cu	45	2	-0.356 ppb	10.03	1.500	
66 Zn	72	3	0.012 ppb	19.71	6.000	
75 As	45	2	0.140 ppb	22.69	0.600	
78 Se	45	1	0.178 ppb	8.64	0.300	
98 Mo	115	3	0.025 ppb	20.31	1.500	
107 Ag	115	3	0.007 ppb	26.71	0.150	
111 Cd	115	3	0.021 ppb	53.40	0.300	
118 Sn	115	3	0.124 ppb	16.20	0.300	
121 Sb	115	3	0.320 ppb	2.68	1.200	
125 Te	115	3	0.069 ppb	43.04	3.000	
133 Cs	115	3	0.028 ppb	4.73	0.600	
137 Ba	115	3	0.064 ppb	24.48	1.500	
205 Tl	209	3	0.035 ppb	9.24	0.300	
208 Pb	209	3	0.064 ppb	19.50	0.300	
232 Th	209	3	0.759 ppb	9.40	3.000	
238 U	209	3	0.044 ppb	13.00	0.300	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	976998	2.22	973727	100.3	60 - 120	
45 Sc	1	2623101	1.19	2490209	105.3	60 - 120	
45 Sc	2	628296	1.70	595752	105.5	60 - 120	
45 Sc	3	6496376	0.65	6201481	104.8	60 - 120	
72 Ge	1	782488	0.75	755907	103.5	60 - 120	
72 Ge	2	306464	0.83	293685	104.4	60 - 120	
72 Ge	3	1513960	0.09	1450449	104.4	60 - 120	
74 Ge	1	1120720	0.41	1070347	104.7	60 - 120	
74 Ge	2	447858	1.01	430776	104.0	60 - 120	
74 Ge	3	2069259	0.23	1984674	104.3	60 - 120	
115 In	1	3736581	1.21	3596183	103.9	60 - 120	
115 In	2	1242139	0.60	1187034	104.6	60 - 120	
115 In	3	4724245	0.54	4498589	105.0	60 - 120	
159 Tb	3	6039449	0.71	5855025	103.1	60 - 120	
209 Bi	3	6369276	0.52	6279629	101.4	60 - 120	

Tune File# 1 c:\icpchem\1\7500\h2.u
Tune File# 2 c:\icpchem\1\7500\he.u
Tune File# 3 c:\icpchem\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg409909.b\003CALB.D\003CALB.D#

0 :Element Failures 0 :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

MS Total Hot Plate

WG409768

ACZ Laboratories, Inc

QC List Type: I-X-THP
QCListMatClass: LIQUID
Bench Sheet List: I-ICPMS-T-200
QC Ref: IP-THP-NO-LCSW
Group ID: IP-G-DIG-THPMS-200-C
Method Ref: M200.2
SOP Ref: SOPII021

Instrument ID: METALSDIG
Analyst: mfm
ACZ Dept: 30
Create Date: 09/14/2016 7:43
Start Date/Time: 09/14/2016 8:40
End Date/Time: 09/14/2016 13:10

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	AG TMS 200	AL TMS 200	AS TMS 200	BE TMS 200	CD TMS 200	CO TMS 200	CR TMS 200	CU TMS 200	MN TMS 200	MO TMS 200	PB TMS 200	SB TMS 200	SE TMS 200	TL TMS 200	U TMS 200	ZN TMS 200	SCN Volume (mL)	Sample Volume (mL)	Final Volume (mL)	Comments
1	WG409768LRB	NONE	r		09/14/16 8:40	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		50	50	
2	WG409768LFB	MS160826-3	r		09/14/16 8:50	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	0.25	50	50	
3	L32649-01	NSJ2	r		09/14/16 9:01		✓							✓									50	50	
4	L32649-02	LG2	r		09/14/16 9:12		✓							✓									50	50	
5	L32649-03	CA1	r		09/14/16 9:23		✓							✓									50	50	
6	L32649-04	LM02	r		09/14/16 9:34		✓							✓									50	50	
7	L32649-05	SJT2	r		09/14/16 9:44		✓							✓									50	50	
8	L32649-05LFM	MS160826-3	r		09/14/16 9:55	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	0.25	50	50	
9	L32649-05LFMD	MS160826-3	r		09/14/16 10:06	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	0.25	50	50	
10	L32649-06	N1	r		09/14/16 10:17		✓							✓									50	50	
11	L32730-01	ARG-1	r		09/14/16 10:28			✓	✓	✓		✓				✓	✓		✓	✓			50	50	
12	L32730-02	SC-1	r		09/14/16 10:38			✓	✓	✓		✓				✓	✓		✓	✓			10	50	Sediment
13	L32752-07	JEFFWAY GULCH SPRING	r		09/14/16 10:49			✓															25	50	Insx
14	L32752-08	JEFFWAY WFMT ABOVE C	r		09/14/16 11:00			✓															50	50	
15	L32754-01	PINALCK@ICCCODMA	r	50	09/14/16 11:11	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓			50	50	
16	L32754-02	PINALCK@PRINGLE	r	50	09/14/16 11:22				✓	✓	✓	✓	✓						✓				50	50	
17	L32754-03	PINALCK@SEERANCH	r	50	09/14/16 11:32				✓	✓	✓	✓	✓						✓				50	50	
18	L32754-03LFM	MS160826-3	r		09/14/16 11:43	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	0.25	50	50	
19	L32754-03LFMD	MS160826-3	r		09/14/16 11:54	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	0.25	50	50	
20	L32759-01	1355-ACCS-ZE	r	40	09/14/16 12:05	✓		✓		✓						✓	✓	✓	✓	✓			50	50	
21	L32759-02	1190-CFTE-EC	r	40	09/14/16 12:16	✓		✓		✓						✓	✓	✓	✓	✓			50	50	
22	L32759-03	UGS-16-042	r	40	09/14/16 12:26	✓		✓		✓						✓	✓	✓	✓	✓			50	50	

Report Comments: _____

Internal Comments _____

AREV: MFM 9/14/16
Initials, Date

SREV: [signature] 9/14/16
Initials, Date

MS Total Hot Plate

QC List Type: I-X-THP
QCListMatClass: LIQUID
Bench Sheet List: I-ICPMS-T-200
QC Ref: IP-THP-NO-LCSW
Group ID: IP-G-DIG-THPMS-200-C
Method Ref: M200.2
SOP Ref: SOPII021

WG409768

ACZ Laboratories, Inc

Instrument ID: METALSDIG
Analyst: mfm
ACZ Dept: 30
Create Date: 09/14/2016 7:43
Start Date/Time: 09/14/2016 8:40
End Date/Time: 09/14/2016 13:10

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	AG TMS 200	AL TMS 200	AS TMS 200	BE TMS 200	CD TMS 200	CO TMS 200	CR TMS 200	CU TMS 200	MN TMS 200	MO TMS 200	PB TMS 200	SB TMS 200	SE TMS 200	TL TMS 200	U TMS 200	ZN TMS 200	SCN Volume (mL)	Sample Volume (mL)	Final Volume (mL)	Comments
23	L32761-01	INFLUENT	r		09/14/16 12:37	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐		50	50	
24	L32761-04	EBR3	r		09/14/16 12:48	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐		10	50	Color
25	L32771-01	16-043 EB	r		09/14/16 12:59	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☑		50	50	
26	L32771-02	16-044 SB	r		09/14/16 13:10	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☑		50	50	

Sample	Login Comments
L32649-01	O(2),P,U,W,RPC,GPC,YG ||
L32649-02	O(2),P,U,W,R,G,YG ||
L32649-03	O(2),P,U,W,R,G,YG ||
L32649-04	O(2),P,U,W,R,G,YG ||
L32649-05	O(2),P,U,W,R,G,YG ||
L32649-06	O(2),P,U,W,R,G,YG ||
L32730-01	P,U,W,RPC,GPC,YG ||
L32730-02	P,U,W,RPC,GPC,YG ||
L32752-07	LU,U,WF,RPC,GFA ||
L32752-08	LU,U,WF,RPC,GFA ||
L32754-01	U,W,RPC,GPC ||
L32754-02	U,W,RPC,GPC ||
L32754-03	U,W,RPC,GPC ||
L32759-01	LA,O,P,U,W,RPC,GPC,YG,B,T ||
L32759-02	LA,O,P,U,W,RPC,GPC,YG,B,T ||
L32759-03	LA,O,P,U,W,RPC,GPC,YG,B,T ||
L32761-01	U,WF,RPC,YG ||
L32761-04	U,WF,RPC,YG ||
L32771-01	RPC(4) ||
L32771-02	RPC(4) ||

Report Comments: _____

AREV: _____
Initials, Date

Internal Comments _____

SREV: _____
Initials, Date

ACZ Laboratories, Inc.

METALS PREP REVIEW CHECKLIST

Work Group:	409768
Sample Type:	THPMS
Prep Date:	9/14/16
Analyst:	MFM

AREV:	MFM
Date:	9/14/16
SREV:	
Date:	9/14/16

	N/A	Yes	No
1.) Are all dilutions correct in LIMS and documented on the bench sheet ?		✓	
2.) Is any sample prepared on dilution appropriately "D" qualified?		✓	
3.) Is the correct sub-sample type entered on the bench sheet (if different than SOP)?		✓	
4.) Are all initial and final sample volumes correct in LIMS ?		✓	
5.) Is the correct SCN entered for each spike and control standard (LFB or LCSW) ?		✓	
6.) Are all SCN volumes correct in LIMS ?		✓	
7.) Are all errors properly corrected (i.e. single-line crossout, dated & initialed) ?		✓	
8.) **FOR SREV**: QA/QC approval for initial training or 2 sets of initials for WG & LIMS ?		✓	

For any item listed above that is checked "No" state the problem and corrective action / resolution in the sections below.

QC/Sample ID	Problem	Corrective action

Disposable Vessel Lot #*: 1512329-8A-6225-QN

Nitric acid PCN: 51741 Hydrochloric acid PCN: 51669

Digest Temp: 92 °C

Comments:

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

MS Total Hot Plate

WG409768

ACZ Laboratories, Inc

QC List Type: I-X-THP
QCListMatClass: LIQUID
Bench Sheet List: I-ICPMS-T-200
QC Ref: IP-THP-NO-LCSW
Group ID: IP-G-DIG-THPMS-200-C
Method Ref: M200.2
SOP Ref: SOPII021

Instrument ID: METALSDIG
Analyst: MFM
ACZ Dept: 30
Create Date: 09/14/2016 7:43
Start Date/Time: 9/14/16 8:40
End Date/Time: 1:10

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	AG TMS 200	AL TMS 200	AS TMS 200	BE TMS 200	CD TMS 200	CO TMS 200	CR TMS 200	CU TMS 200	MN TMS 200	MO TMS 200	PB TMS 200	SB TMS 200	SE TMS 200	TL TMS 200	U TMS 200	ZN TMS 200	SCN Volume (mL)	Sample Volume (mL)	Final Volume (mL)	Comments
1	WG409768LRB	NONE				☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑				
2	WG409768LFB	MS160826-3				☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑				
3	L32649-01	NSJ2				☐	☑	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐				
4	L32649-02	LG2				☐	☑	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐				
5	L32649-03	CA1				☐	☑	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐				
6	L32649-04	LM02				☐	☑	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐				
7	L32649-05	SJT2				☐	☑	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐				
8	L32649-05LFM	MS160826-3				☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑				
9	L32649-05LFMD	MS160826-3				☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑				
10	L32649-06	N1				☐	☑	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐				
11	L32730-01	ARG-1				☐	☐	☑	☑	☑	☐	☑	☐	☐	☐	☑	☑	☐	☑	☑	☐				
12	L32730-02	SC-1				☐	☐	☑	☑	☑	☐	☑	☐	☐	☐	☑	☑	☐	☑	☑	☐		10		Sed.
13	L32752-07	JEFFWAY GULCH SPRING				☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		25		InSx
14	L32752-08	JEFFWAY WFMT ABOVE C				☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐				
15	L32754-01	PINALCK@ICCCODMA		50		☑	☐	☑	☑	☑	☑	☑	☑	☐	☑	☑	☑	☑	☑	☑	☐				
16	L32754-02	PINALCK@PRINGLE		50		☐	☐	☐	☑	☑	☑	☑	☑	☐	☐	☐	☐	☐	☑	☐	☐				
17	L32754-03	PINALCK@SEERANCH		50		☐	☐	☐	☑	☑	☑	☑	☑	☐	☐	☐	☐	☐	☑	☐	☐				
18	L32754-03LFM	MS160826-3				☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑				
19	L32754-03LFMD	MS160826-3				☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑				
20	L32759-01	1355-ACCS-ZE		40		☑	☐	☑	☐	☑	☐	☐	☐	☐	☐	☑	☑	☑	☑	☑	☐				
21	L32759-02	1190-CFTE-EC		40		☑	☐	☑	☐	☑	☐	☐	☐	☐	☐	☑	☑	☑	☑	☑	☐				
22	L32759-03	UGS-16-042		40		☑	☐	☑	☐	☑	☐	☐	☐	☐	☐	☑	☑	☑	☑	☑	☐				

Report Comments: _____

Internal Comments _____

AREV: _____
Initials, Date

SREV: _____
Initials, Date

MS Total Hot Plate

QC List Type: I-X-THP
QCListMatClass: LIQUID
Bench Sheet List: I-ICPMS-T-200
QC Ref: IP-THP-NO-LCSW
Group ID: IP-G-DIG-THPMS-200-C
Method Ref: M200.2
SOP Ref: SOPII021

WG409768

ACZ Laboratories, Inc

Instrument ID: METALSDIG
Analyst:
ACZ Dept: 30
Create Date: 09/14/2016 7:43
Start Date/Time:
End Date/Time:

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	AG TMS 200	AL TMS 200	AS TMS 200	BE TMS 200	CD TMS 200	CO TMS 200	CR TMS 200	CU TMS 200	MN TMS 200	MO TMS 200	PB TMS 200	SB TMS 200	SE TMS 200	TL TMS 200	U TMS 200	ZN TMS 200	SCN Volume (mL)	Sample Volume (mL)	Final Volume (mL)	Comments
23	L32761-01	INFLUENT				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐				
24	L32761-04	EBR3				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐		10		Color
25	L32771-01	16-043 EB				☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☑				
26	L32771-02	16-044 SB				☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☑				

Sample	Login Comments
L32649-01	O(2),P,U,W,RPC,GPC,YG ||
L32649-02	O(2),P,U,W,R,G,YG ||
L32649-03	O(2),P,U,W,R,G,YG ||
L32649-04	O(2),P,U,W,R,G,YG ||
L32649-05	O(2),P,U,W,R,G,YG ||
L32649-06	O(2),P,U,W,R,G,YG ||
L32730-01	P,U,W,RPC,GPC,YG ||
L32730-02	P,U,W,RPC,GPC,YG ||
L32752-07	LU,U,WF,RPC,GFA ||
L32752-08	LU,U,WF,RPC,GFA ||
L32754-01	U,W,RPC,GPC ||
L32754-02	U,W,RPC,GPC ||
L32754-03	U,W,RPC,GPC ||
L32759-01	LA,O,P,U,W,RPC,GPC,YG,B,T ||
L32759-02	LA,O,P,U,W,RPC,GPC,YG,B,T ||
L32759-03	LA,O,P,U,W,RPC,GPC,YG,B,T ||
L32761-01	U,WF,RPC,YG ||
L32761-04	U,WF,RPC,YG ||
L32771-01	RPC(4) ||
L32771-02	RPC(4) ||

Report Comments: _____

Internal Comments _____

AREV: _____
Initials, Date

SREV: _____
Initials, Date

WG409768

Date Reported: 14-Sep-16
Run ID: R1450780
Date Analyzed: 14-Sep-16
ICAL Workgroup:
Instrument ID: METALSDIG

WG409768LRB

Tag:

Measured: 9/14/2016 8:40:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	PREP	50	1		mL	++					
SREV	VOLUME, SAMPLE	PREP	50	1		mL	++					

WG409768LFB

Tag:

Measured: 9/14/2016 8:50:48 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	PREP	50	1		mL	++					
SREV	SCN VOLUME	PREP	0.25	1		mL	++					
SREV	VOLUME, SAMPLE	PREP	50	1		mL	++					

L32649-01

Tag: 1

Measured: 9/14/2016 9:01:36 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32649-02

Tag: 1

Measured: 9/14/2016 9:12:24 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32649-03

Tag: 1

Measured: 9/14/2016 9:23:12 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32649-04

Tag: 1

Measured: 9/14/2016 9:34:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32649-05

Tag: 1

Measured: 9/14/2016 9:44:48 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32649-05LFM

Tag:

Measured: 9/14/2016 9:55:36 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	PREP	50	1		mL	++					
SREV	SCN VOLUME	PREP	0.25	1		mL	++					
SREV	VOLUME, SAMPLE	PREP	50	1		mL	++					

L32649-05LFMD

Tag: Measured: 9/14/2016 10:06:24 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	PREP	50	1		mL	++					
SREV	SCN VOLUME	PREP	0.25	1		mL	++					
SREV	VOLUME, SAMPLE	PREP	50	1		mL	++					

L32649-06

Tag: 1 Measured: 9/14/2016 10:17:12 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32730-01

Tag: 1 Measured: 9/14/2016 10:28:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32730-02

Tag: 1 Measured: 9/14/2016 10:38:48 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	5		mL	++				DF	
SREV	VOLUME, SAMPLE	IPMS-200	10	5		mL	++				DF	

L32752-07

Tag: 1 Measured: 9/14/2016 10:49:36 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	2		mL	++				DJ	
SREV	VOLUME, SAMPLE	IPMS-200	25	2		mL	++				DJ	

L32752-08

Tag: 1 Measured: 9/14/2016 11:00:24 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32754-01

Tag: 1 Measured: 9/14/2016 11:11:12 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32754-02

Tag: 1 Measured: 9/14/2016 11:22:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32754-03

Tag: 1 Measured: 9/14/2016 11:32:48 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32754-03LFM

Tag: Measured: 9/14/2016 11:43:36 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	PREP	50	1		mL	++					
SREV	SCN VOLUME	PREP	0.25	1		mL	++					
SREV	VOLUME, SAMPLE	PREP	50	1		mL	++					

L32754-03LFMD

Tag: Measured: 9/14/2016 11:54:24 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	PREP	50	1		mL	++					
SREV	SCN VOLUME	PREP	0.25	1		mL	++					
SREV	VOLUME, SAMPLE	PREP	50	1		mL	++					

L32759-01

Tag: 1 Measured: 9/14/2016 12:05:12 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32759-02

Tag: 1 Measured: 9/14/2016 12:16:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32759-03

Tag: 1 Measured: 9/14/2016 12:26:48 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32761-01

Tag: 1 Measured: 9/14/2016 12:37:36 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32761-04

Tag: 1 Measured: 9/14/2016 12:48:24 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	5		mL	++				DD	
SREV	VOLUME, SAMPLE	IPMS-200	10	5		mL	++				DD	

L32771-01

Tag: Measured: 9/14/2016 12:59:12 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

L32771-02

Tag: Measured: 9/14/2016 1:10:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	FINAL VOLUME	IPMS-200	50	1		mL	++					
SREV	VOLUME, SAMPLE	IPMS-200	50	1		mL	++					

Teck Alaska Incorporated
Project ID: L32771

Metals Analysis

WG409909 **ICPMS Total 200-CC**

Sample	Date	SCN	Ag	Al	As	Be	Cd	Co	Cr	Cu	Mn	Mo	Pb	Sb	Se	Tl	U	Zn
WG409909ICV	09/15/16 22:15	MS160823-2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WG409909ICB	09/15/16 22:18		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WG409768LRB	09/15/16 22:21		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WG409768LFB	09/15/16 22:24	MS160826-3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L32649-01	09/15/16 22:27			X							X							
L32649-02	09/15/16 22:30			X							X							
L32649-03	09/15/16 22:34			X							X							
L32649-04	09/15/16 22:37										X							
L32649-05	09/15/16 22:40										X							
L32649-05LFM	09/15/16 22:43	MS160826-3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L32649-05LFMD	09/15/16 22:46	MS160826-3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WG409909CCV1	09/15/16 22:49	MS160914-3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WG409909CCB1	09/15/16 22:52		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L32649-06	09/15/16 22:55			X							X							
L32730-01	09/15/16 22:59				X	X	X						X	X			X	
L32730-02	09/15/16 23:02				X	X	X						X	X			X	
L32752-07	09/15/16 23:05				X													
L32752-08	09/15/16 23:08				X													
L32754-01	09/15/16 23:11		X		X	X	X	X		X		X	X	X	X		X	
L32754-02	09/15/16 23:14					X	X	X		X								
L32754-03	09/15/16 23:18					X	X	X		X								
L32754-03LFM	09/15/16 23:21	MS160826-3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L32754-03LFMD	09/15/16 23:24	MS160826-3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WG409909CCV2	09/15/16 23:27	MS160914-3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WG409909CCB2	09/15/16 23:30		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L32759-01	09/15/16 23:33		X		X		X						X	X	X		X	

Teck Alaska Incorporated
Project ID: L32771

Metals Analysis

WG409909 **ICPMS Total 200-CC**

Sample	Date	SCN	Ag	Al	As	Be	Cd	Co	Cr	Cu	Mn	Mo	Pb	Sb	Se	Tl	U	Zn
L32759-02	09/15/16 23:36		X		X		X						X	X	X		X	
L32759-03	09/15/16 23:39		X		X		X						X	X	X		X	
L32761-01	09/15/16 23:43														X			
L32761-04	09/15/16 23:46														X			
L32771-01	09/15/16 23:49						X						X					X
L32771-02	09/15/16 23:52						X						X					X
WG409909CCV3	09/15/16 23:55	MS160914-3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WG409909CCB3	09/15/16 23:58		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Teck Alaska Incorporated
1370966-SVC

ACZ Project ID: L32771
Date Received: 09/07/2016 14:43
Received By: kmo
Date Printed: 9/7/2016

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]	X		
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
4718	2.1	NA	15	Yes

Was ice present in the shipment container(s)?

Yes - Gel ice was present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

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ACZ Project ID:	L32771
Date Received:	09/07/2016 14:43
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[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

L32771 Chain of Custody

L32771

TECK ALASKA INC - CHAIN OF CUSTODY

TO:
Sue Webber
ACZ Laboratories
2773 Downhill Drive
Steamboat Springs, CO 80487
Phone: 970-879-6590 ext. 110
Lab Phone: 800-334-5493

FROM:
Teck Alaska Inc.
3105 Lakeshore Drive
Bldg A - Suite 101
Anchorage Alaska 99517
Project Manager: Joe Diehl
Phone: 907-754-5109

Teck	PROJECT:	Marine Sediment Sampling			PO# 1330199-SVC		
	PROJECT COORDINATOR:	Joe Diehl/ Johanna Salatas			Page 1 of 1		
Sample I.D.	Location	TYPE	#Bottles	ANALYSIS	Collection Date	Collection Time	LAB I.D.
16-035_NMM-A	Marine Sediment NMM	SD	1	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	13:00	
16-036_NMGZ-A	Marine Sediment NMGZ	SD	1	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	13:14	
16-037_NMN-A	Marine Sediment NMN	SD	1	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	13:52	
16-038_NMO-A	Marine Sediment NMO	SD	2	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	14:02	
16-039_NMO-B	Marine Sediment NMO	SD	1	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	14:10	
16-040_NML-A	Marine Sediment NML	SD	1	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	14:43	
16-041_NMD-A	Marine Sediment NMD	SD	1	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	14:54	
16-042_NMAA-A	Marine Sediment NMAA	SD	1	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	15:14	
1. 16-043_EB	Marine Sediment Resinate Water	H2O	4	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	15:34	
2. 16-044_SB	Marine Sediment Resinate Water	H2O	4	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	15:37	

SAMPLE RELEASE BY:		SAMPLE RECEIVED BY:		SPECIAL INSTRUCTIONS:
Name:	Marissa Attard	Name:	Daniel Reyes	E-MAIL RESULTS TO: Enviro.Transfer@teck.com
Signature:		Signature:		NO IMPORT EDD REQUIRED. ANALYSIS REPORT ONLY.
Firm:	Teck Alaska Inc.	Firm:	ACZ	Also please e-mail Final Report to: joe.diehl@teck.com rebecca.hager@teck.com
Date/Time:	9-6-16 10:00	Date/Time:	9/7/16 14:43	

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Revised Analytical Report

November 09, 2016

Report to:
Joe Diehl
Teck Alaska Incorporated
P.O. Box 1230

Kotzebue, AK 99752

cc: Rebecca Hager

Bill to:
Accounts Payable
Teck Alaska Incorporated
3105 Lakeshore Drive
Bldg. A - Suite 101
Anchorage, AK 99517

Project ID: 1370966-SVC
ACZ Project ID: L32770

Joe Diehl:

Enclosed are revised analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on September 07, 2016 and originally reported on September 21, 2016. Refer to the case narrative for an explanation of the changes. This project was assigned to ACZ's project number, L32770. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L32770. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after September 21, 2017. If the samples are determined to be hazardous, additional charges apply for disposal (typically less than $10/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical reports for five years.

If you have any questions or other needs, please contact your Project Manager.

Sue Webber has reviewed and approved this report.

TECK ALASKA INCORPORATED

Level IV Data Package – L32770
Table of Contents

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Summary

ACZ Project ID: ***L32770***

SAMPLE ID	LAB NO.	SAMPLE DATE	SAMPLE TIME
16-035 NMM-A	L32770-01	9/4/2016	13:00
16-036 NMGZ-A	L32770-02	9/4/2016	13:14
16-037 NMN-A	L32770-03	9/4/2016	13:52
16-038 NMO-A	L32770-04	9/4/2016	14:02
16-039 NMO-B	L32770-05	9/4/2016	14:10
16-040 NML-A	L32770-06	9/4/2016	14:43
16-041 NMD-A	L32770-07	9/4/2016	14:54
16-042 NMAA-A	L32770-08	9/4/2016	15:14

Teck Alaska Incorporated

November 09, 2016

Project ID: 1370966-SVC
ACZ Project ID: L32770

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 8 sediment samples from Teck Alaska Incorporated on September 7, 2016. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L32770. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports.

This report was revised on 11/9/16 to provide a Level IV Data Package. No other changes were made.

Teck Alaska Incorporated
Project ID: 1370966-SVC
Sample ID: 16-035 NMM-A

ACZ Sample ID: ***L32770-01***
Date Sampled: *09/04/16 13:00*
Date Received: *09/07/16*
Sample Matrix: *Sediment*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cadmium, total (3050)	M6020 ICP-MS	500	0.19	B		mg/Kg	0.05	0.3	09/20/16 19:53	enb
Lead, total (3050)	M6020 ICP-MS	500	14.60			mg/Kg	0.05	0.3	09/20/16 19:53	enb
Zinc, total (3050)	M6020 ICP-MS	500	89			mg/Kg	1	3	09/20/16 19:53	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	84.3		*	%	0.1	0.5	09/12/16 13:48	rbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								09/12/16 8:39	rbt
Digestion - Hot Plate	M3050B ICP-MS								09/15/16 20:05	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								09/15/16 9:02	rbt

Teck Alaska Incorporated
Project ID: 1370966-SVC
Sample ID: 16-036 NMGZ-A

ACZ Sample ID: ***L32770-02***
Date Sampled: *09/04/16 13:14*
Date Received: *09/07/16*
Sample Matrix: *Sediment*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cadmium, total (3050)	M6020 ICP-MS	500	0.11	B		mg/Kg	0.05	0.3	09/20/16 19:55	enb
Lead, total (3050)	M6020 ICP-MS	500	7.89			mg/Kg	0.05	0.3	09/20/16 19:55	enb
Zinc, total (3050)	M6020 ICP-MS	500	48			mg/Kg	1	3	09/20/16 19:55	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	94		*	%	0.1	0.5	09/12/16 16:12	rbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								09/12/16 8:42	rbt
Digestion - Hot Plate	M3050B ICP-MS								09/15/16 21:51	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								09/15/16 9:05	rbt

Teck Alaska Incorporated
Project ID: 1370966-SVC
Sample ID: 16-037 NMN-A

ACZ Sample ID: ***L32770-03***
Date Sampled: *09/04/16 13:52*
Date Received: *09/07/16*
Sample Matrix: *Sediment*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cadmium, total (3050)	M6020 ICP-MS	500	0.23	B		mg/Kg	0.05	0.3	09/20/16 19:57	enb
Lead, total (3050)	M6020 ICP-MS	500	11.70			mg/Kg	0.05	0.3	09/20/16 19:57	enb
Zinc, total (3050)	M6020 ICP-MS	500	59			mg/Kg	1	3	09/20/16 19:57	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	73.1		*	%	0.1	0.5	09/12/16 18:36	rbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								09/12/16 8:45	rbt
Digestion - Hot Plate	M3050B ICP-MS								09/15/16 23:37	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								09/15/16 9:07	rbt

Teck Alaska Incorporated
Project ID: 1370966-SVC
Sample ID: 16-038 NMO-A

ACZ Sample ID: ***L32770-04***
Date Sampled: *09/04/16 14:02*
Date Received: *09/07/16*
Sample Matrix: *Sediment*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cadmium, total (3050)	M6020 ICP-MS	500	0.24	B		mg/Kg	0.05	0.3	09/20/16 20:00	enb
Lead, total (3050)	M6020 ICP-MS	500	7.49			mg/Kg	0.05	0.3	09/20/16 20:00	enb
Zinc, total (3050)	M6020 ICP-MS	500	58			mg/Kg	1	3	09/20/16 20:00	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	73.3		*	%	0.1	0.5	09/12/16 21:00	rbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								09/12/16 8:48	rbt
Digestion - Hot Plate	M3050B ICP-MS								09/16/16 1:23	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								09/15/16 9:10	rbt

Teck Alaska Incorporated
Project ID: 1370966-SVC
Sample ID: 16-039 NMO-B

ACZ Sample ID: ***L32770-05***
Date Sampled: *09/04/16 14:10*
Date Received: *09/07/16*
Sample Matrix: *Sediment*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cadmium, total (3050)	M6020 ICP-MS	500	0.24	B		mg/Kg	0.05	0.3	09/20/16 20:10	enb
Lead, total (3050)	M6020 ICP-MS	500	7.54			mg/Kg	0.05	0.3	09/20/16 20:10	enb
Zinc, total (3050)	M6020 ICP-MS	500	56			mg/Kg	1	3	09/20/16 20:10	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	74		*	%	0.1	0.5	09/13/16 1:48	rbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								09/12/16 8:51	rbt
Digestion - Hot Plate	M3050B ICP-MS								09/16/16 6:41	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								09/15/16 9:12	rbt

Teck Alaska Incorporated
Project ID: 1370966-SVC
Sample ID: 16-040 NML-A

ACZ Sample ID: ***L32770-06***
Date Sampled: *09/04/16 14:43*
Date Received: *09/07/16*
Sample Matrix: *Sediment*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cadmium, total (3050)	M6020 ICP-MS	500	0.26	B		mg/Kg	0.05	0.3	09/20/16 20:12	enb
Lead, total (3050)	M6020 ICP-MS	500	16.30			mg/Kg	0.05	0.3	09/20/16 20:12	enb
Zinc, total (3050)	M6020 ICP-MS	500	59			mg/Kg	1	3	09/20/16 20:12	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	85.7		*	%	0.1	0.5	09/13/16 4:12	rbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								09/12/16 8:54	rbt
Digestion - Hot Plate	M3050B ICP-MS								09/16/16 8:27	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								09/15/16 9:15	rbt

Teck Alaska Incorporated
Project ID: 1370966-SVC
Sample ID: 16-041 NMD-A

ACZ Sample ID: ***L32770-07***
Date Sampled: *09/04/16 14:54*
Date Received: *09/07/16*
Sample Matrix: *Sediment*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cadmium, total (3050)	M6020 ICP-MS	500	0.18	B		mg/Kg	0.05	0.3	09/20/16 20:17	enb
Lead, total (3050)	M6020 ICP-MS	500	17.40			mg/Kg	0.05	0.3	09/20/16 20:17	enb
Zinc, total (3050)	M6020 ICP-MS	500	67			mg/Kg	1	3	09/20/16 20:17	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	90.5		*	%	0.1	0.5	09/13/16 6:36	rbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								09/12/16 8:57	rbt
Digestion - Hot Plate	M3050B ICP-MS								09/16/16 10:13	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								09/15/16 9:17	rbt

Teck Alaska Incorporated
Project ID: 1370966-SVC
Sample ID: 16-042 NMAA-A

ACZ Sample ID: ***L32770-08***
Date Sampled: *09/04/16 15:14*
Date Received: *09/07/16*
Sample Matrix: *Sediment*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cadmium, total (3050)	M6020 ICP-MS	500	0.19	B		mg/Kg	0.05	0.3	09/20/16 20:19	enb
Lead, total (3050)	M6020 ICP-MS	500	6.01			mg/Kg	0.05	0.3	09/20/16 20:19	enb
Zinc, total (3050)	M6020 ICP-MS	500	52			mg/Kg	1	3	09/20/16 20:19	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	73.3		*	%	0.1	0.5	09/13/16 9:00	rbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								09/12/16 9:00	rbt
Digestion - Hot Plate	M3050B ICP-MS								09/16/16 11:59	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								09/15/16 9:20	rbt

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1)	EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2)	EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3)	EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4)	EPA SW-846. Test Methods for Evaluating Solid Waste.
(5)	Standard Methods for the Examination of Water and Wastewater.

Comments

(1)	QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2)	Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3)	Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4)	An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5)	If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Teck Alaska Incorporated

ACZ Project ID: ***L32770***

Cadmium, total (3050) M6020 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG410083													
WG410083ICV	ICV	09/20/16 19:36	MS160920-1	.05		.04663	mg/L	93	90	110			
WG410083ICB	ICB	09/20/16 19:38				U	mg/L		-0.0003	0.0003			
WG410083ICSA	ICSA	09/20/16 19:40				U	mg/L		-0.0005	0.0005			
WG410083ICSAB	ICSAB	09/20/16 19:42	MS160826-5	.02002		.01796	mg/L	90	80	120			
WG409857PBS	PBS	09/20/16 19:47				U	mg/Kg		-0.15	0.15			
WG409857LCSS	LCSS	09/20/16 19:49	PCN51904	76.6		77.3	mg/Kg		63.1	90.1			
WG409857LCSSD	LCSSD	09/20/16 19:51	PCN51904	76.6		80.25	mg/Kg		63.1	90.1	4	20	
L32770-04MS	MS	09/20/16 20:02	MS160803-3	25.025	.24	24.645	mg/Kg	98	75	125			
WG410083CCV1	CCV	09/20/16 20:04	MS160914-3	.1001		.1001	mg/L	100	90	110			
WG410083CCB1	CCB	09/20/16 20:06				U	mg/L		-0.0003	0.0003			
L32770-04MSD	MSD	09/20/16 20:08	MS160803-3	25.025	.24	24.82	mg/Kg	98	75	125	1	20	
L32770-06SDL	SDL	09/20/16 20:14			.26	U	mg/Kg					10	
WG410083CCV2	CCV	09/20/16 20:21	MS160914-3	.1001		.09777	mg/L	98	90	110			
WG410083CCB2	CCB	09/20/16 20:23				U	mg/L		-0.0003	0.0003			

Lead, total (3050) M6020 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG410083													
WG410083ICV	ICV	09/20/16 19:36	MS160920-1	.05		.05067	mg/L	101	90	110			
WG410083ICB	ICB	09/20/16 19:38				U	mg/L		-0.0003	0.0003			
WG410083ICSAB	ICSAB	09/20/16 19:42	MS160826-5	.02002		.01873	mg/L	94	80	120			
WG409857PBS	PBS	09/20/16 19:47				U	mg/Kg		-0.15	0.15			
WG409857LCSS	LCSS	09/20/16 19:49	PCN51904	96.7		98.55	mg/Kg		79	114			
WG409857LCSSD	LCSSD	09/20/16 19:51	PCN51904	96.7		99.2	mg/Kg		79	114	1	20	
L32770-04MS	MS	09/20/16 20:02	MS160803-3	25.025	7.49	33.565	mg/Kg	104	75	125			
WG410083CCV1	CCV	09/20/16 20:04	MS160914-3	.25025		.2479	mg/L	99	90	110			
WG410083CCB1	CCB	09/20/16 20:06				.00011	mg/L		-0.0003	0.0003			
L32770-04MSD	MSD	09/20/16 20:08	MS160803-3	25.025	7.49	34.695	mg/Kg	109	75	125	3	20	
L32770-06SDL	SDL	09/20/16 20:14			16.3	15.515	mg/Kg				5	10	
WG410083CCV2	CCV	09/20/16 20:21	MS160914-3	.25025		.2456	mg/L	98	90	110			
WG410083CCB2	CCB	09/20/16 20:23				.0001	mg/L		-0.0003	0.0003			

Solids, Percent D2216-80

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG409607													
WG409607PBS	PBS	09/12/16 9:00				U	%		-0.1	0.1			
L32770-04DUP	DUP	09/12/16 23:24			73.3	73.52	%				0	20	

Teck Alaska Incorporated

ACZ Project ID: ***L32770***

Zinc, total (3050) M6020 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG410083													
WG410083ICV	ICV	09/20/16 19:36	MS160920-1	.05		.0488	mg/L	98	90	110			
WG410083ICB	ICB	09/20/16 19:38				U	mg/L		-0.006	0.006			
WG410083ICSAB	ICSAB	09/20/16 19:42	MS160826-5	.020054		.0192	mg/L	96	80	120			
WG409857PBS	PBS	09/20/16 19:47				U	mg/Kg		-3	3			
WG409857LCSS	LCSS	09/20/16 19:49	PCN51904	229		238	mg/Kg		188	271			
WG409857LCSSD	LCSSD	09/20/16 19:51	PCN51904	229		239	mg/Kg		188	271	0	20	
L32770-04MS	MS	09/20/16 20:02	MS160803-3	25.0675	58	84	mg/Kg	104	75	125			
WG410083CCV1	CCV	09/20/16 20:04	MS160914-3	.50135		.4922	mg/L	98	90	110			
WG410083CCB1	CCB	09/20/16 20:06				U	mg/L		-0.006	0.006			
L32770-04MSD	MSD	09/20/16 20:08	MS160803-3	25.0675	58	81.3	mg/Kg	93	75	125	3	20	
L32770-06SDL	SDL	09/20/16 20:14			59	58	mg/Kg				2	10	
WG410083CCV2	CCV	09/20/16 20:21	MS160914-3	.50135		.4906	mg/L	98	90	110			
WG410083CCB2	CCB	09/20/16 20:23				U	mg/L		-0.006	0.006			

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Extended Qualifier Report

Teck Alaska Incorporated ACZ Project ID: ***L32770***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION

No extended qualifiers associated with this analysis

Teck Alaska Incorporated ACZ Project ID: ***L32770***

Soil Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Solids, Percent	D2216-80

ICPMS Total 3050

QC List Type: QC-ICPMS-846
QCListMatClass: SOLID
Bench Sheet List: R-RA-226
QC Ref: MA-ICPMS-T-846
Group ID: MA-G-MS-3050
Method Ref: M6020
SOP Ref: SOPII022

WG410083

ACZ Laboratories, Inc

Instrument ID: ICPMS5
Analyst: ENB
ACZ Dept: 33
Create Date: 09/20/2016 11:57
Start Date/Time:
End Date/Time:

SEQ	ACZ ID	Client ID	SubSX	Pri	Prep Dil	EC	TDS	CD MS 30 50	PB MS 30 50	ZN MS 30 50	Dilution
1	WG410083ICV	~~MS160823-2~~	MS160920-1		1			☑	☑	☑	1
2	WG410083ICB	NONE			1			☑	☑	☑	1
3	WG410083ICSA	MS160826-4			1			☑	☑	☑	1
4	WG410083ICSAB	MS160826-5			1			☑	☑	☑	1
5	WG410083WASH	NONE			1			☑	☑	☑	1
6	WG409857PBS	NONE			100			☑	☑	☑	500
7	WG409857LCSS	PCN51904			100			☑	☑	☑	5000
8	WG409857LCSSD	PCN51904			100			☑	☑	☑	5000
9	L32770-01	16-035 NMM-A			100			☑	☑	☑	500
10	L32770-02	16-036 NMGZ-A			100			☑	☑	☑	500
11	L32770-03	16-037 NMN-A			100			☑	☑	☑	500
12	**L32770-04** ENB 9/20/16	16-038 NMO-A			100			☑	☑	☑	500
13	WG410083CCV1	~~MS160720-7~~ MS160914-3			1			☑	☑	☑	1
14	WG410083CCB1	NONE			1			☑	☑	☑	1
15	L32770-04MS	MS160803-3			100			☑	☑	☑	500
16	L32770-04MSD	MS160803-3			100			☑	☑	☑	500
17	L32770-05	16-039 NMO-B			100			☑	☑	☑	500
18	L32770-06	16-040 NML-A			100			☑	☑	☑	500
19	L32770-06SDL	NONE			1			☑	☑	☑	500
20	L32770-07	16-041 NMD-A			100			☑	☑	☑	500
21	L32770-08	16-042 NMAA-A			100			☑	☑	☑	500
22	WG410083CCV2	~~MS160720-7~~ MS160914-3			1			☑	☑	☑	1

Report Comments:

Internal Comments

AREV: ENB 9/21/16
Initials, Date

SREV: 9.21.16
Initials, Date

ICPMS Total 3050

QC List Type: QC-ICPMS-846
QCListMatClass: SOLID
Bench Sheet List: R-RA-226
QC Ref: MA-ICPMS-T-846
Group ID: MA-G-MS-3050
Method Ref: M6020
SOP Ref: SOPII022

WG410083

ACZ Laboratories, Inc

Instrument ID: ICPMS5
Analyst:
ACZ Dept: 33
Create Date: 09/20/2016 11:57
Start Date/Time:
End Date/Time:

SEQ	ACZ ID	Client ID	SubSX	Pri	Prep Dil	EC	TDS	CD MS 30 50	PB MS 30 50	ZN MS 30 50	Dilution
23	WG410083CCB2	NONE			1			☑	☑	☑	1

Sample	Login Comments
L32770-01	SJ || In the Inorganic cooler.
L32770-02	SJ || In the Inorganic cooler.
L32770-03	SJ || In the Inorganic cooler.
L32770-04	SJ(2) || In the Inorganic cooler. Run QC.
L32770-04MS	ICPMS Spike
L32770-04MSD	ICPMS Spike
L32770-05	SJ || In the Inorganic cooler.
L32770-06	SJ || In the Inorganic cooler.
L32770-07	SJ || In the Inorganic cooler.
L32770-08	SJ || In the Inorganic cooler.

Report Comments: _____

AREV: _____
Initials, Date

Internal Comments _____

SREV: _____
Initials, Date

ACZ Laboratories, Inc.

ICPMS DATA REVIEW CHECKLIST

AREV:	ENB
Date:	9/21/16
SREV:	
Date:	9.21.16

Workgroup:	416083
Sample Type:	3050
Analysis Date:	9/20/16
Analyst:	ENB

	Yes	No	N/A
1) Is the instrument ID on the bench sheet correct?	✓		
2) Has a passing method tune been performed within 24 hours?	✓		
3) Was the low calibration point dropped? If yes, notify PM of change to PQLs.			✓
4) Is the linear regression ≥ 0.995 for the analytes of interest?	✓		
5) Was the PQV standard analyzed & evaluated for DW samples ? (Fail in LIMS if no DW sxs in WG.)			✓
6) Do the dilution factors on the benchsheet match the sequence in the raw data?	✓		
7) Is any sample analyzed on dilution appropriately "D" qualified (not required for o-cal, EC, TDS)?			✓
8) Is the correct sub-sample type entered on the bench sheet (if different than SOP)?			✓
9) Are the % Recoveries of the internal standards within the method limits?	✓		
10) Are all of the QC critera listed in LIMS within specified limits?	✓		
11) Are all samples requiring re-analysis / re-digestion at REDO / REDX status?			✓
12) Are all errors properly crossed out (i.e. single-line, dated & initialed)?	✓		
13) Is a current standard/reagent form attached to the workgroup?	✓		
14) **FOR SREV**: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	✓		

For any of the items listed above that are checked "No" state the corrective action/explanation below.

QC/Sample ID	Analytical Problem	Corrective action

ACZ Labs, Inc.
Standards/Reagents Information
ICPMS, Methods 6020 and 200.8

Calibration Standards

6020/200.8 Stock #1: MS160914-1 SCN
6020/200.8 Stock #2: MS160914-2 SCN
6020/200.8 Stock #3: MS160720-4 SCN

PQV STD: MS160901-3 SCN
Exp. 11/30/2016

INT STD: MS160128-3 SCN
Exp. 1/28/2017

Nitric Acid: 51826 PCN

Hydrochloric Acid: 51742 PCN

VERIFIED: ENB

WG410083

Date Reported: 21-Sep-16
Run ID: R1452918
Date Analyzed: 20-Sep-16
ICAL Workgroup:
Instrument ID: ICPMS5

WG410083ICV

Tag:

Measured: 9/20/2016 7:36:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	FOUND	0.04663	1		mg/L	++	0.0001	0.0005			
SREV	CADMIUM	REC	93	1		%	++	0.0001	0.0005			
SREV	LEAD	FOUND	0.05067	1		mg/L	++	0.0001	0.0005			
SREV	LEAD	REC	101	1		%	++	0.0001	0.0005			
SREV	ZINC	FOUND	0.0488	1		mg/L	++	0.002	0.005			
SREV	ZINC	REC	98	1		%	++	0.002	0.005			

WG410083ICB

Tag:

Measured: 9/20/2016 7:38:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	LEAD	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	ZINC	FOUND		1	U	mg/L	++	0.002	0.005			

WG410083ICSA

Tag:

Measured: 9/20/2016 7:40:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			

WG410083ICSAB

Tag:

Measured: 9/20/2016 7:42:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	FOUND	0.01796	1		mg/L	++	0.0001	0.0005			
SREV	CADMIUM	REC	90	1		%	++	0.0001	0.0005			
SREV	LEAD	FOUND	0.01873	1		mg/L	++	0.0001	0.0005			
SREV	LEAD	REC	94	1		%	++	0.0001	0.0005			
SREV	ZINC	FOUND	0.0192	1		mg/L	++	0.002	0.005			
SREV	ZINC	REC	96	1		%	++	0.002	0.005			

WG409857PBS

Tag:

Measured: 9/20/2016 7:47:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	FOUND		500	U	mg/Kg	++	0.05	0.3			
SREV	LEAD	FOUND		500	U	mg/Kg	++	0.05	0.3			
SREV	ZINC	FOUND		500	U	mg/Kg	++	1	3			

WG409857LCSS

Tag:

Measured: 9/20/2016 7:49:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	FOUND	77.3	5000		mg/Kg	++	0.5	3			
SREV	CADMIUM	REC	101	5000		%	++	0.5	3			
SREV	LEAD	FOUND	98.55	5000		mg/Kg	++	0.5	3			
SREV	LEAD	REC	102	5000		%	++	0.5	3			
SREV	ZINC	FOUND	238	5000		mg/Kg	++	10	30			
SREV	ZINC	REC	104	5000		%	++	10	30			

WG409857LCSSD

Tag:

Measured: 9/20/2016 7:51:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	FOUND	80.25	5000		mg/Kg	++	0.5	3			
SREV	CADMIUM	REC	105	5000		%	++	0.5	3			
SREV	CADMIUM	RPD	4	5000		%	++	0.5	3			
SREV	LEAD	FOUND	99.2	5000		mg/Kg	++	0.5	3			
SREV	LEAD	REC	103	5000		%	++	0.5	3			
SREV	LEAD	RPD	1	5000		%	++	0.5	3			
SREV	ZINC	FOUND	239	5000		mg/Kg	++	10	30			
SREV	ZINC	REC	104	5000		%	++	10	30			
SREV	ZINC	RPD	0	5000		%	++	10	30			

L32770-01

Tag:

Measured: 9/20/2016 7:53:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	-MS-3050	0.19	500	B	mg/Kg	++	0.05	0.3			
SREV	LEAD	-MS-3050	14.60	500		mg/Kg	++	0.05	0.3			
SREV	ZINC	-MS-3050	89	500		mg/Kg	++	1	3			

L32770-02

Tag:

Measured: 9/20/2016 7:55:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	-MS-3050	0.11	500	B	mg/Kg	++	0.05	0.3			
SREV	LEAD	-MS-3050	7.89	500		mg/Kg	++	0.05	0.3			
SREV	ZINC	-MS-3050	48	500		mg/Kg	++	1	3			

L32770-03

Tag:

Measured: 9/20/2016 7:57:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	-MS-3050	0.23	500	B	mg/Kg	++	0.05	0.3			
SREV	LEAD	-MS-3050	11.70	500		mg/Kg	++	0.05	0.3			
SREV	ZINC	-MS-3050	59	500		mg/Kg	++	1	3			

L32770-04

Tag:

Measured: 9/20/2016 8:00:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	-MS-3050	0.24	500	B	mg/Kg	++	0.05	0.3			
SREV	LEAD	-MS-3050	7.49	500		mg/Kg	++	0.05	0.3			
SREV	ZINC	-MS-3050	58	500		mg/Kg	++	1	3			

L32770-04MS

Tag:

Measured: 9/20/2016 8:02:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	FOUND	24.645	500		mg/Kg	++	0.05	0.3			
SREV	CADMIUM	REC	98	500		%	++	0.05	0.3			
SREV	LEAD	FOUND	33.565	500		mg/Kg	++	0.05	0.3			
SREV	LEAD	REC	104	500		%	++	0.05	0.3			
SREV	ZINC	FOUND	84	500		mg/Kg	++	1	3			
SREV	ZINC	REC	104	500		%	++	1	3			

WG410083CCV1

Tag: Measured: 9/20/2016 8:04:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	FOUND	0.1001	1		mg/L	++	0.0001	0.0005			
SREV	CADMIUM	REC	100	1		%	++	0.0001	0.0005			
SREV	LEAD	FOUND	0.2479	1		mg/L	++	0.0001	0.0005			
SREV	LEAD	REC	99	1		%	++	0.0001	0.0005			
SREV	ZINC	FOUND	0.4922	1		mg/L	++	0.002	0.005			
SREV	ZINC	REC	98	1		%	++	0.002	0.005			

WG410083CCB1

Tag: Measured: 9/20/2016 8:06:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	LEAD	FOUND	0.00011	1	B	mg/L	++	0.0001	0.0005			
SREV	ZINC	FOUND		1	U	mg/L	++	0.002	0.005			

L32770-04MSD

Tag: Measured: 9/20/2016 8:08:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	FOUND	24.82	500		mg/Kg	++	0.05	0.3			
SREV	CADMIUM	REC	98	500		%	++	0.05	0.3			
SREV	CADMIUM	RPD	1	500		%	++	0.05	0.3			
SREV	LEAD	FOUND	34.695	500		mg/Kg	++	0.05	0.3			
SREV	LEAD	REC	109	500		%	++	0.05	0.3			
SREV	LEAD	RPD	3	500		%	++	0.05	0.3			
SREV	ZINC	FOUND	81.3	500		mg/Kg	++	1	3			
SREV	ZINC	REC	93	500		%	++	1	3			
SREV	ZINC	RPD	3	500		%	++	1	3			

L32770-05

Tag: Measured: 9/20/2016 8:10:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	-MS-3050	0.24	500	B	mg/Kg	++	0.05	0.3			
SREV	LEAD	-MS-3050	7.54	500		mg/Kg	++	0.05	0.3			
SREV	ZINC	-MS-3050	56	500		mg/Kg	++	1	3			

L32770-06

Tag: Measured: 9/20/2016 8:12:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	-MS-3050	0.26	500	B	mg/Kg	++	0.05	0.3			
SREV	LEAD	-MS-3050	16.30	500		mg/Kg	++	0.05	0.3			
SREV	ZINC	-MS-3050	59	500		mg/Kg	++	1	3			

L32770-06SDL

Tag: Measured: 9/20/2016 8:14:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	D		500	U	%	++	0.05	0.3			
SREV	CADMIUM	FOUND		500	U	mg/Kg	++	0.05	0.3			
SREV	CADMIUM	REG	0	500	U	mg/Kg	++	0.05	0.3			
SREV	LEAD	D	5	500		%	++	0.05	0.3			
SREV	LEAD	FOUND	3.103	500		mg/Kg	++	0.05	0.3			
SREV	LEAD	REG	15.515	500		mg/Kg	++	0.05	0.3			
SREV	ZINC	D	2	500		%	++	1	3			
SREV	ZINC	FOUND	11.6	500		mg/Kg	++	1	3			
SREV	ZINC	REG	58	500		mg/Kg	++	1	3			

L32770-07

Tag: Measured: 9/20/2016 8:17:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	-MS-3050	0.18	500	B	mg/Kg	++	0.05	0.3			
SREV	LEAD	-MS-3050	17.40	500		mg/Kg	++	0.05	0.3			
SREV	ZINC	-MS-3050	67	500		mg/Kg	++	1	3			

L32770-08

Tag: Measured: 9/20/2016 8:19:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	-MS-3050	0.19	500	B	mg/Kg	++	0.05	0.3			
SREV	LEAD	-MS-3050	6.01	500		mg/Kg	++	0.05	0.3			
SREV	ZINC	-MS-3050	52	500		mg/Kg	++	1	3			

WG410083CCV2

Tag: Measured: 9/20/2016 8:21:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	FOUND	0.09777	1		mg/L	++	0.0001	0.0005			
SREV	CADMIUM	REC	98	1		%	++	0.0001	0.0005			
SREV	LEAD	FOUND	0.2456	1		mg/L	++	0.0001	0.0005			
SREV	LEAD	REC	98	1		%	++	0.0001	0.0005			
SREV	ZINC	FOUND	0.4906	1		mg/L	++	0.002	0.005			
SREV	ZINC	REC	98	1		%	++	0.002	0.005			

WG410083CCB2

Tag: Measured: 9/20/2016 8:23:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	CADMIUM	FOUND		1	U	mg/L	++	0.0001	0.0005			
SREV	LEAD	FOUND	0.0001	1	B	mg/L	++	0.0001	0.0005			
SREV	ZINC	FOUND		1	U	mg/L	++	0.002	0.005			

Calibration Coefficients

Sample Name: **ICV**
Date Acquired: **Sep 20 2016 07:36 pm**
Acq. Method: **ACZ_T3.M**
Current Method Pa**ICPCHEM\1\DATA\wg410083.b**
Calibration Path**ICPCHEM\1\DATA\wg410083.b**

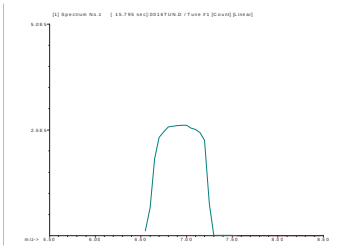
Element Name	Mass	Calibration Corr Coef	Tune Step	IS Ref
Be	9	1.0000	3	6
B	11	1.0000	3	6
Al	27	1.0000	3	72
Mn	55	1.0000	3	72
Co	59	0.9999	3	72
Zn	66	0.9999	3	72
Mo	98	1.0000	3	115
Ag	107	1.0000	3	115
Cd	111	1.0000	3	115
Sn	118	1.0000	3	115
Sb	121	0.9997	3	115
Te	125	1.0000	3	115
Cs	133	1.0000	3	115
Ba	137	1.0000	3	115
Tl	205	1.0000	3	209
Pb	208	1.0000	3	209
Th	232	1.0000	3	209
U	238	1.0000	3	209

6020 QC Tune Report

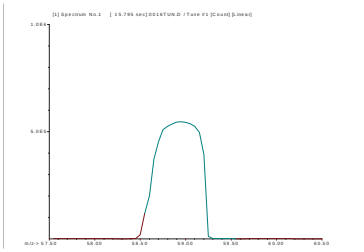
Data File: C:\ICPCHEM\1\DATA\160920at.b\0016TUN.D
Date Acquired: Sep 20 2016 11:47 am
Acq. Method: TN6020.M
Operator: SCP
Sample Name: 6020 Tune
Misc Info:
Vial Number: 1201
Current Method: C:\ICPCHEM\1\METHODS\TN6020.M

RSD (%)

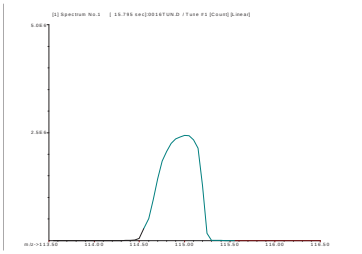
Element	Actual	Required	Flag
7 Li	1.41	5.00	
59 Co	1.17	5.00	
115 In	0.96	5.00	
205 Tl	0.23	5.00	



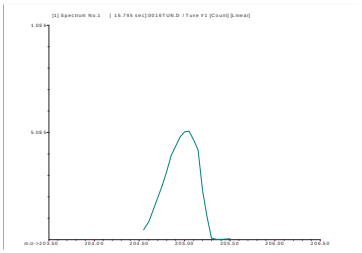
7 Li
Mass Calib.
Actual: 6.90
Required: 6.90 - 7.10
Flag:
Peak Width
Actual: 0.65
Required: 0.90
Flag:



59 Co
Mass Calib.
Actual: 58.95
Required: 58.90 - 59.10
Flag:
Peak Width
Actual: 0.65
Required: 0.90
Flag:



115 In
Mass Calib.
Actual: 115.00
Required: 114.90 - 115.10
Flag:
Peak Width
Actual: 0.60
Required: 0.90
Flag:



205 Tl
Mass Calib.
Actual: 205.00
Required: 204.90 - 205.10
Flag:
Peak Width
Actual: 0.65
Required: 0.90
Flag:

Calibration Blank QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\001CAL
Date Acquired: Sep 20 2016 07:22 pm
Operator:
Sample Name: Calblk
Misc Info:
Vial Number: 1101
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal Update: Sep 20 2016 07:22 pm
Sample Type: CalBlk
Total Dil Factor: 1.00

QC&ISTD Elements

Element		CPS Mean		SD	RSD(%)
6	Li	4566235.00	A	61740.00	1.35
9	Be	168.90	P	18.36	10.87
11	B	30941.05	P	420.60	1.36
27	Al	70537.19	P	651.80	0.92
45	Sc	19370370.00	A	199400.00	1.03
55	Mn	17874.63	P	367.90	2.06
59	Co	794.49	P	113.40	14.27
66	Zn	6333.80	P	197.50	3.12
72	Ge	4289881.00	A	28160.00	0.66
74	Ge	5910697.00	A	30010.00	0.51
98	Mo	460.39	P	34.85	7.57
99			P		
106	Cd		P		
107	Ag	438.91	P	31.68	7.22
108	Cd		P		
111	Cd	106.66	P	24.04	22.54
115	In	15593900.00	A	118200.00	0.76
118	Sn	2813.73	P	108.20	3.85
121	Sb	3118.18	P	235.60	7.56
125	Te	50.00	P	0.00	0.00
133	Cs	1499.02	P	85.02	5.67
137	Ba	687.82	P	33.39	4.85
159	Tb	20004970.00	A	156800.00	0.78
205	Tl	1439.02	P	102.90	7.15
206	Pb		P		
207	Pb		P		
208	Pb	2784.67	P	160.60	5.77
209	Bi	22159350.00	A	57540.00	0.26
232	Th	5174.56	P	215.40	4.16
238	U	1020.08	P	56.97	5.58

Calibration Blank QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\002CAL
Date Acquired: Sep 20 2016 07:24 pm
Operator:
Sample Name: Calblk
Misc Info:
Vial Number: 1101
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal Update: Sep 20 2016 07:22 pm
Sample Type: CalBlk
Total Dil Factor: 1.00

QC&ISTD Elements

Element		CPS Mean		SD	RSD(%)
6	Li	4531410.00	A	52600.00	1.16
9	Be	137.78	P	28.35	20.58
11	B	29775.44	P	423.70	1.42
27	Al	68772.84	P	232.30	0.34
45	Sc	19170410.00	A	67770.00	0.35
55	Mn	17587.67	P	67.49	0.38
59	Co	495.58	P	41.95	8.46
66	Zn	6161.52	P	194.80	3.16
72	Ge	4239380.00	A	11600.00	0.27
74	Ge	5823343.00	A	43750.00	0.75
98	Mo	359.73	P	49.32	13.71
99			P		
106	Cd		P		
107	Ag	427.83	P	52.16	12.19
108	Cd		P		
111	Cd	58.69	P	26.87	45.78
115	In	15353640.00	A	221700.00	1.44
118	Sn	2408.08	P	56.72	2.36
121	Sb	2224.66	P	106.80	4.80
125	Te	30.00	P	3.33	11.11
133	Cs	994.52	P	53.48	5.38
137	Ba	500.03	P	48.42	9.68
159	Tb	19554370.00	A	83560.00	0.43
205	Tl	1083.42	P	66.43	6.13
206	Pb		P		
207	Pb		P		
208	Pb	1807.89	P	86.05	4.76
209	Bi	21960440.00	A	209300.00	0.95
232	Th	3171.61	P	374.60	11.81
238	U	713.38	P	25.16	3.53

Calibration Blank QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\003CAL
Date Acquired: Sep 20 2016 07:26 pm
Operator:
Sample Name: Calblk
Misc Info:
Vial Number: 1102
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal Update: Sep 20 2016 07:24 pm
Sample Type: CalBlk
Total Dil Factor: 1.00

QC&ISTD Elements

Element		CPS Mean		SD	RSD(%)
6	Li	4492700.00	A	25520.00	0.57
9	Be	241.12	P	13.47	5.59
11	B	28499.71	P	250.60	0.88
27	Al	65259.75	P	657.50	1.01
45	Sc	19038030.00	A	45380.00	0.24
55	Mn	18033.64	P	177.50	0.98
59	Co	1230.10	P	70.96	5.77
66	Zn	2376.94	P	60.66	2.55
72	Ge	4215162.00	A	61510.00	1.46
74	Ge	5782803.00	A	47310.00	0.82
98	Mo	550.58	P	57.15	10.38
99			P		
106	Cd		P		
107	Ag	376.69	P	40.00	10.62
108	Cd		P		
111	Cd	144.85	P	13.73	9.48
115	In	15293280.00	A	195300.00	1.28
118	Sn	1853.54	P	138.70	7.48
121	Sb	1805.70	P	161.80	8.96
125	Te	37.78	P	3.85	10.19
133	Cs	1945.76	P	129.00	6.63
137	Ba	620.04	P	38.45	6.20
159	Tb	19484250.00	A	121200.00	0.62
205	Tl	1706.84	P	102.70	6.02
206	Pb		P		
207	Pb		P		
208	Pb	3691.46	P	120.70	3.27
209	Bi	21710270.00	A	389700.00	1.80
232	Th	3132.71	P	194.90	6.22
238	U	1535.71	P	60.59	3.95

Calibration Standard QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\004CALS.D\004CALS.D#
Date Acquired: Sep 20 2016 07:28 pm
Operator:
Sample Name: PQV Std
Misc Info:
Vial Number: 1103
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal Update: Sep 20 2016 07:27 pm
Sample Type: CalStd
Total Dil Factor: 1.00

QC&ISTD Elements

Element	CPS Mean		SD	RSD(%)
6 Li	4483156.00	A	47490.00	1.06
9 Be	2652.54	P	103.60	3.91
11 B	35934.41	P	322.30	0.90
27 Al	320704.69	P	3025.00	0.94
45 Sc	18871160.00	A	133500.00	0.71
55 Mn	206097.91	P	1379.00	0.67
59 Co	20820.90	P	475.30	2.28
66 Zn	50082.88	P	605.30	1.21
72 Ge	4188473.00	A	22620.00	0.54
74 Ge	5766977.00	A	49160.00	0.85
98 Mo	81043.79	P	67.58	0.08
99		P		
106 Cd		P		
107 Ag	16742.53	P	87.10	0.52
108 Cd		P		
111 Cd	5251.61	P	215.90	4.11
115 In	14988020.00	A	27420.00	0.18
118 Sn	18274.52	P	174.40	0.95
121 Sb	81594.74	P	437.90	0.54
125 Te	6441.69	P	286.00	4.44
133 Cs	129821.70	P	1494.00	1.15
137 Ba	39623.65	P	344.60	0.87
159 Tb	19196850.00	A	139300.00	0.73
205 Tl	41986.77	P	580.90	1.38
206 Pb		P		
207 Pb		P		
208 Pb	59627.30	P	364.80	0.61
209 Bi	21384500.00	A	289400.00	1.35
232 Th	582179.00	P	4301.00	0.74
238 U	56030.66	P	852.10	1.52

ISTD Elements

Element	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	4483156.50	1.06	4492700.50	99.8	59.5 - 120.4	
45 Sc	18871158.00	0.71	19038030.00	99.1	59.5 - 120.4	
72 Ge	4188472.80	0.54	4215162.50	99.4	59.5 - 120.4	
74 Ge	5766977.50	0.85	5782803.00	99.7	59.5 - 120.4	
115 In	14988025.00	0.18	15293276.00	98.0	59.5 - 120.4	
159 Tb	19196850.00	0.73	19484246.00	98.5	59.5 - 120.4	
209 Bi	21384496.00	1.35	21710272.00	98.5	59.5 - 120.4	

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

--- :Element Failures --- :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Data Results:
Analytes: Pass
ISTD: Pass

Calibration Standard QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\005CALS.D\005CALS.D#
Date Acquired: Sep 20 2016 07:30 pm
Operator:
Sample Name: Level 3 Std
Misc Info:
Vial Number: 1104
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal Update: Sep 20 2016 07:29 pm
Sample Type: CalStd
Total Dil Factor: 1.00

QC&ISTD Elements

Element	CPS Mean		SD	RSD(%)
6 Li	4508169.00	A	44540.00	0.99
9 Be	198034.20	P	788.00	0.40
11 B	44193.87	P	569.90	1.29
27 Al	4771435.00	A	31870.00	0.67
45 Sc	18823620.00	A	75350.00	0.40
55 Mn	2021129.00	A	15830.00	0.78
59 Co	1706944.00	A	20050.00	1.17
66 Zn	978522.19	A	4522.00	0.46
72 Ge	4184943.00	A	8488.00	0.20
74 Ge	5766204.00	A	40030.00	0.69
98 Mo	640236.31	P	4327.00	0.68
99		P		
106 Cd		P		
107 Ag	272977.69	P	2530.00	0.93
108 Cd		P		
111 Cd	218149.50	P	459.80	0.21
115 In	15114660.00	A	85400.00	0.57
118 Sn	651465.50	P	4701.00	0.72
121 Sb	93837.26	P	1488.00	1.59
125 Te	31638.38	P	370.20	1.17
133 Cs	2726639.00	A	29130.00	1.07
137 Ba	860104.88	A	10800.00	1.26
159 Tb	19457700.00	A	144400.00	0.74
205 Tl	1814901.00	A	10980.00	0.60
206 Pb		A		
207 Pb		A		
208 Pb	6033361.00	A	9761.00	0.16
209 Bi	21756890.00	A	230300.00	1.06
232 Th	2504189.00	A	39500.00	1.58
238 U	2432730.00	A	41510.00	1.71

ISTD Elements

Element	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	4508168.50	0.99	4492700.50	100.3	59.5 - 120.4	
45 Sc	18823618.00	0.40	19038030.00	98.9	59.5 - 120.4	
72 Ge	4184943.30	0.20	4215162.50	99.3	59.5 - 120.4	
74 Ge	5766204.50	0.69	5782803.00	99.7	59.5 - 120.4	
115 In	15114665.00	0.57	15293276.00	98.8	59.5 - 120.4	
159 Tb	19457698.00	0.74	19484246.00	99.9	59.5 - 120.4	
209 Bi	21756886.00	1.06	21710272.00	100.2	59.5 - 120.4	

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

--- :Element Failures --- :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Data Results:
Analytes: Pass
ISTD: Pass

Calibration Standard QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\006CALS.D\006CALS.D#
Date Acquired: Sep 20 2016 07:32 pm
Operator:
Sample Name: Level 4 Std
Misc Info:
Vial Number: 1105
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal Update: Sep 20 2016 07:31 pm
Sample Type: CalStd
Total Dil Factor: 1.00

QC&ISTD Elements

Element	CPS Mean		SD	RSD(%)
6 Li	4431979.00	A	61300.00	1.38
9 Be	1032858.00	A	1810.00	0.18
11 B	106009.40	P	321.20	0.30
27 Al	23155120.00	A	138100.00	0.60
45 Sc	18771640.00	A	68740.00	0.37
55 Mn	9710199.00	A	101400.00	1.04
59 Co	8203517.00	A	45610.00	0.56
66 Zn	4679691.00	A	17460.00	0.37
72 Ge	4194257.00	A	9345.00	0.22
74 Ge	5769810.00	A	21570.00	0.37
98 Mo	3192919.00	A	9348.00	0.29
99		P		
106 Cd		P		
107 Ag	1385847.00	A	11250.00	0.81
108 Cd		P		
111 Cd	1132435.00	A	13370.00	1.18
115 In	15213570.00	A	134800.00	0.89
118 Sn	3250546.00	A	34010.00	1.05
121 Sb	449091.81	P	3420.00	0.76
125 Te	155020.50	P	1296.00	0.84
133 Cs	13277540.00	A	120800.00	0.91
137 Ba	4109337.00	A	47690.00	1.16
159 Tb	19523610.00	A	153400.00	0.79
205 Tl	8691087.00	A	83780.00	0.96
206 Pb		A		
207 Pb		A		
208 Pb	29103220.00	A	286000.00	0.98
209 Bi	21721100.00	A	73190.00	0.34
232 Th	12107420.00	A	117200.00	0.97
238 U	11699080.00	A	50760.00	0.43

ISTD Elements

Element	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	4431979.00	1.38	4492700.50	98.6	59.5 - 120.4	
45 Sc	18771644.00	0.37	19038030.00	98.6	59.5 - 120.4	
72 Ge	4194256.50	0.22	4215162.50	99.5	59.5 - 120.4	
74 Ge	5769810.00	0.37	5782803.00	99.8	59.5 - 120.4	
115 In	15213566.00	0.89	15293276.00	99.5	59.5 - 120.4	
159 Tb	19523614.00	0.79	19484246.00	100.2	59.5 - 120.4	
209 Bi	21721098.00	0.34	21710272.00	100.0	59.5 - 120.4	

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

--- :Element Failures --- :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Data Results:
Analytes: Pass
ISTD: Pass

Calibration Standard QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\007CALS.D\007CALS.D#
Date Acquired: Sep 20 2016 07:34 pm
Operator:
Sample Name: Level 5 Std
Misc Info:
Vial Number: 1106
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal Update: Sep 20 2016 07:33 pm
Sample Type: CalStd
Total Dil Factor: 1.00

QC&ISTD Elements

Element	CPS Mean		SD	RSD(%)
6 Li	4485157.00	A	35470.00	0.79
9 Be	2091899.00	A	32190.00	1.54
11 B	185527.09	P	4488.00	2.42
27 Al	47228648.00	A	351900.00	0.75
45 Sc	18860400.00	A	63280.00	0.34
55 Mn	19795230.00	A	151200.00	0.76
59 Co	16811250.00	A	102900.00	0.61
66 Zn	9552880.00	A	69930.00	0.73
72 Ge	4200955.00	A	31130.00	0.74
74 Ge	5808267.00	A	24830.00	0.43
98 Mo	6487122.00	A	95550.00	1.47
99		P		
106 Cd		P		
107 Ag	2817871.00	A	32190.00	1.14
108 Cd		P		
111 Cd	2283313.00	A	22840.00	1.00
115 In	15250030.00	A	126900.00	0.83
118 Sn	6493927.00	A	93660.00	1.44
121 Sb	941073.38	A	7294.00	0.78
125 Te	311789.69	P	3360.00	1.08
133 Cs	27062660.00	A	557500.00	2.06
137 Ba	8208171.00	A	154000.00	1.88
159 Tb	19519500.00	A	225000.00	1.15
205 Tl	17368820.00	A	302600.00	1.74
206 Pb		A		
207 Pb		A		
208 Pb	59380260.00	A	865500.00	1.46
209 Bi	21802520.00	A	154100.00	0.71
232 Th	24567520.00	A	219000.00	0.89
238 U	23573040.00	A	211600.00	0.90

ISTD Elements

Element	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	4485157.00	0.79	4492700.50	99.8	59.5 - 120.4	
45 Sc	18860402.00	0.34	19038030.00	99.1	59.5 - 120.4	
72 Ge	4200955.50	0.74	4215162.50	99.7	59.5 - 120.4	
74 Ge	5808267.50	0.43	5782803.00	100.4	59.5 - 120.4	
115 In	15250030.00	0.83	15293276.00	99.7	59.5 - 120.4	
159 Tb	19519504.00	1.15	19484246.00	100.2	59.5 - 120.4	
209 Bi	21802518.00	0.71	21710272.00	100.4	59.5 - 120.4	

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

--- :Element Failures --- :Max. Number of Failures Allowed
0 :ISTD Failures 0 :Max. Number of ISTD Failures Allowed

Data Results:
Analytes: Pass
ISTD: Pass

Initial Calibration Verification (CCV) QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\008_QCS.D\008_QCS.D#
Date Acquired: Sep 20 2016 07:36 pm
Operator:
Sample Name: ICV
Misc Info:
Vial Number: 1107
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal Update: Sep 20 2016 07:35 pm
Sample Type: QCS
Total Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc. ppb	RSD(%)	Expected	Rec(%)	QC Range(%)	Flag
9 Be	6	3	46.470	0.66	50.00	92.9	89 - 110	
11 B	6	3	19.530	1.41	20.00	97.7	89 - 110	
27 Al	72	3	98.370	2.28	100.00	98.4	89 - 110	
55 Mn	72	3	47.760	2.24	50.00	95.5	89 - 110	
59 Co	72	3	49.850	1.99	50.00	99.7	89 - 110	
66 Zn	72	3	48.780	1.83	50.00	97.6	89 - 110	
98 Mo	115	3	19.180	0.43	20.00	95.9	89 - 110	
107 Ag	115	3	20.350	0.71	20.00	101.8	89 - 110	
111 Cd	115	3	46.630	0.82	50.00	93.3	89 - 110	
118 Sn	115	3	48.980	1.02	50.00	98.0	89 - 110	
121 Sb	115	3	19.030	0.32	20.00	95.2	89 - 110	
125 Te	115	3	48.830	1.12	50.00	97.7	89 - 110	
133 Cs	115	3	47.840	0.44	50.00	95.7	89 - 110	
137 Ba	115	3	48.910	1.53	50.00	97.8	89 - 110	
205 Tl	209	3	50.430	1.10	50.00	100.9	89 - 110	
208 Pb	209	3	50.670	0.57	50.00	101.3	89 - 110	
232 Th	209	3	47.310	1.56	50.00	94.6	89 - 110	
238 U	209	3	49.140	0.17	50.00	98.3	89 - 110	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4471316	0.95	4492701	99.5	60 - 120	
45 Sc	3	19036924	0.78	19038030	100.0	60 - 120	
72 Ge	3	4229974	2.13	4215163	100.4	60 - 120	
74 Ge	3	5819244	0.81	5782803	100.6	60 - 120	
115 In	3	15297460	0.75	15293276	100.0	60 - 120	
159 Tb	3	19892150	1.62	19484246	102.1	60 - 120	
209 Bi	3	21841234	1.06	21710272	100.6	60 - 120	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Continuing Calibration Blank (CCB) QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\009_CCB.D\009_CCB.D#
Date Acquired: Sep 20 2016 07:38 pm
Operator:
Sample Name: ICB
Misc Info:
Vial Number: 1102
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal Update: Sep 20 2016 07:35 pm
Sample Type: CCB
Total Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc.	RSD(%)	High Limit	Flag
9 Be	6	3	0.036 ppb	23.99	0.150	
11 B	6	3	0.117 ppb	53.05	1.500	
27 Al	72	3	0.075 ppb	16.50	3.000	
55 Mn	72	3	0.021 ppb	24.66	1.500	
59 Co	72	3	0.030 ppb	14.85	0.150	
66 Zn	72	3	0.073 ppb	37.46	6.000	
98 Mo	115	3	0.022 ppb	4.98	1.500	
107 Ag	115	3	0.012 ppb	23.19	0.150	
111 Cd	115	3	0.033 ppb	15.27	0.300	
118 Sn	115	3	0.064 ppb	8.56	0.300	
121 Sb	115	3	0.282 ppb	23.40	1.200	
125 Te	115	3	0.062 ppb	16.37	3.000	
133 Cs	115	3	0.034 ppb	15.65	0.600	
137 Ba	115	3	0.051 ppb	13.65	0.300	
205 Tl	209	3	0.042 ppb	13.90	0.300	
208 Pb	209	3	0.057 ppb	18.19	0.300	
232 Th	209	3	0.158 ppb	4.78	3.000	
238 U	209	3	0.028 ppb	20.85	0.300	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4469031	1.40	4492701	99.5	60 - 120	
45 Sc	3	19177980	1.28	19038030	100.7	60 - 120	
72 Ge	3	4246910	1.40	4215163	100.8	60 - 120	
74 Ge	3	5823304	1.66	5782803	100.7	60 - 120	
115 In	3	15503563	1.90	15293276	101.4	60 - 120	
159 Tb	3	19889294	3.01	19484246	102.1	60 - 120	
209 Bi	3	21881694	2.24	21710272	100.8	60 - 120	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Continuing Calibration Blank (CCB) QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\010_CCB.D\010_CCB.D#
Date Acquired: Sep 20 2016 07:40 pm
Operator:
Sample Name: ICSA
Misc Info:
Vial Number: 4510
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal Update: Sep 20 2016 07:35 pm
Sample Type: CCB
Total Dil Factor: 1.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc.	RSD(%)	High Limit	Flag
9 Be	6	3	0.004 ppb	3.58	0.150	
11 B	6	3	1.112 ppb	1.91	1.500	
27 Al	72	3	48650.000 ppb	2.66	3.000	Fail
55 Mn	72	3	0.576 ppb	2.32	1.500	
59 Co	72	3	0.252 ppb	3.22	0.150	Fail
66 Zn	72	3	1.947 ppb	1.26	6.000	
98 Mo	115	3	1044.000 ppb	3.41	1.500	Fail
107 Ag	115	3	0.072 ppb	6.61	0.150	
111 Cd	115	3	0.096 ppb	5.02	0.300	
118 Sn	115	3	0.058 ppb	11.74	0.300	
121 Sb	115	3	0.243 ppb	16.28	1.200	
125 Te	115	3	0.011 ppb	31.99	3.000	
133 Cs	115	3	0.019 ppb	10.80	0.600	
137 Ba	115	3	0.357 ppb	5.83	0.300	Fail
205 Tl	209	3	0.004 ppb	74.59	0.300	
208 Pb	209	3	0.052 ppb	2.89	0.300	
232 Th	209	3	0.181 ppb	4.97	3.000	
238 U	209	3	0.009 ppb	2.32	0.300	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	3956557	1.58	4492701	88.1	60 - 120	
45 Sc	3	17968086	1.86	19038030	94.4	60 - 120	
72 Ge	3	4048809	1.57	4215163	96.1	60 - 120	
74 Ge	3	5420804	1.71	5782803	93.7	60 - 120	
115 In	3	13765046	2.62	15293276	90.0	60 - 120	
159 Tb	3	17845188	1.30	19484246	91.6	60 - 120	
209 Bi	3	18453454	2.01	21710272	85.0	60 - 120	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

4 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\011SMPL.D\011SMPL.D#
Date Acquired: Sep 20 2016 07:42 pm
Acq. Method: ACZ_T3.M
Operator:
Sample Name: ICSAB
Misc Info:
Vial Number: 4511
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal. Update: Sep 20 2016 07:35 pm
Sample Type: Sample
Dilution Factor: 1.00
Autodil Factor: Undiluted
Final Dil Factor: 1.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	17.890	17.890	ppb	0.79	200.00	
11 B	6	3	10.260	10.260	ppb	0.76	20.00	
27 Al	72	3	47,400.000	47400.000	ppb	0.73	1000.00	OCAL
55 Mn	72	3	18.580	18.580	ppb	0.37	200.00	
59 Co	72	3	18.380	18.380	ppb	0.45	200.00	
66 Zn	72	3	19.240	19.240	ppb	0.20	1000.00	
98 Mo	115	3	1,049.000	1049.000	ppb	0.85	200.00	OCAL
107 Ag	115	3	11.050	11.050	ppb	1.05	50.00	
111 Cd	115	3	17.960	17.960	ppb	0.61	200.00	
118 Sn	115	3	18.780	18.780	ppb	0.84	200.00	
121 Sb	115	3	10.360	10.360	ppb	0.48	25.00	
125 Te	115	3	19.720	19.720	ppb	0.96	200.00	
133 Cs	115	3	19.260	19.260	ppb	0.53	200.00	
137 Ba	115	3	19.540	19.540	ppb	1.13	200.00	
205 Tl	209	3	19.760	19.760	ppb	1.24	200.00	
208 Pb	209	3	18.730	18.730	ppb	0.80	500.00	
232 Th	209	3	49.630	49.630	ppb	1.80	200.00	
238 U	209	3	20.390	20.390	ppb	1.68	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4002846	0.98	4492701	89.1	59.5 - 120.4	
45 Sc	3	18074286	1.11	19038030	94.9	59.5 - 120.4	
72 Ge	3	4102111	0.61	4215163	97.3	59.5 - 120.4	
74 Ge	3	5483084	1.17	5782803	94.8	59.5 - 120.4	
115 In	3	13770678	0.71	15293276	90.0	59.5 - 120.4	
159 Tb	3	17816558	0.65	19484246	91.4	59.5 - 120.4	
209 Bi	3	18526922	1.34	21710272	85.3	59.5 - 120.4	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

2 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Continuing Calibration Blank (CCB) QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\012_CCB.D\012_CCB.D#
Date Acquired: Sep 20 2016 07:45 pm
Operator:
Sample Name: wash
Misc Info:
Vial Number: 4512
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal Update: Sep 20 2016 07:35 pm
Sample Type: CCB
Total Dil Factor: 1.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc.	RSD(%)	High Limit	Flag
9 Be	6	3	0.000 ppb	7746.30	0.150	
11 B	6	3	-0.118 ppb	24.43	1.500	
27 Al	72	3	19.860 ppb	24.69	3.000	Fail
55 Mn	72	3	-0.033 ppb	8.28	1.500	
59 Co	72	3	0.001 ppb	357.49	0.150	
66 Zn	72	3	0.008 ppb	146.45	6.000	
98 Mo	115	3	0.433 ppb	22.72	1.500	
107 Ag	115	3	0.002 ppb	60.25	0.150	
111 Cd	115	3	-0.001 ppb	157.71	0.300	
118 Sn	115	3	0.033 ppb	5.50	0.300	
121 Sb	115	3	-0.007 ppb	136.81	1.200	
125 Te	115	3	0.004 ppb	109.48	3.000	
133 Cs	115	3	0.000 ppb	432.70	0.600	
137 Ba	115	3	-0.017 ppb	20.93	0.300	
205 Tl	209	3	-0.003 ppb	49.66	0.300	
208 Pb	209	3	-0.010 ppb	13.72	0.300	
232 Th	209	3	0.021 ppb	8.65	3.000	
238 U	209	3	-0.004 ppb	42.30	0.300	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4318281	1.18	4492701	96.1	60 - 120	
45 Sc	3	19317622	1.01	19038030	101.5	60 - 120	
72 Ge	3	4315764	0.68	4215163	102.4	60 - 120	
74 Ge	3	5962928	0.15	5782803	103.1	60 - 120	
115 In	3	15463113	0.35	15293276	101.1	60 - 120	
159 Tb	3	19707928	1.07	19484246	101.1	60 - 120	
209 Bi	3	21508948	0.15	21710272	99.1	60 - 120	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

1 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\013SMPL.D\013SMPL.D#
Date Acquired: Sep 20 2016 07:47 pm
Acq. Method: ACZ_T3.M
Operator:
Sample Name: WG409857PBS
Misc Info:
Vial Number: 4301
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal. Update: Sep 20 2016 07:35 pm
Sample Type: Sample
Dilution Factor: 500.00
Autodil Factor: Undiluted
Final Dil Factor: 500.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	-4.679	-0.009	ppb	41.64	200.00	
11 B	6	3	472.800	0.946	ppb	5.07	20.00	
27 Al	72	3	2,859.000	5.718	ppb	34.12	1000.00	
55 Mn	72	3	66.150	0.132	ppb	5.13	200.00	
59 Co	72	3	-3.670	-0.007	ppb	20.71	200.00	
66 Zn	72	3	351.000	0.702	ppb	2.42	1000.00	
98 Mo	115	3	55.800	0.112	ppb	27.18	200.00	
107 Ag	115	3	0.385	0.001	ppb	147.62	50.00	
111 Cd	115	3	-3.589	-0.007	ppb	4.46	200.00	
118 Sn	115	3	3,573.500	7.147	ppb	0.30	200.00	
121 Sb	115	3	69.700	0.139	ppb	0.95	25.00	
125 Te	115	3	-1.474	-0.003	ppb	328.06	200.00	
133 Cs	115	3	-2.963	-0.006	ppb	9.70	200.00	
137 Ba	115	3	7.890	0.016	ppb	10.17	200.00	
205 Tl	209	3	-5.675	-0.011	ppb	17.09	200.00	
208 Pb	209	3	20.365	0.041	ppb	2.13	500.00	
232 Th	209	3	1.216	0.002	ppb	19.11	200.00	
238 U	209	3	-4.758	-0.010	ppb	8.44	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4430158	0.43	4492701	98.6	59.5 - 120.4	
45 Sc	3	19112236	0.52	19038030	100.4	59.5 - 120.4	
72 Ge	3	4185539	0.70	4215163	99.3	59.5 - 120.4	
74 Ge	3	5777417	0.55	5782803	99.9	59.5 - 120.4	
115 In	3	15347966	0.40	15293276	100.4	59.5 - 120.4	
159 Tb	3	19782530	0.34	19484246	101.5	59.5 - 120.4	
209 Bi	3	21524924	0.69	21710272	99.1	59.5 - 120.4	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\014SMPL.D\014SMPL.D#
Date Acquired: Sep 20 2016 07:49 pm
Acq. Method: ACZ_T3.M
Operator:
Sample Name: WG409857LCSS
Misc Info:
Vial Number: 4302
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal. Update: Sep 20 2016 07:35 pm
Sample Type: Sample
Dilution Factor: 5000.00
Autodil Factor: Undiluted
Final Dil Factor: 5000.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	100,300.000	20.060	ppb	1.26	200.00	
11 B	6	3	118,900.000	23.780	ppb	1.28	20.00	OCAL
27 Al	72	3	###########	1659.000	ppb	0.68	1000.00	OCAL
55 Mn	72	3	401,400.000	80.280	ppb	0.16	200.00	
59 Co	72	3	111,600.000	22.320	ppb	0.34	200.00	
66 Zn	72	3	237,850.000	47.570	ppb	0.42	1000.00	
98 Mo	115	3	98,150.000	19.630	ppb	0.84	200.00	
107 Ag	115	3	49,665.000	9.933	ppb	0.92	50.00	
111 Cd	115	3	77,300.000	15.460	ppb	0.21	200.00	
118 Sn	115	3	110,200.000	22.040	ppb	0.69	200.00	
121 Sb	115	3	52,650.000	10.530	ppb	0.46	25.00	
125 Te	115	3	44.445	0.009	ppb	108.03	200.00	
133 Cs	115	3	1,380.000	0.276	ppb	1.94	200.00	
137 Ba	115	3	321,300.000	64.260	ppb	2.32	200.00	
205 Tl	209	3	129,050.000	25.810	ppb	0.69	200.00	
208 Pb	209	3	98,550.000	19.710	ppb	0.67	500.00	
232 Th	209	3	18,595.000	3.719	ppb	0.73	200.00	
238 U	209	3	82,500.000	16.500	ppb	0.83	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4431448	1.53	4492701	98.6	59.5 - 120.4	
45 Sc	3	19587384	1.21	19038030	102.9	59.5 - 120.4	
72 Ge	3	4328869	0.23	4215163	102.7	59.5 - 120.4	
74 Ge	3	5960136	0.39	5782803	103.1	59.5 - 120.4	
115 In	3	15466861	0.35	15293276	101.1	59.5 - 120.4	
159 Tb	3	19731118	1.36	19484246	101.3	59.5 - 120.4	
209 Bi	3	21613044	1.04	21710272	99.6	59.5 - 120.4	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

2 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\015SMPL.D\015SMPL.D#
Date Acquired: Sep 20 2016 07:51 pm
Acq. Method: ACZ_T3.M
Operator:
Sample Name: WG409857LCSSD
Misc Info:
Vial Number: 4303
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal. Update: Sep 20 2016 07:35 pm
Sample Type: Sample
Dilution Factor: 5000.00
Autodil Factor: Undiluted
Final Dil Factor: 5000.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	103,150.000	20.630	ppb	0.81	200.00	
11 B	6	3	123,250.000	24.650	ppb	0.75	20.00	OCAL
27 Al	72	3	###########	1633.000	ppb	0.87	1000.00	OCAL
55 Mn	72	3	409,650.000	81.930	ppb	0.50	200.00	
59 Co	72	3	115,700.000	23.140	ppb	0.33	200.00	
66 Zn	72	3	239,250.000	47.850	ppb	0.75	1000.00	
98 Mo	115	3	99,650.000	19.930	ppb	0.06	200.00	
107 Ag	115	3	49,320.000	9.864	ppb	0.44	50.00	
111 Cd	115	3	80,250.000	16.050	ppb	1.13	200.00	
118 Sn	115	3	110,550.000	22.110	ppb	0.28	200.00	
121 Sb	115	3	56,500.000	11.300	ppb	0.33	25.00	
125 Te	115	3	19.405	0.004	ppb	241.43	200.00	
133 Cs	115	3	1,344.500	0.269	ppb	1.84	200.00	
137 Ba	115	3	325,500.000	65.100	ppb	0.14	200.00	
205 Tl	209	3	133,950.000	26.790	ppb	0.56	200.00	
208 Pb	209	3	99,200.000	19.840	ppb	0.36	500.00	
232 Th	209	3	19,470.000	3.894	ppb	0.51	200.00	
238 U	209	3	83,000.000	16.600	ppb	0.92	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4419251	0.57	4492701	98.4	59.5 - 120.4	
45 Sc	3	19636238	0.77	19038030	103.1	59.5 - 120.4	
72 Ge	3	4351630	0.72	4215163	103.2	59.5 - 120.4	
74 Ge	3	5985448	0.68	5782803	103.5	59.5 - 120.4	
115 In	3	15487186	0.47	15293276	101.3	59.5 - 120.4	
159 Tb	3	19833224	0.19	19484246	101.8	59.5 - 120.4	
209 Bi	3	21574570	0.23	21710272	99.4	59.5 - 120.4	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

2 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\016SMPL.D\016SMPL.D#
Date Acquired: Sep 20 2016 07:53 pm
Acq. Method: ACZ_T3.M
Operator:
Sample Name: L32770-01
Misc Info:
Vial Number: 4304
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal. Update: Sep 20 2016 07:35 pm
Sample Type: Sample
Dilution Factor: 500.00
Autodil Factor: Undiluted
Final Dil Factor: 500.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	180.150	0.360	ppb	2.46	200.00	
11 B	6	3	8,390.000	16.780	ppb	0.84	20.00	
27 Al	72	3	###########	7056.000	ppb	0.64	1000.00	OCAL
55 Mn	72	3	167,350.000	334.700	ppb	0.77	200.00	OCAL
59 Co	72	3	6,060.000	12.120	ppb	0.83	200.00	
66 Zn	72	3	89,350.000	178.700	ppb	0.59	1000.00	
98 Mo	115	3	875.000	1.750	ppb	1.38	200.00	
107 Ag	115	3	61.850	0.124	ppb	2.20	50.00	
111 Cd	115	3	191.150	0.382	ppb	3.41	200.00	
118 Sn	115	3	3,771.500	7.543	ppb	0.48	200.00	
121 Sb	115	3	132.300	0.265	ppb	2.58	25.00	
125 Te	115	3	26.325	0.053	ppb	28.85	200.00	
133 Cs	115	3	373.300	0.747	ppb	0.87	200.00	
137 Ba	115	3	552,500.000	1105.000	ppb	1.32	200.00	OCAL
205 Tl	209	3	41.430	0.083	ppb	9.58	200.00	
208 Pb	209	3	14,625.000	29.250	ppb	0.64	500.00	
232 Th	209	3	1,110.000	2.220	ppb	0.44	200.00	
238 U	209	3	666.500	1.333	ppb	1.23	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4553959	0.20	4492701	101.4	59.5 - 120.4	
45 Sc	3	19835312	0.55	19038030	104.2	59.5 - 120.4	
72 Ge	3	4295646	0.17	4215163	101.9	59.5 - 120.4	
74 Ge	3	5790674	0.54	5782803	100.1	59.5 - 120.4	
115 In	3	15014876	0.71	15293276	98.2	59.5 - 120.4	
159 Tb	3	19510660	0.08	19484246	100.1	59.5 - 120.4	
209 Bi	3	20551374	0.70	21710272	94.7	59.5 - 120.4	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

3 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\017SMPL.D\017SMPL.D#
Date Acquired: Sep 20 2016 07:55 pm
Acq. Method: ACZ_T3.M
Operator:
Sample Name: L32770-02
Misc Info:
Vial Number: 4305
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal. Update: Sep 20 2016 07:35 pm
Sample Type: Sample
Dilution Factor: 500.00
Autodil Factor: Undiluted
Final Dil Factor: 500.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	163.450	0.327	ppb	3.53	200.00	
11 B	6	3	5,800.000	11.600	ppb	1.21	20.00	
27 Al	72	3	###########	4227.000	ppb	0.46	1000.00	OCAL
55 Mn	72	3	194,000.000	388.000	ppb	0.90	200.00	OCAL
59 Co	72	3	3,839.000	7.678	ppb	0.66	200.00	
66 Zn	72	3	47,900.000	95.800	ppb	0.58	1000.00	
98 Mo	115	3	755.500	1.511	ppb	0.52	200.00	
107 Ag	115	3	30.985	0.062	ppb	4.30	50.00	
111 Cd	115	3	107.700	0.215	ppb	5.10	200.00	
118 Sn	115	3	3,722.000	7.444	ppb	0.89	200.00	
121 Sb	115	3	93.600	0.187	ppb	2.11	25.00	
125 Te	115	3	24.010	0.048	ppb	21.26	200.00	
133 Cs	115	3	207.800	0.416	ppb	0.60	200.00	
137 Ba	115	3	306,000.000	612.000	ppb	0.69	200.00	OCAL
205 Tl	209	3	18.460	0.037	ppb	5.11	200.00	
208 Pb	209	3	7,890.000	15.780	ppb	0.96	500.00	
232 Th	209	3	669.500	1.339	ppb	0.77	200.00	
238 U	209	3	315.150	0.630	ppb	1.38	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4465888	0.73	4492701	99.4	59.5 - 120.4	
45 Sc	3	19373732	0.73	19038030	101.8	59.5 - 120.4	
72 Ge	3	4275036	1.57	4215163	101.4	59.5 - 120.4	
74 Ge	3	5779633	1.02	5782803	99.9	59.5 - 120.4	
115 In	3	14892215	1.57	15293276	97.4	59.5 - 120.4	
159 Tb	3	19399134	0.69	19484246	99.6	59.5 - 120.4	
209 Bi	3	20698638	1.05	21710272	95.3	59.5 - 120.4	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

3 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\018SMPL.D\018SMPL.D#
Date Acquired: Sep 20 2016 07:57 pm
Acq. Method: ACZ_T3.M
Operator:
Sample Name: L32770-03
Misc Info:
Vial Number: 4306
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal. Update: Sep 20 2016 07:35 pm
Sample Type: Sample
Dilution Factor: 500.00
Autodil Factor: Undiluted
Final Dil Factor: 500.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	199.050	0.398	ppb	5.09	200.00	
11 B	6	3	9,965.000	19.930	ppb	0.93	20.00	
27 Al	72	3	###########	12610.000	ppb	0.22	1000.00	OCAL
55 Mn	72	3	261,850.000	523.700	ppb	0.68	200.00	OCAL
59 Co	72	3	8,270.000	16.540	ppb	1.48	200.00	
66 Zn	72	3	59,400.000	118.800	ppb	0.26	1000.00	
98 Mo	115	3	395.250	0.791	ppb	0.79	200.00	
107 Ag	115	3	41.295	0.083	ppb	2.19	50.00	
111 Cd	115	3	230.350	0.461	ppb	1.56	200.00	
118 Sn	115	3	3,659.500	7.319	ppb	0.76	200.00	
121 Sb	115	3	76.050	0.152	ppb	4.88	25.00	
125 Te	115	3	23.305	0.047	ppb	9.65	200.00	
133 Cs	115	3	463.300	0.927	ppb	0.88	200.00	
137 Ba	115	3	319,100.000	638.200	ppb	1.03	200.00	OCAL
205 Tl	209	3	33.365	0.067	ppb	4.22	200.00	
208 Pb	209	3	11,680.000	23.360	ppb	0.36	500.00	
232 Th	209	3	1,852.000	3.704	ppb	0.85	200.00	
238 U	209	3	334.950	0.670	ppb	0.32	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4517243	0.66	4492701	100.5	59.5 - 120.4	
45 Sc	3	19470570	0.59	19038030	102.3	59.5 - 120.4	
72 Ge	3	4277954	0.31	4215163	101.5	59.5 - 120.4	
74 Ge	3	5743104	0.26	5782803	99.3	59.5 - 120.4	
115 In	3	14751456	0.54	15293276	96.5	59.5 - 120.4	
159 Tb	3	19230016	1.04	19484246	98.7	59.5 - 120.4	
209 Bi	3	20110174	0.64	21710272	92.6	59.5 - 120.4	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

3 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\019SMPL.D\019SMPL.D#
Date Acquired: Sep 20 2016 08:00 pm
Acq. Method: ACZ_T3.M
Operator:
Sample Name: L32770-04
Misc Info:
Vial Number: 4307
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal. Update: Sep 20 2016 07:35 pm
Sample Type: Sample
Dilution Factor: 500.00
Autodil Factor: Undiluted
Final Dil Factor: 500.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	210.250	0.421	ppb	3.02	200.00	
11 B	6	3	10,030.000	20.060	ppb	2.03	20.00	OCAL
27 Al	72	3	###########	13000.000	ppb	1.00	1000.00	OCAL
55 Mn	72	3	330,000.000	660.000	ppb	0.62	200.00	OCAL
59 Co	72	3	9,870.000	19.740	ppb	0.41	200.00	
66 Zn	72	3	57,850.000	115.700	ppb	0.82	1000.00	
98 Mo	115	3	478.050	0.956	ppb	1.80	200.00	
107 Ag	115	3	35.930	0.072	ppb	1.63	50.00	
111 Cd	115	3	241.250	0.483	ppb	6.22	200.00	
118 Sn	115	3	3,715.000	7.430	ppb	0.89	200.00	
121 Sb	115	3	82.600	0.165	ppb	1.73	25.00	
125 Te	115	3	14.915	0.030	ppb	63.76	200.00	
133 Cs	115	3	360.600	0.721	ppb	0.12	200.00	
137 Ba	115	3	549,000.000	1098.000	ppb	0.76	200.00	OCAL
205 Tl	209	3	23.185	0.046	ppb	4.12	200.00	
208 Pb	209	3	7,490.000	14.980	ppb	0.49	500.00	
232 Th	209	3	2,225.000	4.450	ppb	1.00	200.00	
238 U	209	3	409.650	0.819	ppb	0.73	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4395994	1.47	4492701	97.8	59.5 - 120.4	
45 Sc	3	19155748	0.55	19038030	100.6	59.5 - 120.4	
72 Ge	3	4162020	1.33	4215163	98.7	59.5 - 120.4	
74 Ge	3	5587402	0.57	5782803	96.6	59.5 - 120.4	
115 In	3	14345545	1.47	15293276	93.8	59.5 - 120.4	
159 Tb	3	18770684	0.88	19484246	96.3	59.5 - 120.4	
209 Bi	3	19676562	1.19	21710272	90.6	59.5 - 120.4	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

4 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\020SMPL.D\020SMPL.D#
Date Acquired: Sep 20 2016 08:02 pm
Acq. Method: ACZ_T3.M
Operator:
Sample Name: L32770-04MS
Misc Info:
Vial Number: 4308
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal. Update: Sep 20 2016 07:35 pm
Sample Type: Sample
Dilution Factor: 500.00
Autodil Factor: Undiluted
Final Dil Factor: 500.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	25,125.000	50.250	ppb	0.63	200.00	
11 B	6	3	15,040.000	30.080	ppb	0.74	20.00	OCAL
27 Al	72	3	###########	13890.000	ppb	0.94	1000.00	OCAL
55 Mn	72	3	368,400.000	736.800	ppb	0.99	200.00	OCAL
59 Co	72	3	34,450.000	68.900	ppb	0.90	200.00	
66 Zn	72	3	83,950.000	167.900	ppb	0.39	1000.00	
98 Mo	115	3	26,095.000	52.190	ppb	0.96	200.00	
107 Ag	115	3	4,883.500	9.767	ppb	1.65	50.00	
111 Cd	115	3	24,645.000	49.290	ppb	1.37	200.00	
118 Sn	115	3	29,905.000	59.810	ppb	0.91	200.00	
121 Sb	115	3	2,003.500	4.007	ppb	1.21	25.00	
125 Te	115	3	11,875.000	23.750	ppb	0.92	200.00	
133 Cs	115	3	12,785.000	25.570	ppb	1.22	200.00	
137 Ba	115	3	594,000.000	1188.000	ppb	1.42	200.00	OCAL
205 Tl	209	3	26,155.000	52.310	ppb	0.31	200.00	
208 Pb	209	3	33,565.000	67.130	ppb	0.46	500.00	
232 Th	209	3	2,798.500	5.597	ppb	0.26	200.00	
238 U	209	3	13,570.000	27.140	ppb	0.38	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4406364	0.20	4492701	98.1	59.5 - 120.4	
45 Sc	3	19086824	0.40	19038030	100.3	59.5 - 120.4	
72 Ge	3	4155584	0.30	4215163	98.6	59.5 - 120.4	
74 Ge	3	5566181	0.66	5782803	96.3	59.5 - 120.4	
115 In	3	14327031	1.03	15293276	93.7	59.5 - 120.4	
159 Tb	3	18826968	0.35	19484246	96.6	59.5 - 120.4	
209 Bi	3	19851860	0.26	21710272	91.4	59.5 - 120.4	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

4 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Continuing Calibration Verification (CCV) QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\021_CCV.D\021_CCV.D#
Date Acquired: Sep 20 2016 08:04 pm
Operator:
Sample Name: CCV
Misc Info:
Vial Number: 1105
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal Update: Sep 20 2016 07:35 pm
Sample Type: CCV
Total Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc. ppb	RSD(%)	Expected	Rec(%)	QC Range(%)	Flag
9 Be	6	3	100.600	1.89	100.00	100.6	89 - 110	
11 B	6	3	10.210	2.33	10.00	102.1	89 - 110	
27 Al	72	3	504.000	0.39	500.00	100.8	89 - 110	
55 Mn	72	3	98.380	0.95	100.00	98.4	89 - 110	
59 Co	72	3	99.000	1.02	100.00	99.0	89 - 110	
66 Zn	72	3	492.200	0.70	500.00	98.4	89 - 110	
98 Mo	115	3	100.900	0.97	100.00	100.9	89 - 110	
107 Ag	115	3	25.380	0.67	25.00	101.5	89 - 110	
111 Cd	115	3	100.100	0.92	100.00	100.1	89 - 110	
118 Sn	115	3	101.000	0.61	100.00	101.0	89 - 110	
121 Sb	115	3	12.150	0.61	12.50	97.2	89 - 110	
125 Te	115	3	100.500	1.49	100.00	100.5	89 - 110	
133 Cs	115	3	98.900	0.65	100.00	98.9	89 - 110	
137 Ba	115	3	253.300	0.38	250.00	101.3	89 - 110	
205 Tl	209	3	100.800	0.91	100.00	100.8	89 - 110	
208 Pb	209	3	247.900	1.05	250.00	99.2	89 - 110	
232 Th	209	3	99.330	0.63	100.00	99.3	89 - 110	
238 U	209	3	100.100	1.19	100.00	100.1	89 - 110	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4409149	2.36	4492701	98.1	60 - 120	
45 Sc	3	18857640	1.55	19038030	99.1	60 - 120	
72 Ge	3	4176118	1.20	4215163	99.1	60 - 120	
74 Ge	3	5772902	1.14	5782803	99.8	60 - 120	
115 In	3	14943313	1.55	15293276	97.7	60 - 120	
159 Tb	3	19273614	2.23	19484246	98.9	60 - 120	
209 Bi	3	20954708	1.78	21710272	96.5	60 - 120	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Continuing Calibration Blank (CCB) QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\022_CCB.D\022_CCB.D#
Date Acquired: Sep 20 2016 08:06 pm
Operator:
Sample Name: CCB
Misc Info:
Vial Number: 1102
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal Update: Sep 20 2016 07:35 pm
Sample Type: CCB
Total Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc.	RSD(%)	High Limit	Flag
9 Be	6	3	0.046 ppb	37.34	0.150	
11 B	6	3	-0.016 ppb	276.62	1.500	
27 Al	72	3	2.301 ppb	29.64	3.000	
55 Mn	72	3	0.119 ppb	33.61	1.500	
59 Co	72	3	0.041 ppb	35.26	0.150	
66 Zn	72	3	0.177 ppb	42.93	6.000	
98 Mo	115	3	0.049 ppb	25.85	1.500	
107 Ag	115	3	0.012 ppb	43.56	0.150	
111 Cd	115	3	0.043 ppb	34.42	0.300	
118 Sn	115	3	0.078 ppb	18.14	0.300	
121 Sb	115	3	0.128 ppb	22.41	1.200	
125 Te	115	3	0.058 ppb	51.17	3.000	
133 Cs	115	3	0.048 ppb	33.63	0.600	
137 Ba	115	3	0.228 ppb	34.72	0.300	
205 Tl	209	3	0.060 ppb	29.17	0.300	
208 Pb	209	3	0.109 ppb	31.55	0.300	
232 Th	209	3	0.093 ppb	10.33	3.000	
238 U	209	3	0.038 ppb	36.41	0.300	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4489154	1.19	4492701	99.9	60 - 120	
45 Sc	3	18987138	0.86	19038030	99.7	60 - 120	
72 Ge	3	4198524	0.71	4215163	99.6	60 - 120	
74 Ge	3	5797025	0.71	5782803	100.2	60 - 120	
115 In	3	15066028	1.88	15293276	98.5	60 - 120	
159 Tb	3	19376840	1.16	19484246	99.4	60 - 120	
209 Bi	3	21106444	1.40	21710272	97.2	60 - 120	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\023SMPL.D\023SMPL.D#
Date Acquired: Sep 20 2016 08:08 pm
Acq. Method: ACZ_T3.M
Operator:
Sample Name: L32770-04MSD
Misc Info:
Vial Number: 4309
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal. Update: Sep 20 2016 07:35 pm
Sample Type: Sample
Dilution Factor: 500.00
Autodil Factor: Undiluted
Final Dil Factor: 500.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	25,360.000	50.720	ppb	1.35	200.00	
11 B	6	3	15,215.000	30.430	ppb	2.72	20.00	OCAL
27 Al	72	3	###########	13290.000	ppb	0.44	1000.00	OCAL
55 Mn	72	3	356,100.000	712.200	ppb	0.80	200.00	OCAL
59 Co	72	3	33,895.000	67.790	ppb	0.72	200.00	
66 Zn	72	3	81,250.000	162.500	ppb	0.41	1000.00	
98 Mo	115	3	26,230.000	52.460	ppb	0.96	200.00	
107 Ag	115	3	4,868.000	9.736	ppb	1.61	50.00	
111 Cd	115	3	24,820.000	49.640	ppb	1.06	200.00	
118 Sn	115	3	29,885.000	59.770	ppb	0.83	200.00	
121 Sb	115	3	2,122.000	4.244	ppb	1.09	25.00	
125 Te	115	3	11,910.000	23.820	ppb	2.49	200.00	
133 Cs	115	3	12,865.000	25.730	ppb	2.00	200.00	
137 Ba	115	3	512,500.000	1025.000	ppb	1.86	200.00	OCAL
205 Tl	209	3	26,480.000	52.960	ppb	0.29	200.00	
208 Pb	209	3	34,695.000	69.390	ppb	0.45	500.00	
232 Th	209	3	2,485.500	4.971	ppb	0.43	200.00	
238 U	209	3	13,680.000	27.360	ppb	0.28	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4431845	0.93	4492701	98.6	59.5 - 120.4	
45 Sc	3	19164818	0.58	19038030	100.7	59.5 - 120.4	
72 Ge	3	4188631	0.22	4215163	99.4	59.5 - 120.4	
74 Ge	3	5606582	0.19	5782803	97.0	59.5 - 120.4	
115 In	3	14470446	0.97	15293276	94.6	59.5 - 120.4	
159 Tb	3	19313256	0.42	19484246	99.1	59.5 - 120.4	
209 Bi	3	20146704	0.35	21710272	92.8	59.5 - 120.4	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

4 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\024SMPL.D\024SMPL.D#
Date Acquired: Sep 20 2016 08:10 pm
Acq. Method: ACZ_T3.M
Operator:
Sample Name: L32770-05
Misc Info:
Vial Number: 4310
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal. Update: Sep 20 2016 07:35 pm
Sample Type: Sample
Dilution Factor: 500.00
Autodil Factor: Undiluted
Final Dil Factor: 500.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	219.650	0.439	ppb	5.94	200.00	
11 B	6	3	9,865.000	19.730	ppb	1.46	20.00	
27 Al	72	3	###########	12060.000	ppb	0.80	1000.00	OCAL
55 Mn	72	3	312,500.000	625.000	ppb	0.38	200.00	OCAL
59 Co	72	3	8,955.000	17.910	ppb	0.43	200.00	
66 Zn	72	3	56,000.000	112.000	ppb	0.84	1000.00	
98 Mo	115	3	582.500	1.165	ppb	1.75	200.00	
107 Ag	115	3	37.545	0.075	ppb	7.48	50.00	
111 Cd	115	3	239.900	0.480	ppb	5.94	200.00	
118 Sn	115	3	3,723.500	7.447	ppb	0.64	200.00	
121 Sb	115	3	100.800	0.202	ppb	2.10	25.00	
125 Te	115	3	38.285	0.077	ppb	22.31	200.00	
133 Cs	115	3	380.350	0.761	ppb	1.29	200.00	
137 Ba	115	3	531,000.000	1062.000	ppb	0.79	200.00	OCAL
205 Tl	209	3	45.160	0.090	ppb	15.47	200.00	
208 Pb	209	3	7,535.000	15.070	ppb	1.49	500.00	
232 Th	209	3	1,989.000	3.978	ppb	0.54	200.00	
238 U	209	3	386.400	0.773	ppb	1.91	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4412737	1.39	4492701	98.2	59.5 - 120.4	
45 Sc	3	19345214	1.04	19038030	101.6	59.5 - 120.4	
72 Ge	3	4204234	0.38	4215163	99.7	59.5 - 120.4	
74 Ge	3	5648865	1.29	5782803	97.7	59.5 - 120.4	
115 In	3	14476975	1.20	15293276	94.7	59.5 - 120.4	
159 Tb	3	19091994	0.35	19484246	98.0	59.5 - 120.4	
209 Bi	3	20040394	0.07	21710272	92.3	59.5 - 120.4	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

3 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\025SMPL.D\025SMPL.D#
Date Acquired: Sep 20 2016 08:12 pm
Acq. Method: ACZ_T3.M
Operator:
Sample Name: L32770-06
Misc Info:
Vial Number: 4311
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal. Update: Sep 20 2016 07:35 pm
Sample Type: Sample
Dilution Factor: 500.00
Autodil Factor: Undiluted
Final Dil Factor: 500.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	183.700	0.367	ppb	2.55	200.00	
11 B	6	3	7,020.000	14.040	ppb	1.30	20.00	
27 Al	72	3	###########	6829.000	ppb	0.29	1000.00	OCAL
55 Mn	72	3	171,800.000	343.600	ppb	0.28	200.00	OCAL
59 Co	72	3	5,435.000	10.870	ppb	0.97	200.00	
66 Zn	72	3	58,950.000	117.900	ppb	0.36	1000.00	
98 Mo	115	3	652.000	1.304	ppb	1.48	200.00	
107 Ag	115	3	45.475	0.091	ppb	1.75	50.00	
111 Cd	115	3	257.100	0.514	ppb	2.23	200.00	
118 Sn	115	3	3,663.500	7.327	ppb	0.69	200.00	
121 Sb	115	3	101.450	0.203	ppb	2.80	25.00	
125 Te	115	3	31.875	0.064	ppb	16.91	200.00	
133 Cs	115	3	329.600	0.659	ppb	0.76	200.00	
137 Ba	115	3	512,500.000	1025.000	ppb	1.09	200.00	OCAL
205 Tl	209	3	32.330	0.065	ppb	3.22	200.00	
208 Pb	209	3	16,315.000	32.630	ppb	0.42	500.00	
232 Th	209	3	641.000	1.282	ppb	0.41	200.00	
238 U	209	3	1,947.500	3.895	ppb	0.16	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4434362	0.65	4492701	98.7	59.5 - 120.4	
45 Sc	3	19391260	0.69	19038030	101.9	59.5 - 120.4	
72 Ge	3	4243006	0.53	4215163	100.7	59.5 - 120.4	
74 Ge	3	5706053	0.29	5782803	98.7	59.5 - 120.4	
115 In	3	14968526	0.42	15293276	97.9	59.5 - 120.4	
159 Tb	3	19642384	1.30	19484246	100.8	59.5 - 120.4	
209 Bi	3	20918834	0.44	21710272	96.4	59.5 - 120.4	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

3 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\026SMPL.D\026SMPL.D#
Date Acquired: Sep 20 2016 08:14 pm
Acq. Method: ACZ_T3.M
Operator:
Sample Name: L32770-06SDL
Misc Info:
Vial Number: 4312
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal. Update: Sep 20 2016 07:35 pm
Sample Type: Sample
Dilution Factor: 500.00
Autodil Factor: Undiluted
Final Dil Factor: 500.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	31.000	0.062	ppb	1.09	200.00	
11 B	6	3	1,324.000	2.648	ppb	2.29	20.00	
27 Al	72	3	678,500.000	1357.000	ppb	0.28	1000.00	OCAL
55 Mn	72	3	34,415.000	68.830	ppb	0.49	200.00	
59 Co	72	3	1,021.500	2.043	ppb	0.95	200.00	
66 Zn	72	3	11,555.000	23.110	ppb	0.27	1000.00	
98 Mo	115	3	123.150	0.246	ppb	3.21	200.00	
107 Ag	115	3	7.340	0.015	ppb	10.36	50.00	
111 Cd	115	3	45.095	0.090	ppb	12.95	200.00	
118 Sn	115	3	706.000	1.412	ppb	1.10	200.00	
121 Sb	115	3	2.716	0.005	ppb	28.10	25.00	
125 Te	115	3	-1.650	-0.003	ppb	300.03	200.00	
133 Cs	115	3	60.750	0.122	ppb	1.88	200.00	
137 Ba	115	3	100,950.000	201.900	ppb	1.99	200.00	OCAL
205 Tl	209	3	0.463	0.001	ppb	53.10	200.00	
208 Pb	209	3	3,102.500	6.205	ppb	0.25	500.00	
232 Th	209	3	115.150	0.230	ppb	0.52	200.00	
238 U	209	3	372.900	0.746	ppb	0.63	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4401869	1.15	4492701	98.0	59.5 - 120.4	
45 Sc	3	19277824	0.62	19038030	101.3	59.5 - 120.4	
72 Ge	3	4249549	0.47	4215163	100.8	59.5 - 120.4	
74 Ge	3	5849028	0.37	5782803	101.1	59.5 - 120.4	
115 In	3	15152071	1.02	15293276	99.1	59.5 - 120.4	
159 Tb	3	19317280	0.16	19484246	99.1	59.5 - 120.4	
209 Bi	3	21093088	0.26	21710272	97.2	59.5 - 120.4	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

2 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\027SMPL.D\027SMPL.D#
Date Acquired: Sep 20 2016 08:17 pm
Acq. Method: ACZ_T3.M
Operator:
Sample Name: L32770-07
Misc Info:
Vial Number: 4401
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal. Update: Sep 20 2016 07:35 pm
Sample Type: Sample
Dilution Factor: 500.00
Autodil Factor: Undiluted
Final Dil Factor: 500.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	182.800	0.366	ppb	5.63	200.00	
11 B	6	3	7,370.000	14.740	ppb	1.45	20.00	
27 Al	72	3	###########	8227.000	ppb	0.51	1000.00	OCAL
55 Mn	72	3	222,150.000	444.300	ppb	0.48	200.00	OCAL
59 Co	72	3	6,120.000	12.240	ppb	0.77	200.00	
66 Zn	72	3	66,800.000	133.600	ppb	0.92	1000.00	
98 Mo	115	3	622.000	1.244	ppb	0.70	200.00	
107 Ag	115	3	46.710	0.093	ppb	0.82	50.00	
111 Cd	115	3	181.350	0.363	ppb	3.59	200.00	
118 Sn	115	3	3,663.500	7.327	ppb	0.88	200.00	
121 Sb	115	3	91.150	0.182	ppb	3.06	25.00	
125 Te	115	3	32.285	0.065	ppb	30.76	200.00	
133 Cs	115	3	317.350	0.635	ppb	1.31	200.00	
137 Ba	115	3	467,050.000	934.100	ppb	0.24	200.00	OCAL
205 Tl	209	3	29.945	0.060	ppb	4.49	200.00	
208 Pb	209	3	17,420.000	34.840	ppb	0.25	500.00	
232 Th	209	3	960.500	1.921	ppb	1.30	200.00	
238 U	209	3	316.800	0.634	ppb	1.46	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4536488	1.75	4492701	101.0	59.5 - 120.4	
45 Sc	3	19481684	0.69	19038030	102.3	59.5 - 120.4	
72 Ge	3	4245037	1.14	4215163	100.7	59.5 - 120.4	
74 Ge	3	5735116	0.73	5782803	99.2	59.5 - 120.4	
115 In	3	14709271	0.20	15293276	96.2	59.5 - 120.4	
159 Tb	3	19233412	0.45	19484246	98.7	59.5 - 120.4	
209 Bi	3	20228646	0.42	21710272	93.2	59.5 - 120.4	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

3 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Sample QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\028SMPL.D\028SMPL.D#
Date Acquired: Sep 20 2016 08:19 pm
Acq. Method: ACZ_T3.M
Operator:
Sample Name: L32770-08
Misc Info:
Vial Number: 4402
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal. Update: Sep 20 2016 07:35 pm
Sample Type: Sample
Dilution Factor: 500.00
Autodil Factor: Undiluted
Final Dil Factor: 500.00

Data Results:
Analytes: Fail
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Corr Conc	Raw Conc	Units	RSD(%)	High Limit	Flag
9 Be	6	3	197.050	0.394	ppb	3.18	200.00	
11 B	6	3	10,375.000	20.750	ppb	0.50	20.00	OCAL
27 Al	72	3	###########	11970.000	ppb	0.75	1000.00	OCAL
55 Mn	72	3	371,700.000	743.400	ppb	0.77	200.00	OCAL
59 Co	72	3	8,840.000	17.680	ppb	1.15	200.00	
66 Zn	72	3	52,300.000	104.600	ppb	0.20	1000.00	
98 Mo	115	3	497.800	0.996	ppb	2.38	200.00	
107 Ag	115	3	34.705	0.069	ppb	2.14	50.00	
111 Cd	115	3	188.550	0.377	ppb	4.36	200.00	
118 Sn	115	3	3,674.000	7.348	ppb	0.66	200.00	
121 Sb	115	3	72.700	0.145	ppb	0.82	25.00	
125 Te	115	3	16.305	0.033	ppb	43.30	200.00	
133 Cs	115	3	412.750	0.826	ppb	0.56	200.00	
137 Ba	115	3	398,150.000	796.300	ppb	1.77	200.00	OCAL
205 Tl	209	3	32.065	0.064	ppb	5.48	200.00	
208 Pb	209	3	6,010.000	12.020	ppb	0.91	500.00	
232 Th	209	3	2,585.000	5.170	ppb	0.93	200.00	
238 U	209	3	384.050	0.768	ppb	1.43	200.00	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4414597	0.90	4492701	98.3	59.5 - 120.4	
45 Sc	3	19382014	0.96	19038030	101.8	59.5 - 120.4	
72 Ge	3	4201932	0.85	4215163	99.7	59.5 - 120.4	
74 Ge	3	5627232	0.36	5782803	97.3	59.5 - 120.4	
115 In	3	14511635	1.89	15293276	94.9	59.5 - 120.4	
159 Tb	3	19179974	0.46	19484246	98.4	59.5 - 120.4	
209 Bi	3	20124262	1.20	21710272	92.7	59.5 - 120.4	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

4 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Continuing Calibration Verification (CCV) QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\029_CCV.D\029_CCV.D#
Date Acquired: Sep 20 2016 08:21 pm
Operator:
Sample Name: CCV
Misc Info:
Vial Number: 1105
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal Update: Sep 20 2016 07:35 pm
Sample Type: CCV
Total Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc. ppb	RSD(%)	Expected	Rec(%)	QC Range(%)	Flag
9 Be	6	3	99.200	0.34	100.00	99.2	89 - 110	
11 B	6	3	9.922	1.18	10.00	99.2	89 - 110	
27 Al	72	3	503.900	0.72	500.00	100.8	89 - 110	
55 Mn	72	3	98.890	0.62	100.00	98.9	89 - 110	
59 Co	72	3	97.900	0.27	100.00	97.9	89 - 110	
66 Zn	72	3	490.600	0.10	500.00	98.1	89 - 110	
98 Mo	115	3	98.860	1.06	100.00	98.9	89 - 110	
107 Ag	115	3	24.920	0.75	25.00	99.7	89 - 110	
111 Cd	115	3	97.770	1.39	100.00	97.8	89 - 110	
118 Sn	115	3	99.120	0.31	100.00	99.1	89 - 110	
121 Sb	115	3	11.900	0.55	12.50	95.2	89 - 110	
125 Te	115	3	99.830	0.19	100.00	99.8	89 - 110	
133 Cs	115	3	98.110	1.00	100.00	98.1	89 - 110	
137 Ba	115	3	250.200	1.14	250.00	100.1	89 - 110	
205 Tl	209	3	99.830	1.44	100.00	99.8	89 - 110	
208 Pb	209	3	245.600	1.00	250.00	98.2	89 - 110	
232 Th	209	3	97.310	1.30	100.00	97.3	89 - 110	
238 U	209	3	99.220	0.87	100.00	99.2	89 - 110	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4501206	0.26	4492701	100.2	60 - 120	
45 Sc	3	19069838	0.88	19038030	100.2	60 - 120	
72 Ge	3	4201239	0.44	4215163	99.7	60 - 120	
74 Ge	3	5796769	0.47	5782803	100.2	60 - 120	
115 In	3	15189531	0.55	15293276	99.3	60 - 120	
159 Tb	3	19437618	1.22	19484246	99.8	60 - 120	
209 Bi	3	21339786	0.43	21710272	98.3	60 - 120	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Continuing Calibration Blank (CCB) QC Report

Data File: C:\ICPCHEM\1\DATA\wg410083.b\030_CCB.D\030_CCB.D#
Date Acquired: Sep 20 2016 08:23 pm
Operator:
Sample Name: CCB
Misc Info:
Vial Number: 1102
Current Method: C:\ICPCHEM\1\METHODS\ACZ_T3.M
Calibration File: C:\ICPCHEM\1\CALIB\ACZ_T3.C
Last Cal Update: Sep 20 2016 07:35 pm
Sample Type: CCB
Total Dil Factor: 1.00

Data Results:
Analytes: Pass
ISTD: Pass

QC Elements

Element	IS Ref	Tune	Conc.	RSD(%)	High Limit	Flag
9 Be	6	3	0.041 ppb	35.14	0.150	
11 B	6	3	-0.063 ppb	82.34	1.500	
27 Al	72	3	1.974 ppb	24.86	3.000	
55 Mn	72	3	0.106 ppb	24.99	1.500	
59 Co	72	3	0.038 ppb	32.10	0.150	
66 Zn	72	3	0.189 ppb	40.25	6.000	
98 Mo	115	3	0.043 ppb	24.42	1.500	
107 Ag	115	3	0.011 ppb	32.41	0.150	
111 Cd	115	3	0.041 ppb	30.25	0.300	
118 Sn	115	3	0.056 ppb	30.02	0.300	
121 Sb	115	3	0.113 ppb	26.49	1.200	
125 Te	115	3	0.062 ppb	41.29	3.000	
133 Cs	115	3	0.047 ppb	28.51	0.600	
137 Ba	115	3	0.200 ppb	26.81	0.300	
205 Tl	209	3	0.051 ppb	28.95	0.300	
208 Pb	209	3	0.102 ppb	32.64	0.300	
232 Th	209	3	0.085 ppb	10.29	3.000	
238 U	209	3	0.036 ppb	33.39	0.300	

ISTD Elements

Element	Tune	CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
6 Li	3	4471512	0.77	4492701	99.5	60 - 120	
45 Sc	3	18883706	0.65	19038030	99.2	60 - 120	
72 Ge	3	4171652	0.49	4215163	99.0	60 - 120	
74 Ge	3	5750944	0.93	5782803	99.4	60 - 120	
115 In	3	15049101	1.02	15293276	98.4	60 - 120	
159 Tb	3	19390334	0.26	19484246	99.5	60 - 120	
209 Bi	3	21211680	0.48	21710272	97.7	60 - 120	

Tune File# 1 C:\ICPCHEM\1\7500\
Tune File# 2 C:\ICPCHEM\1\7500\
Tune File# 3 C:\ICPCHEM\1\7500\norm.u

ISTD Ref File : C:\ICPCHEM\1\DATA\wg410083.b\003CALB.D\003CALB.D#

0 :Element Failures
0 :ISTD Failures
0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

3050 ICP ICPMS

QC List Type: I-X-3050
QCListMatClass: SOLID
Bench Sheet List: R-GROSS-AB
QC Ref: SP-3050MSICP
Group ID: SP-G-3050-MSICP
Method Ref: M3050B
SOP Ref: SOPSO28/SOPSO029

WG409857

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: BCC
ACZ Dept: 20
Create Date: 09/15/2016 9:21
Start Date/Time: 09/15/2016 9:30
End Date/Time: 09/16/2016 13:45

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Sample Weight (g)	HNO3 (mL)	H2O2 (mL)	HCl (mL)	Soil Extract Volume (mL)	SCN Volume (mL)	Air Dry or Percent Solid (%)	Pan Weight (g)	Pan and Sample Weight (g)	Dried Sample and Pan Weight (g)	Air Dry Solids (%)	Dilution	Comments
1	WG409857PBS	NONE	<200		09/15/16 9:30	0	7.5	5	5	50			1.271	7.746	1.271	.00	100	
2	WG409857LCSS	PCN51904	<200		09/15/16 11:15	0.5	7.5	5	5	50		100					100	
3	WG409857LCSSD	PCN51904	<200		09/15/16 13:01	0.5	7.5	5	5	50		100					100	
4	L32739-01	SANDRIDGE FRAC SAND	<200		09/15/16 14:47	0.5	7.5	5	5	50			1.27	7.876	7.836	99.39	101	
5	L32739-01MS	II160831-5	<200		09/15/16 16:33	0.5	7.5	5	5	50	0.5	99.39					101	
6	L32739-01MSD	II160831-5	<200		09/15/16 18:19	0.5	7.5	5	5	50	0.5	99.39					101	
7	L32770-01	16-035 NMM-A	<200		09/15/16 20:05	0.5	7.5	5	5	50			1.268	7.02	7.006	99.76	100	
8	L32770-02	16-036 NMGZ-A	<200		09/15/16 21:51	0.5	7.5	5	5	50			1.269	3.577	3.569	99.65	100	
9	L32770-03	16-037 NMN-A	<200		09/15/16 23:37	0.5	7.5	5	5	50			1.271	7.333	7.315	99.70	100	
10	**L32770-04**	16-038 NMO-A	<200		09/16/16 1:23	0.5	7.5	5	5	50			1.273	7.256	7.237	99.68	100	
11	L32770-04MS	MS160803-3	<200		09/16/16 3:09	0.5	7.5	5	5	50	0.25	99.68	1.273	7.996	7.973	99.66	100	
12	L32770-04MSD	MS160803-3	<200		09/16/16 4:55	0.5	7.5	5	5	50	0.25	99.68					100	
13	L32770-05	16-039 NMO-B	<200		09/16/16 6:41	0.5	7.5	5	5	50			1.276	7.115	7.096	99.67	100	
14	L32770-06	16-040 NML-A	<200		09/16/16 8:27	0.5	7.5	5	5	50			1.271	7.372	7.351	99.66	100	
15	L32770-07	16-041 NMD-A	<200		09/16/16 10:13	0.5	7.5	5	5	50			1.27	7.276	7.259	99.72	100	
16	L32770-08	16-042 NMAA-A	<200		09/16/16 11:59	0.5	7.5	5	5	50			1.273	7.954	7.934	99.70	100	
17	L32928-01	102-44-10	<200	30	09/16/16 13:44	0.5	7.5	5	5	50		97.73					102	

Report Comments: _____

Internal Comments _____

AREV: BCC 9.16.16
Initials, Date

SREV: BAD 9/19/16
Initials, Date

3050 ICP ICPMS

QC List Type: I-X-3050
QCListMatClass: SOLID
Bench Sheet List: R-GROSS-AB
QC Ref: SP-3050MSICP
Group ID: SP-G-3050-MSICP
Method Ref: M3050B
SOP Ref: SOPSO28/SOPSO029

WG409857

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: BCC
ACZ Dept: 20
Create Date: 09/15/2016 9:21
Start Date/Time: 09/15/2016 9:30
End Date/Time: 09/16/2016 13:45

Sample	Login Comments
L32739-01	SJ(4) || 3 INORG SJ in the Inorganic cooler.
L32739-01MS	ICP Spike
L32739-01MSD	ICP Spike
L32770-01	SJ || In the Inorganic cooler.
L32770-02	SJ || In the Inorganic cooler
L32770-03	SJ || In the Inorganic cooler.
L32770-04	SJ(2) || In the Inorganic cooler. Run QC.
L32770-04MS	ICPMS Spike
L32770-04MSD	ICPMS Spike
L32770-05	SJ || In the Inorganic cooler.
L32770-06	SJ || In the Inorganic cooler.
L32770-07	SJ || In the Inorganic cooler.
L32770-08	SJ || In the Inorganic cooler.
L32928-01	ZIPLOCK -- RELOG OF L32117-04 || In the Inorganic cooler.

Report Comments: _____

Internal Comments _____

AREV: _____
Initials, Date

SREV: _____
Initials, Date

ACZ Laboratories, Inc.
Geochemistry Department
Data Review and Reagents

Data Reviewer: BCC
Date: 9.16.16

Approved:
Date: 9/19/16

Analyst: BCC

Workgroup: 409857

Analysis Date: 9/15 - 9/16/16

Sample type used: SO

Extraction / Digestion / Analysis / Prep / Calc:

	Yes	No	N/A
1. Is the raw data checked to the computer printout for transcription errors?	X		
2. Is the %solid or TS attached for dilution factors?	X		
3. Were proper volumes of reagents used per final volume?	X		
4. Was the proper sub-sample used (as received, <2000, <500, <250, dry, R&P)?	X		
5. Were the dilution factor calculation checked (final volume, weight, %solid)?	X		
6. Did the RPD pass?	X		
7. Does all the spike information correlate with each other?	X		
8. Is the appropriate spike in the computer-designated line?	X		
9. Are all errors properly corrected (single-line crossout, dated & initialed)?	X		
10. Is the standard/reagent information complete and current?	X		
11. Is your instrument calibration passing (and included in the data package if needed)?	X		
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?			

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date
50 mL Digestion Tubes	15i2329-SA-6225-QN	
HNO_3	51528	1-20-18
H_2O_2	51491, 51485	4-30-18
HCl	51243	1-27-19

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

Comments: _____

3050 ICP ICPMS

WG408873

ACZ Laboratories, Inc

QC List Type: I-X-3050
QCListMatClass: SOLID
Bench Sheet List: R-GROSS-AB
QC Ref: SP-3050MSICP
Group ID: SP-G-3050-MSICP
Method Ref: M3050B
SOP Ref: SOPSO28/SOPSO029

Instrument ID: SOILSPREP
Analyst: BCC
ACZ Dept: 20
Create Date: 08/26/2016 8:19
Start Date/Time: 08/26/2016 8:20
End Date/Time: 08/26/2016 14:30

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Sample Weight (g)	HNO3 (mL)	H2O2 (mL)	HCl (mL)	Soil Extract Volume (mL)	SCN Volume (mL)	Air Dry or Percent Solid (%)	Pan Weight (g)	Pan and Sample Weight (g)	Dried Sample and Pan Weight (g)	Air Dry Solids (%)	Dilution	Comments
1	WG408873PBS	NONE	<250		08/26/16 8:20	0	7.5	5	5	50			1.261	9.151	1.261	.00	100	
2	WG408873LCSS	PCN51347	<250		08/26/16 8:43	0.5	7.5	5	5	50		100					100	
3	WG408873LCSSD	PCN51347	<250		08/26/16 9:06	0.5	7.5	5	5	50		100					100	
4	L32116-01	102-44-1 BLANK	<250		08/26/16 9:29	0.5	7.5	5	5	50			1.263	2.016	2.005	98.54	101	
5	L32116-02	102-44-3	<250		08/26/16 9:52	0.5	7.5	5	5	50			1.263	2.324	2.304	98.11	102	
6	L32116-02MS	II160802-3	<250		08/26/16 10:15	0.5	7.5	5	5	50	0.5	98.11	1.262	2.3	2.28	98.07	102	AD QC
7	L32116-02MSD	II160802-3	<250		08/26/16 10:38	0.5	7.5	5	5	50	0.5	98.11					102	
8	L32116-03	102-44-4	<250		08/26/16 11:01	0.5	7.5	5	5	50			1.268	4.367	4.3	97.84	102	
9	L32116-04	102-44-6 BLANK	<250		08/26/16 11:25	0.5	7.5	5	5	50			1.268	1.566	1.558	97.32	103	
10	L32116-05	102-44-8	<250		08/26/16 11:48	0.5	7.5	5	5	50			1.259	2.52	2.497	98.18	102	
11	L32116-06	102-44-9	<250		08/26/16 12:11	0.5	7.5	5	5	50			1.267	2.003	1.986	97.69	102	
12	L32116-07	102-44-11 SOIL BLANK	<250		08/26/16 12:34	0.5	7.5	5	5	50			1.273	3.554	3.529	98.90	101	
13	L32116-08	102-44-12	<250		08/26/16 12:57	0.5	7.5	5	5	50			1.265	3.641	3.599	98.23	102	
14	L32117-01	102-44-2 BLANK	<250		08/26/16 13:20	0.5	7.5	5	5	50			1.254	2.311	2.296	98.58	101	
15	L32117-02	102-44-5	<250		08/26/16 13:43	0.5	7.5	5	5	50			1.256	1.816	1.804	97.86	102	
16	L32117-03	102-44-7 BLANK	<250		08/26/16 14:07	0.5	7.5	5	5	50		100					100	
17	L32117-04	102-44-10	<250		08/26/16 14:30	0.5	7.5	5	5	50			1.27	1.578	1.571	97.73	102	

L32928-01 Relog of 32117-04

Report Comments: _____

Internal Comments _____

AREV: BCC 8-26-16
Initials, Date

SREV: DRD 8/26/16
Initials, Date

3050 ICP ICPMS

QC List Type: I-X-3050
QCListMatClass: SOLID
Bench Sheet List: R-GROSS-AB
QC Ref: SP-3050MSICP
Group ID: SP-G-3050-MSICP
Method Ref: M3050B
SOP Ref: SOPSO28/SOPSO029

WG409857

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: BCC
ACZ Dept: 20
Create Date: 09/15/2016 9:21
Start Date/Time: 9/15/16 9:30
End Date/Time: 9/16/16 1:45

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Sample Weight (g)	HNO3 (mL)	H2O2 (mL)	HCl (mL)	Soil Extract Volume (mL)	SCN Volume (mL)	Air Dry or Percent Solid (%)	Pan Weight (g)	Pan and Sample Weight (g)	Dried Sample and Pan Weight (g)	Air Dry Solids (%)	Dilution	Comments
1	WG409857PBS	NONE				0	7.5	5	5	50			1.271	7.746	1.271			
2	WG409857LCSS	PCN51904				0.500												
3	WG409857LCSSD	PCN51904				0.500												
4	L32739-01	SANDRIDGE FRAC SAND	62000			0.500							1.270	7.876	7.836			
5	L32739-01MS	II160831-5				0.500					0.500							
6	L32739-01MSD	II160831-5				0.500					0.500							
7	L32770-01	16-035 NMM-A				0.500							1.268	7.020	7.006			
8	L32770-02	16-036 NMGZ-A				0.500							1.269	3.577	3.569			
9	L32770-03	16-037 NMN-A				0.500							1.271	7.333	7.315			
10	**L32770-04**	16-038 NMO-A				0.500							1.273	7.256	7.237			
11	L32770-04MS	MS160803-3				0.500					0.250		1.273	7.496	7.473			AD QC
12	L32770-04MSD	MS160803-3				0.500					0.250							
13	L32770-05	16-039 NMO-B				0.500							1.276	7.115	7.096			
14	L32770-06	16-040 NML-A				0.500							1.271	7.372	7.351			
15	L32770-07	16-041 NMD-A				0.500							1.270	7.276	7.259			
16	L32770-08	16-042 NMAA-A				0.500							1.273	7.954	7.934			
17	L32928-01	102-44-10		30		0.500												

Report Comments: _____

AREV: _____ Initials, Date

Internal Comments _____

SREV: _____ Initials, Date

3050 ICP ICPMS

QC List Type: I-X-3050
QCListMatClass: SOLID
Bench Sheet List: R-GROSS-AB
QC Ref: SP-3050MSICP
Group ID: SP-G-3050-MSICP
Method Ref: M3050B
SOP Ref: SOPSO28/SOPSO029

WG409857

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst:
ACZ Dept: 20
Create Date: 09/15/2016 9:21
Start Date/Time:
End Date/Time:

Sample	Login Comments
L32739-01	SJ(4) || 3 INORG SJ in the Inorganic cooler.
L32739-01MS	ICP Spike
L32739-01MSD	ICP Spike
L32770-01	SJ || In the Inorganic cooler.
L32770-02	SJ || In the Inorganic cooler.
L32770-03	SJ || In the Inorganic cooler.
L32770-04	SJ(2) || In the Inorganic cooler. Run QC.
L32770-04MS	ICPMS Spike
L32770-04MSD	ICPMS Spike
L32770-05	SJ || In the Inorganic cooler.
L32770-06	SJ || In the Inorganic cooler.
L32770-07	SJ || In the Inorganic cooler.
L32770-08	SJ || In the Inorganic cooler.
L32928-01	ZIPLOCK -- RELOG OF L32117-04 || In the Inorganic cooler.

Report Comments: _____

Internal Comments _____

AREV: _____
Initials, Date

SREV: _____
Initials, Date

Workgroup Review and Approval

WG409857

Date Reported: 19-Sep-16
Run ID: R1451806
Date Analyzed: 15-Sep-16
ICAL Workgroup:
Instrument ID: SOILSPREP

WG409857PBS

Tag:

Measured: 9/15/2016 9:30:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY SOLIDS	PREP	0	100		%	++					
SREV	DILUTION	REG	100	100			++					
SREV	DRIED SAMPLE AND PAN WEIGHT	PREP	1.271	100		g	++					
SREV	H2O2	PREP	5	100		mL	++					
SREV	HCL	PREP	5	100		mL	++					
SREV	HNO3	PREP	7.5	100		mL	++					
SREV	PAN AND SAMPLE WEIGHT	PREP	7.746	100		g	++					
SREV	PAN WEIGHT	PREP	1.271	100		g	++					
SREV	VOLUME, SOIL EXTRACT	PREP	50	100		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0	100		g	++					

WG409857LCSS

Tag:

Measured: 9/15/2016 11:15:56 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY OR PERCENT SOLID	PREP	100	100		%	++					
SREV	DILUTION	REG	100	100			++					
SREV	H2O2	PREP	5	100		mL	++					
SREV	HCL	PREP	5	100		mL	++					
SREV	HNO3	PREP	7.5	100		mL	++					
SREV	VOLUME, SOIL EXTRACT	PREP	50	100		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0.5	100		g	++					

WG409857LCSSD

Tag:

Measured: 9/15/2016 1:01:52 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY OR PERCENT SOLID	PREP	100	100		%	++					
SREV	DILUTION	REG	100	100			++					
SREV	H2O2	PREP	5	100		mL	++					
SREV	HCL	PREP	5	100		mL	++					
SREV	HNO3	PREP	7.5	100		mL	++					
SREV	VOLUME, SOIL EXTRACT	PREP	50	100		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0.5	100		g	++					

L32739-01

Tag:

Measured: 9/15/2016 2:47:48 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY SOLIDS	X-3050	99.39	101		%	++					
SREV	DILUTION	X-3050	101	101			++					
SREV	DRIED SAMPLE AND PAN WEIGHT	X-3050	7.836	101		g	++					
SREV	H2O2	X-3050	5	101		mL	++					
SREV	HCL	X-3050	5	101		mL	++					
SREV	HNO3	X-3050	7.5	101		mL	++					
SREV	PAN AND SAMPLE WEIGHT	X-3050	7.876	101		g	++					
SREV	PAN WEIGHT	X-3050	1.27	101		g	++					
SREV	VOLUME, SOIL EXTRACT	X-3050	50	101		mL	++					
SREV	WEIGHT, SAMPLE	X-3050	0.5	101		g	++					

L32739-01MS

Tag:

Measured: 9/15/2016 4:33:44 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY OR PERCENT SOLID	PREP	99.39	101		%	++					
SREV	DILUTION	REG	101	101			++					
SREV	H2O2	PREP	5	101		mL	++					
SREV	HCL	PREP	5	101		mL	++					
SREV	HNO3	PREP	7.5	101		mL	++					
SREV	SCN VOLUME	PREP	0.5	101		mL	++					
SREV	VOLUME, SOIL EXTRACT	PREP	50	101		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0.5	101		g	++					

L32739-01MSD

Tag:

Measured: 9/15/2016 6:19:40 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY OR PERCENT SOLID	PREP	99.39	101		%	++					
SREV	DILUTION	REG	101	101			++					
SREV	H2O2	PREP	5	101		mL	++					
SREV	HCL	PREP	5	101		mL	++					
SREV	HNO3	PREP	7.5	101		mL	++					
SREV	SCN VOLUME	PREP	0.5	101		mL	++					
SREV	VOLUME, SOIL EXTRACT	PREP	50	101		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0.5	101		g	++					

L32770-01

Tag:

Measured: 9/15/2016 8:05:36 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY SOLIDS	X-MS-3050	99.76	100		%	++					
SREV	DILUTION	X-MS-3050	100	100			++					
SREV	DRIED SAMPLE AND PAN WEIGHT	X-MS-3050	7.006	100		g	++					
SREV	H2O2	X-MS-3050	5	100		mL	++					
SREV	HCL	X-MS-3050	5	100		mL	++					
SREV	HNO3	X-MS-3050	7.5	100		mL	++					
SREV	PAN AND SAMPLE WEIGHT	X-MS-3050	7.02	100		g	++					
SREV	PAN WEIGHT	X-MS-3050	1.268	100		g	++					
SREV	VOLUME, SOIL EXTRACT	X-MS-3050	50	100		mL	++					
SREV	WEIGHT, SAMPLE	X-MS-3050	0.5	100		g	++					

L32770-02

Tag:

Measured: 9/15/2016 9:51:32 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY SOLIDS	X-MS-3050	99.65	100		%	++					
SREV	DILUTION	X-MS-3050	100	100			++					
SREV	DRIED SAMPLE AND PAN WEIGHT	X-MS-3050	3.569	100		g	++					
SREV	H2O2	X-MS-3050	5	100		mL	++					
SREV	HCL	X-MS-3050	5	100		mL	++					
SREV	HNO3	X-MS-3050	7.5	100		mL	++					
SREV	PAN AND SAMPLE WEIGHT	X-MS-3050	3.577	100		g	++					
SREV	PAN WEIGHT	X-MS-3050	1.269	100		g	++					
SREV	VOLUME, SOIL EXTRACT	X-MS-3050	50	100		mL	++					
SREV	WEIGHT, SAMPLE	X-MS-3050	0.5	100		g	++					

L32770-03

Tag:

Measured: 9/15/2016 11:37:28 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY SOLIDS	X-MS-3050	99.7	100		%	++					
SREV	DILUTION	X-MS-3050	100	100			++					
SREV	DRIED SAMPLE AND PAN WEIGHT	X-MS-3050	7.315	100		g	++					
SREV	H2O2	X-MS-3050	5	100		mL	++					
SREV	HCL	X-MS-3050	5	100		mL	++					
SREV	HNO3	X-MS-3050	7.5	100		mL	++					
SREV	PAN AND SAMPLE WEIGHT	X-MS-3050	7.333	100		g	++					
SREV	PAN WEIGHT	X-MS-3050	1.271	100		g	++					
SREV	VOLUME, SOIL EXTRACT	X-MS-3050	50	100		mL	++					
SREV	WEIGHT, SAMPLE	X-MS-3050	0.5	100		g	++					

L32770-04

Tag:

Measured: 9/16/2016 1:23:24 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY SOLIDS	X-MS-3050	99.68	100		%	++					
SREV	DILUTION	X-MS-3050	100	100			++					
SREV	DRIED SAMPLE AND PAN WEIGHT	X-MS-3050	7.237	100		g	++					
SREV	H2O2	X-MS-3050	5	100		mL	++					
SREV	HCL	X-MS-3050	5	100		mL	++					
SREV	HNO3	X-MS-3050	7.5	100		mL	++					
SREV	PAN AND SAMPLE WEIGHT	X-MS-3050	7.256	100		g	++					
SREV	PAN WEIGHT	X-MS-3050	1.273	100		g	++					
SREV	VOLUME, SOIL EXTRACT	X-MS-3050	50	100		mL	++					
SREV	WEIGHT, SAMPLE	X-MS-3050	0.5	100		g	++					

L32770-04MS

Tag:

Measured: 9/16/2016 3:09:20 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY OR PERCENT SOLID	PREP	99.68	100		%	++					
SREV	AIR DRY SOLIDS	PREP	99.66	100		%	++					
SREV	DILUTION	REG	100	100			++					
SREV	DRIED SAMPLE AND PAN WEIGHT	PREP	7.973	100		g	++					
SREV	H2O2	PREP	5	100		mL	++					
SREV	HCL	PREP	5	100		mL	++					
SREV	HNO3	PREP	7.5	100		mL	++					
SREV	PAN AND SAMPLE WEIGHT	PREP	7.996	100		g	++					
SREV	PAN WEIGHT	PREP	1.273	100		g	++					
SREV	SCN VOLUME	PREP	0.25	100		mL	++					
SREV	VOLUME, SOIL EXTRACT	PREP	50	100		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0.5	100		g	++					

L32770-04MSD

Tag:

Measured: 9/16/2016 4:55:16 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY OR PERCENT SOLID	PREP	99.68	100		%	++					
SREV	DILUTION	REG	100	100			++					
SREV	H2O2	PREP	5	100		mL	++					
SREV	HCL	PREP	5	100		mL	++					
SREV	HNO3	PREP	7.5	100		mL	++					
SREV	SCN VOLUME	PREP	0.25	100		mL	++					
SREV	VOLUME, SOIL EXTRACT	PREP	50	100		mL	++					
SREV	WEIGHT, SAMPLE	PREP	0.5	100		g	++					

L32770-05

Tag:

Measured: 9/16/2016 6:41:12 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY SOLIDS	X-MS-3050	99.67	100		%	++					
SREV	DILUTION	X-MS-3050	100	100			++					
SREV	DRIED SAMPLE AND PAN WEIGHT	X-MS-3050	7.096	100		g	++					
SREV	H2O2	X-MS-3050	5	100		mL	++					
SREV	HCL	X-MS-3050	5	100		mL	++					
SREV	HNO3	X-MS-3050	7.5	100		mL	++					
SREV	PAN AND SAMPLE WEIGHT	X-MS-3050	7.115	100		g	++					
SREV	PAN WEIGHT	X-MS-3050	1.276	100		g	++					
SREV	VOLUME, SOIL EXTRACT	X-MS-3050	50	100		mL	++					
SREV	WEIGHT, SAMPLE	X-MS-3050	0.5	100		g	++					

L32770-06

Tag:

Measured: 9/16/2016 8:27:08 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY SOLIDS	X-MS-3050	99.66	100		%	++					
SREV	DILUTION	X-MS-3050	100	100			++					
SREV	DRIED SAMPLE AND PAN WEIGHT	X-MS-3050	7.351	100		g	++					
SREV	H2O2	X-MS-3050	5	100		mL	++					
SREV	HCL	X-MS-3050	5	100		mL	++					
SREV	HNO3	X-MS-3050	7.5	100		mL	++					
SREV	PAN AND SAMPLE WEIGHT	X-MS-3050	7.372	100		g	++					
SREV	PAN WEIGHT	X-MS-3050	1.271	100		g	++					
SREV	VOLUME, SOIL EXTRACT	X-MS-3050	50	100		mL	++					
SREV	WEIGHT, SAMPLE	X-MS-3050	0.5	100		g	++					

L32770-07

Tag:

Measured: 9/16/2016 10:13:04 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY SOLIDS	X-MS-3050	99.72	100		%	++					
SREV	DILUTION	X-MS-3050	100	100			++					
SREV	DRIED SAMPLE AND PAN WEIGHT	X-MS-3050	7.259	100		g	++					
SREV	H2O2	X-MS-3050	5	100		mL	++					
SREV	HCL	X-MS-3050	5	100		mL	++					
SREV	HNO3	X-MS-3050	7.5	100		mL	++					
SREV	PAN AND SAMPLE WEIGHT	X-MS-3050	7.276	100		g	++					
SREV	PAN WEIGHT	X-MS-3050	1.27	100		g	++					
SREV	VOLUME, SOIL EXTRACT	X-MS-3050	50	100		mL	++					
SREV	WEIGHT, SAMPLE	X-MS-3050	0.5	100		g	++					

L32770-08

Tag:

Measured: 9/16/2016 11:59:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY SOLIDS	X-MS-3050	99.7	100		%	++					
SREV	DILUTION	X-MS-3050	100	100			++					
SREV	DRIED SAMPLE AND PAN WEIGHT	X-MS-3050	7.934	100		g	++					
SREV	H2O2	X-MS-3050	5	100		mL	++					
SREV	HCL	X-MS-3050	5	100		mL	++					
SREV	HNO3	X-MS-3050	7.5	100		mL	++					
SREV	PAN AND SAMPLE WEIGHT	X-MS-3050	7.954	100		g	++					
SREV	PAN WEIGHT	X-MS-3050	1.273	100		g	++					
SREV	VOLUME, SOIL EXTRACT	X-MS-3050	50	100		mL	++					
SREV	WEIGHT, SAMPLE	X-MS-3050	0.5	100		g	++					

L32928-01

Tag:

Measured: 9/16/2016 1:44:56 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	AIR DRY OR PERCENT SOLID	X-3050	97.73	102		%	++					
SREV	DILUTION	X-3050	102	102			++					
SREV	H2O2	X-3050	5	102		mL	++					
SREV	HCL	X-3050	5	102		mL	++					
SREV	HNO3	X-3050	7.5	102		mL	++					
SREV	VOLUME, SOIL EXTRACT	X-3050	50	102		mL	++					
SREV	WEIGHT, SAMPLE	X-3050	0.5	102		g	++					

Percent Solids

WG409607

ACZ Laboratories, Inc

QC List Type: QC-MST-PCNT
QCListMatClass: SOLID
Bench Sheet List: I-MST-PCNT
QC Ref: PBS-DUP
Group ID: SA-G-PCNT-SOLID
Method Ref: USDA
SOP Ref: SOPSO026

Instrument ID: SOILS
Analyst: rbt
ACZ Dept: 25
Create Date: 09/12/2016 8:55
Start Date/Time: 09/12/2016 9:00
End Date/Time: 09/13/2016 9:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Pan Weight (g)	Pan And Sample Weight (g)	Dried Sample And Pan Weight (g)	Percent Solid (%)	Percent Moisture (%)	Comments
1	WG409607PBS	NONE	as rec		09/12/16 9:00	1.268	8.839	1.268	.00	100.00	
2	L32739-01	SANDRIDGE FRAC SAND	as rec		09/12/16 11:24	1.263	11.38	9.51	81.52	18.48	
3	L32770-01	16-035 NMM-A	as rec		09/12/16 13:48	1.264	12.054	10.359	84.29	15.71	
4	L32770-02	16-036 NMGZ-A	as rec		09/12/16 16:12	1.266	10.932	10.348	93.96	6.04	
5	L32770-03	16-037 NMN-A	as rec		09/12/16 18:36	1.265	13.17	9.967	73.10	26.90	
6	**L32770-04**	16-038 NMO-A	as rec		09/12/16 21:00	1.268	10.994	8.393	73.26	26.74	
7	L32770-04DUP	NONE	as rec		09/12/16 23:24	1.269	9.995	7.684	73.52	26.48	
8	L32770-05	16-039 NMO-B	as rec		09/13/16 1:48	1.264	13.193	10.093	74.01	25.99	
9	L32770-06	16-040 NML-A	as rec		09/13/16 4:12	1.264	10.156	8.881	85.66	14.34	
10	L32770-07	16-041 NMD-A	as rec		09/13/16 6:36	1.263	10.421	9.555	90.54	9.46	
11	L32770-08	16-042 NMAA-A	as rec		09/13/16 9:00	1.26	9.415	7.235	73.27	26.73	

Sample	Login Comments
L32739-01	SJ(4) || 3 INORG SJ in the Inorganic cooler.
L32770-01	SJ || In the Inorganic cooler.
L32770-02	SJ || In the Inorganic cooler.
L32770-03	SJ || In the Inorganic cooler.
L32770-04	SJ(2) || In the Inorganic cooler. Run QC.
L32770-05	SJ || In the Inorganic cooler.
L32770-06	SJ || In the Inorganic cooler.
L32770-07	SJ || In the Inorganic cooler.
L32770-08	SJ || In the Inorganic cooler.

Report Comments: _____

Internal Comments _____

AREV: RBT 9/13/16
Initials, Date

SREV: [signature] 9/13/16
Initials, Date

ACZ Laboratories, Inc.
Geochemistry Department
Data Review and Reagents

Data Reviewer: RBT
Date: 9/13/16
Approved: RRD
Date: 9/13/16

Analyst: RBT

Workgroup: WG409607

Analysis Date: 9/13/16

Sample type used: SO/SD

Extraction / Digestion / Analysis / Prep / Calc:

	Yes	No	N/A
1. Is the raw data checked to the computer printout for transcription errors?	✓		
2. Is the %solid or TS attached for dilution factors?			✓
3. Were proper volumes of reagents used per final volume?			✓
4. Was the proper sub-sample used (as received, <2000, <500, <250, dry, R&P)?	✓		
5.Were the dilution factor calculation checked (final volume, weight, %solid)?			✓
6. Did the RPD pass?	✓		
7. Does all the spike information correlate with each other?			✓
8. Is the appropriate spike in the computer-designated line?			✓
9. Are all errors properly corrected (single-line crossout, dated & initialed)?	✓		
10. Is the standard/reagent information complete and current?			✓
11. Is your instrument calibration passing (and included in the data package if needed)?	✓		
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?			

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

Comments:

Percent Solids

WG409607

ACZ Laboratories, Inc

QC List Type: QC-MST-PCNT
QCListMatClass: SOLID
Bench Sheet List: I-MST-PCNT
QC Ref: PBS-DUP
Group ID: SA-G-PCNT-SOLID
Method Ref: USDA
SOP Ref: SOPSO026

Instrument ID: SOILS
Analyst: PBT
ACZ Dept: 25
Create Date: 09/12/2016 8:55
Start Date/Time: 9/12/16 9:00
End Date/Time: 9/13/16 9:00

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	Pan Weight (g)	Pan And Sample Weight (g)	Dried Sample And Pan Weight (g)	Percent Solid (%)	Percent Moisture (%)	Comments
1	WG409607PBS	NONE				1.268	8.839	1.269			
2	L32739-01	SANDRIDGE FRAC SAND				1.263	11.380	9.510			
3	L32770-01	16-035 NMM-A				1.264	12.054	10.359			
4	L32770-02	16-036 NMGZ-A				1.266	10.932	10.348			
5	L32770-03	16-037 NMN-A				1.265	13.170	9.967			
6	**L32770-04**	16-038 NMO-A				1.268	10.994	8.393			
7	L32770-04DUP	NONE				1.269	9.995	7.684			
8	L32770-05	16-039 NMO-B				1.264	~~1.263~~ 13.193	10.093			
9	L32770-06	16-040 NML-A				1.264	~~13.206~~ 10.156	8.881			
10	L32770-07	16-041 NMD-A				1.263	10.421	9.555			
11	L32770-08	16-042 NMAA-A				1.260	9.415	7.235			

PBT
9/12/16

Sample	Login Comments
L32739-01	SJ(4) || 3 INORG SJ in the Inorganic cooler.
L32770-01	SJ || In the Inorganic cooler.
L32770-02	SJ || In the Inorganic cooler.
L32770-03	SJ || In the Inorganic cooler.
L32770-04	SJ(2) || In the Inorganic cooler. Run QC.
L32770-05	SJ || In the Inorganic cooler.
L32770-06	SJ || In the Inorganic cooler.
L32770-07	SJ || In the Inorganic cooler.
L32770-08	SJ || In the Inorganic cooler.

Report Comments: _____

AREV: _____
Initials, Date

Internal Comments _____

SREV: _____
Initials, Date

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Workgroup Review and Approval

WG409607

Date Reported: 13-Sep-16
Run ID: R1449749
Date Analyzed: 12-Sep-16
ICAL Workgroup:
Instrument ID: SOILS

WG409607PBS

Tag:

Measured: 9/12/2016 9:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	DRIED SAMPLE AND PAN WEIGHT	PREP	1.268	1		g	++					
SREV	PAN AND SAMPLE WEIGHT	PREP	8.839	1		g	++					
SREV	PAN WEIGHT	PREP	1.268	1		g	++					
SREV	PERCENT SOLID	FOUND		1	U	%	++	0.1	0.5			

L32739-01

Tag:

Measured: 9/12/2016 11:24:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
NEED	DRIED SAMPLE AND PAN WEIGHT	PREP	9.51	1		g	++				TB	
NEED	PAN AND SAMPLE WEIGHT	PREP	11.38	1		g	++				TB	
NEED	PAN WEIGHT	PREP	1.263	1		g	++				TB	
NEED	PERCENT MOISTURE	REG	18.5	1		%	++	0.1	0.5		TB	
SREV	PERCENT SOLID	ЈТ-SOLID	81.5	1		%	++	0.1	0.5		TB	

L32770-01

Tag:

Measured: 9/12/2016 1:48:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
NEED	DRIED SAMPLE AND PAN WEIGHT	PREP	10.359	1		g	++				TB	
NEED	PAN AND SAMPLE WEIGHT	PREP	12.054	1		g	++				TB	
NEED	PAN WEIGHT	PREP	1.264	1		g	++				TB	
NEED	PERCENT MOISTURE	REG	15.7	1		%	++	0.1	0.5		TB	
SREV	PERCENT SOLID	ЈТ-SOLID	84.3	1		%	++	0.1	0.5		TB	

L32770-02

Tag:

Measured: 9/12/2016 4:12:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
NEED	DRIED SAMPLE AND PAN WEIGHT	PREP	10.348	1		g	++				TB	
NEED	PAN AND SAMPLE WEIGHT	PREP	10.932	1		g	++				TB	
NEED	PAN WEIGHT	PREP	1.266	1		g	++				TB	
NEED	PERCENT MOISTURE	REG	6	1		%	++	0.1	0.5		TB	
SREV	PERCENT SOLID	ЈТ-SOLID	94	1		%	++	0.1	0.5		TB	

L32770-03

Tag:

Measured: 9/12/2016 6:36:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
NEED	DRIED SAMPLE AND PAN WEIGHT	PREP	9.967	1		g	++				TB	
NEED	PAN AND SAMPLE WEIGHT	PREP	13.17	1		g	++				TB	
NEED	PAN WEIGHT	PREP	1.265	1		g	++				TB	
NEED	PERCENT MOISTURE	REG	26.9	1		%	++	0.1	0.5		TB	
SREV	PERCENT SOLID	ЈТ-SOLID	73.1	1		%	++	0.1	0.5		TB	

L32770-04

Tag:

Measured: 9/12/2016 9:00:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
NEED	DRIED SAMPLE AND PAN WEIGHT	PREP	8.393	1		g	++				TB	
NEED	PAN AND SAMPLE WEIGHT	PREP	10.994	1		g	++				TB	
NEED	PAN WEIGHT	PREP	1.268	1		g	++				TB	
NEED	PERCENT MOISTURE	REG	26.7	1		%	++	0.1	0.5		TB	
SREV	PERCENT SOLID	ɅT-SOLID	73.3	1		%	++	0.1	0.5		TB	

L32770-04DUP

Tag:

Measured: 9/12/2016 11:24:00 PM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	DRIED SAMPLE AND PAN WEIGHT	PREP	7.684	1		g	++					
SREV	PAN AND SAMPLE WEIGHT	PREP	9.995	1		g	++					
SREV	PAN WEIGHT	PREP	1.269	1		g	++					
SREV	PERCENT MOISTURE	FOUND	26.48	1		%	++	0.1	0.5			
SREV	PERCENT MOISTURE	RPD	1	1		%	++	0.1	0.5			
SREV	PERCENT SOLID	FOUND	73.52	1		%	++	0.1	0.5			
SREV	PERCENT SOLID	RPD	0	1		%	++	0.1	0.5			

L32770-05

Tag:

Measured: 9/13/2016 1:48:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
NEED	DRIED SAMPLE AND PAN WEIGHT	PREP	10.093	1		g	++				TB	
NEED	PAN AND SAMPLE WEIGHT	PREP	13.193	1		g	++				TB	
NEED	PAN WEIGHT	PREP	1.264	1		g	++				TB	
NEED	PERCENT MOISTURE	REG	26	1		%	++	0.1	0.5		TB	
SREV	PERCENT SOLID	ɅT-SOLID	74	1		%	++	0.1	0.5		TB	

L32770-06

Tag:

Measured: 9/13/2016 4:12:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
NEED	DRIED SAMPLE AND PAN WEIGHT	PREP	8.881	1		g	++				TB	
NEED	PAN AND SAMPLE WEIGHT	PREP	10.156	1		g	++				TB	
NEED	PAN WEIGHT	PREP	1.264	1		g	++				TB	
NEED	PERCENT MOISTURE	REG	14.3	1		%	++	0.1	0.5		TB	
SREV	PERCENT SOLID	ɅT-SOLID	85.7	1		%	++	0.1	0.5		TB	

L32770-07

Tag:

Measured: 9/13/2016 6:36:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
NEED	DRIED SAMPLE AND PAN WEIGHT	PREP	9.555	1		g	++				TB	
NEED	PAN AND SAMPLE WEIGHT	PREP	10.421	1		g	++				TB	
NEED	PAN WEIGHT	PREP	1.263	1		g	++				TB	
NEED	PERCENT MOISTURE	REG	9.5	1		%	++	0.1	0.5		TB	
SREV	PERCENT SOLID	ɅT-SOLID	90.5	1		%	++	0.1	0.5		TB	

L32770-08 **Tag:** **Measured: 9/13/2016 9:00:00 AM**

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
NEED	DRIED SAMPLE AND PAN WEIGHT	PREP	7.235	1		g	++				TB	
NEED	PAN AND SAMPLE WEIGHT	PREP	9.415	1		g	++				TB	
NEED	PAN WEIGHT	PREP	1.26	1		g	++				TB	
NEED	PERCENT MOISTURE	REG	26.7	1		%	++	0.1	0.5		TB	
SREV	PERCENT SOLID	ɴT-SOLID	73.3	1		%	++	0.1	0.5		TB	

Air Dry

WG409490

ACZ Laboratories, Inc

QC List Type: I-SP-AIRDRY
QCListMatClass: SOLID
Bench Sheet List: I-SP-AIRDRY
QC Ref: NOQC
Group ID: SP-G-DRY-AIR
Method Ref: No 1 1972
SOP Ref: SOPSO001

Instrument ID: SOILSPREP
Analyst: rbt
ACZ Dept: 20
Create Date: 09/08/2016 11:36
Start Date/Time: 09/12/2016 8:30
End Date/Time: 09/12/2016 9:00

SEQ	ACZ ID	Client ID	SubSX	Pri	ASRECEIVED	Analysis Date	SP AirDry	Comments
1	L32714-01	ORF-1 NEW CARBON #1	as rec			09/12/16 8:30	9/12/2016	
2	L32714-02	ORF-1 NEW CARBON #2	as rec			09/12/16 8:33	9/12/2016	
3	L32739-01	SANDRIDGE FRAC SAND	as rec		SAVE SX	09/12/16 8:36	9/12/2016	
4	L32770-01	16-035 NMM-A	as rec			09/12/16 8:39	9/12/2016	
5	L32770-02	16-036 NMGZ-A	as rec			09/12/16 8:42	9/12/2016	
6	L32770-03	16-037 NMN-A	as rec			09/12/16 8:45	9/12/2016	
7	**L32770-04**	16-038 NMO-A	as rec			09/12/16 8:48	9/12/2016	
8	L32770-05	16-039 NMO-B	as rec			09/12/16 8:51	9/12/2016	
9	L32770-06	16-040 NML-A	as rec			09/12/16 8:54	9/12/2016	
10	L32770-07	16-041 NMD-A	as rec			09/12/16 8:57	9/12/2016	
11	L32770-08	16-042 NMAA-A	as rec			09/12/16 9:00	9/12/2016	

Sample	Login Comments
L32714-01	ZIPLOCK || In the Inorganic cooler.
L32714-02	ZIPLOCK || In the Inorganic cooler.
L32739-01	SJ(4) || 3 INORG SJ in the Inorganic cooler.
L32770-01	SJ || In the Inorganic cooler.
L32770-02	SJ || In the Inorganic cooler.
L32770-03	SJ || In the Inorganic cooler.
L32770-04	SJ(2) || In the Inorganic cooler. Run QC.
L32770-05	SJ || In the Inorganic cooler.
L32770-06	SJ || In the Inorganic cooler.
L32770-07	SJ || In the Inorganic cooler.
L32770-08	SJ || In the Inorganic cooler.

Report Comments: _____

Internal Comments _____

AREV: RBT 9/12/16
Initials, Date

SREV: BRD 9/12/16
Initials, Date

ACZ Laboratories, Inc.
Geochemistry Department
Data Review and Reagents

Data Reviewer: RBT
Date: 9/12/16

Approved: BPD
Date: 9/12/16

Analyst: RBT

Workgroup: WG409490

Analysis Date: 9/12/16

Sample type used: ml/SO/SD

Extraction / Digestion / Analysis / (Prep) / Calc:

	Yes	No	N/A
1. Is the raw data checked to the computer printout for transcription errors?	✓		
2. Is the %solid or TS attached for dilution factors?			✓
3. Were proper volumes of reagents used per final volume?			✓
4. Was the proper sub-sample used ((as received), <2000, <500, <250, dry, R&P)?	✓		
5. Were the dilution factor calculation checked (final volume, weight, %solid)?			✓
6. Did the RPD pass?			✓
7. Does all the spike information correlate with each other?			✓
8. Is the appropriate spike in the computer-designated line?			✓
9. Are all errors properly corrected (single-line crossout, dated & initialed)?	✓		
10. Is the standard/reagent information complete and current?			✓
11. Is your instrument calibration passing (and included in the data package if needed)?			✓
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?			

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

Comments:

Air Dry

WG409490

ACZ Laboratories, Inc

QC List Type: I-SP-AIRDRY
QCListMatClass: SOLID
Bench Sheet List: I-SP-AIRDRY
QC Ref: NOQC
Group ID: SP-G-DRY-AIR
Method Ref: No 1 1972
SOP Ref: SOPSO001

Instrument ID: SOILSPREP
Analyst: RBT
ACZ Dept: 20
Create Date: 09/08/2016 11:36
Start Date/Time: ~~9/8/16 11:~~ 9/12/16 8:30
End Date/Time: 9/12/16 9:00

RBT 9/12/16

SEQ	ACZ ID	Client ID	SubSX	Pri	ASRECEIVED	Analysis Date	SP AirDry	Comments
1	L32714-01	ORF-1 NEW CARBON #1						
2	L32714-02	ORF-1 NEW CARBON #2						
3	L32739-01	SANDRIDGE FRAC SAND			SAVE SX			
4	L32770-01	16-035 NMM-A						
5	L32770-02	16-036 NMGZ-A						
6	L32770-03	16-037 NMN-A						
7	**L32770-04**	16-038 NMO-A						
8	L32770-05	16-039 NMO-B						
9	L32770-06	16-040 NML-A						
10	L32770-07	16-041 NMD-A						
11	L32770-08	16-042 NMAA-A						

Sample	Login Comments
L32714-01	ZIPLOCK || In the Inorganic cooler.
L32714-02	ZIPLOCK || In the Inorganic cooler.
L32739-01	SJ(4) || 3 INORG SJ in the Inorganic cooler.
L32770-01	SJ || In the Inorganic cooler.
L32770-02	SJ || In the Inorganic cooler.
L32770-03	SJ || In the Inorganic cooler.
L32770-04	SJ(2) || In the Inorganic cooler. Run QC.
L32770-05	SJ || In the Inorganic cooler.
L32770-06	SJ || In the Inorganic cooler.
L32770-07	SJ || In the Inorganic cooler.
L32770-08	SJ || In the Inorganic cooler.

Report Comments: _____

AREV: _____
Initials, Date

Internal Comments _____

SREV: _____
Initials, Date

WG409490

Date Reported: 12-Sep-16
Run ID: R1449360
Date Analyzed: 12-Sep-16
ICAL Workgroup:
Instrument ID: SOILSPREP

L32714-01

Tag: Measured: 9/12/2016 8:30:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP AIRDRY	DRY-AIR		1			NEED					

L32714-02

Tag: Measured: 9/12/2016 8:33:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP AIRDRY	DRY-AIR		1			NEED					

L32739-01

Tag: Measured: 9/12/2016 8:36:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP AIRDRY	DRY-AIR		1			NEED					

L32770-01

Tag: Measured: 9/12/2016 8:39:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP AIRDRY	DRY-AIR		1			NEED					

L32770-02

Tag: Measured: 9/12/2016 8:42:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP AIRDRY	DRY-AIR		1			NEED					

L32770-03

Tag: Measured: 9/12/2016 8:45:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP AIRDRY	DRY-AIR		1			NEED					

L32770-04

Tag: Measured: 9/12/2016 8:48:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP AIRDRY	DRY-AIR		1			NEED					

L32770-05

Tag: Measured: 9/12/2016 8:51:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP AIRDRY	DRY-AIR		1			NEED					

L32770-06

Tag: Measured: 9/12/2016 8:54:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP AIRDRY	DRY-AIR		1			NEED					

L32770-07

Tag: Measured: 9/12/2016 8:57:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP AIRDRY	DRY-AIR		1			NEED					

L32770-08 **Tag:** **Measured: 9/12/2016 9:00:00 AM**

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP AIRDRY	DRY-AIR		1			NEED					

Soil Prep Sieve

QC List Type: I-SP-SIEVE-ALL
QCListMatClass: SOLID
Bench Sheet List: I-SP-SIEVE-ALL
QC Ref: NOQC
Group ID: SP-G-SIEVE
Method Ref: ASA No. 9 15-4.2.2
SOP Ref: SOPSO001

WG409848

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: rbt
ACZ Dept: 20
Create Date: 09/15/2016 8:39
Start Date/Time: 09/15/2016 9:00
End Date/Time: 09/15/2016 9:20

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	SP SIEVE2000	SP Sieve2000	SP Sieve500	SP Sieve250	SP Sieve177	sp sieve150	SP Sieve125	SP Sieve100	SP Sieve74	SP Sieve63	SP Sieve38	Comments
1	L32739-01	SANDRIDGE FRAC SAND	as rec		09/15/16 9:00	☑	9/15/2016										
2	L32770-01	16-035 NMM-A	as rec		09/15/16 9:02	☑	9/15/2016										
3	L32770-02	16-036 NMGZ-A	as rec		09/15/16 9:05	☑	9/15/2016										
4	L32770-03	16-037 NMN-A	as rec		09/15/16 9:07	☑	9/15/2016										
5	**L32770-04**	16-038 NMO-A	as rec		09/15/16 9:10	☑	9/15/2016										
6	L32770-05	16-039 NMO-B	as rec		09/15/16 9:12	☑	9/15/2016										
7	L32770-06	16-040 NML-A	as rec		09/15/16 9:15	☑	9/15/2016										
8	L32770-07	16-041 NMD-A	as rec		09/15/16 9:17	☑	9/15/2016										
9	L32770-08	16-042 NMAA-A	as rec		09/15/16 9:20	☑	9/15/2016										

Sample	Login Comments
L32739-01	SJ(4) || 3 INORG SJ in the Inorganic cooler.
L32770-01	SJ || In the Inorganic cooler.
L32770-02	SJ || In the Inorganic cooler.
L32770-03	SJ || In the Inorganic cooler.
L32770-04	SJ(2) || In the Inorganic cooler. Run QC.
L32770-05	SJ || In the Inorganic cooler.
L32770-06	SJ || In the Inorganic cooler.
L32770-07	SJ || In the Inorganic cooler.
L32770-08	SJ || In the Inorganic cooler.

Report Comments: _____

Internal Comments _____

AREV: RBT 9/15/16
Initials, Date

SREV: CRA 9-16-16
Initials, Date

ACZ Laboratories, Inc.
Geochemistry Department
Data Review and Reagents

Data Reviewer: RBT
Date: 9/15/16

Approved: CRA
Date: 9-16-16

Analyst: RBT

Workgroup: WG409848

Analysis Date: 9/15/16

Sample type used: SD/SO

Extraction / Digestion / Analysis / Prep / Calc:

	Yes	No	N/A
1. Is the raw data checked to the computer printout for transcription errors?	✓		
2. Is the %solid or TS attached for dilution factors?			✓
3. Were proper volumes of reagents used per final volume?			✓
4. Was the proper sub-sample used (as received, <2000, <500, <250, dry, R&P)?	✓		
5. Were the dilution factor calculation checked (final volume, weight, %solid)?			✓
6. Did the RPD pass?			✓
7. Does all the spike information correlate with each other?			✓
8. Is the appropriate spike in the computer-designated line?			✓
9. Are all errors properly corrected (single-line crossout, dated & initialed)?	✓		
10. Is the standard/reagent information complete and current?			✓
11. Is your instrument calibration passing (and included in the data package if needed)?			✓
FOR SREV: QA/QC approval for initial training or 2 sets of initials for WG & LIMS?	✓		

Standard/Reagent/Equipment*	PCN/SCN/LOT #*	Expiration Date

*Workgroup documentation must include the lot number(s) of all disposable vessels used for volumetric measurements.

Comments: _____

Soil Prep Sieve

QC List Type: I-SP-SIEVE-ALL
QCListMatClass: SOLID
Bench Sheet List: I-SP-SIEVE-ALL
QC Ref: NOQC
Group ID: SP-G-SIEVE
Method Ref: ASA No. 9 15-4.2.2
SOP Ref: SOPSO001

WG409848

ACZ Laboratories, Inc

Instrument ID: SOILSPREP
Analyst: RBT
ACZ Dept: 20
Create Date: 09/15/2016 8:39
Start Date/Time: 9/15/16 9:00
End Date/Time: 9/15/16 9:20

SEQ	ACZ ID	Client ID	SubSX	Pri	Analysis Date	SP SIEVE2000	SP Sieve2000	SP Sieve500	SP Sieve250	SP Sieve177	sp sieve150	SP Sieve125	SP Sieve100	SP Sieve74	SP Sieve63	SP Sieve38	Comments
1	L32739-01	SANDRIDGE FRAC SAND				☑											
2	L32770-01	16-035 NMM-A				☑											
3	L32770-02	16-036 NMGZ-A				☑											
4	L32770-03	16-037 NMN-A				☑											
5	**L32770-04**	16-038 NMO-A				☑											
6	L32770-05	16-039 NMO-B				☑											
7	L32770-06	16-040 NML-A				☑											
8	L32770-07	16-041 NMD-A				☑											
9	L32770-08	16-042 NMAA-A				☑											

Sample	Login Comments
L32739-01	SJ(4) || 3 INORG SJ in the Inorganic cooler.
L32770-01	SJ || In the Inorganic cooler.
L32770-02	SJ || In the Inorganic cooler.
L32770-03	SJ || In the Inorganic cooler.
L32770-04	SJ(2) || In the Inorganic cooler. Run QC.
L32770-05	SJ || In the Inorganic cooler.
L32770-06	SJ || In the Inorganic cooler.
L32770-07	SJ || In the Inorganic cooler.
L32770-08	SJ || In the Inorganic cooler.

Report Comments: _____

AREV: _____
Initials, Date

Internal Comments _____

SREV: _____
Initials, Date

Workgroup Review and Approval

WG409848

Date Reported: 16-Sep-16
Run ID: R1451119
Date Analyzed: 15-Sep-16
ICAL Workgroup:
Instrument ID: SOILSPREP

L32739-01

Tag:

Measured: 9/15/2016 9:00:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP SIEVE2000	IEVE2000		1			NEED					

L32770-01

Tag:

Measured: 9/15/2016 9:02:30 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP SIEVE2000	IEVE2000		1			NEED					

L32770-02

Tag:

Measured: 9/15/2016 9:05:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP SIEVE2000	IEVE2000		1			NEED					

L32770-03

Tag:

Measured: 9/15/2016 9:07:30 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP SIEVE2000	IEVE2000		1			NEED					

L32770-04

Tag:

Measured: 9/15/2016 9:10:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP SIEVE2000	IEVE2000		1			NEED					

L32770-05

Tag:

Measured: 9/15/2016 9:12:30 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP SIEVE2000	IEVE2000		1			NEED					

L32770-06

Tag:

Measured: 9/15/2016 9:15:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP SIEVE2000	IEVE2000		1			NEED					

L32770-07

Tag:

Measured: 9/15/2016 9:17:30 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP SIEVE2000	IEVE2000		1			NEED					

L32770-08

Tag:

Measured: 9/15/2016 9:20:00 AM

Status	Parm_Stored	Type	Value	Dil	Qual	Units	Appv	MDL	PQL	Text Value	Ext Qual	Signal
SREV	SP SIEVE2000	IEVE2000		1			NEED					

Teck Alaska Incorporated
Project ID: L32770

Soil Preparation

WG409490 **Air Dry**

Sample	Date	SCN	SP AIRDRY
L32714-01	09/12/16 08:30		X
L32714-02	09/12/16 08:33		X
L32739-01	09/12/16 08:36		X
L32770-01	09/12/16 08:39		X
L32770-02	09/12/16 08:42		X
L32770-03	09/12/16 08:45		X
L32770-04	09/12/16 08:48		X
L32770-05	09/12/16 08:51		X
L32770-06	09/12/16 08:54		X
L32770-07	09/12/16 08:57		X
L32770-08	09/12/16 09:00		X

Teck Alaska Incorporated
Project ID: L32770

Soil Analysis

WG409607 **Percent Solids**

Sample	Date	SCN	ERCENT MOISTUR	PERCENT SOLID
WG409607PBS	09/12/16 09:00			X
L32739-01	09/12/16 11:24			X
L32770-01	09/12/16 13:48			X
L32770-02	09/12/16 16:12			X
L32770-03	09/12/16 18:36			X
L32770-04	09/12/16 21:00			X
L32770-04DUP	09/12/16 23:24		X	X
L32770-05	09/13/16 01:48			X
L32770-06	09/13/16 04:12			X
L32770-07	09/13/16 06:36			X
L32770-08	09/13/16 09:00			X

Teck Alaska Incorporated
Project ID: L32770

Soil Preparation

WG409848 **Soil Prep Sieve**

Sample	Date	SCN	SP SIEVE2000
L32739-01	09/15/16 09:00		X
L32770-01	09/15/16 09:02		X
L32770-02	09/15/16 09:05		X
L32770-03	09/15/16 09:07		X
L32770-04	09/15/16 09:10		X
L32770-05	09/15/16 09:12		X
L32770-06	09/15/16 09:15		X
L32770-07	09/15/16 09:17		X
L32770-08	09/15/16 09:20		X

Teck Alaska Incorporated
Project ID: L32770

Soil Preparation

WG409857 **3050 ICP ICPMS**

Sample	Date	SCN	DILUTION
WG409857PBS	09/15/16 09:30		X
WG409857LCSS	09/15/16 11:15		X
WG409857LCSSD	09/15/16 13:01		X
L32739-01	09/15/16 14:47		X
L32739-01MS	09/15/16 16:33		X
L32739-01MSD	09/15/16 18:19		X
L32770-01	09/15/16 20:05		X
L32770-02	09/15/16 21:51		X
L32770-03	09/15/16 23:37		X
L32770-04	09/16/16 01:23		X
L32770-04MS	09/16/16 03:09		X
L32770-04MSD	09/16/16 04:55		X
L32770-05	09/16/16 06:41		X
L32770-06	09/16/16 08:27		X
L32770-07	09/16/16 10:13		X
L32770-08	09/16/16 11:59		X
L32928-01	09/16/16 13:44		X

Teck Alaska Incorporated
Project ID: L32770

Metals Analysis

WG410083 **ICPMS Total 3050**

Sample	Date	SCN	Cd	Pb	Zn
WG410083ICV	09/20/16 19:36	MS160920-1	X	X	X
WG410083ICB	09/20/16 19:38		X	X	X
WG410083ICSA	09/20/16 19:40		X		
WG410083ICSAB	09/20/16 19:42	MS160826-5	X	X	X
WG409857PBS	09/20/16 19:47		X	X	X
WG409857LCSS	09/20/16 19:49	PCN51904	X	X	X
WG409857LCSSD	09/20/16 19:51	PCN51904	X	X	X
L32770-01	09/20/16 19:53		X	X	X
L32770-02	09/20/16 19:55		X	X	X
L32770-03	09/20/16 19:57		X	X	X
L32770-04	09/20/16 20:00		X	X	X
L32770-04MS	09/20/16 20:02	MS160803-3	X	X	X
WG410083CCV1	09/20/16 20:04	MS160914-3	X	X	X
WG410083CCB1	09/20/16 20:06		X	X	X
L32770-04MSD	09/20/16 20:08	MS160803-3	X	X	X
L32770-05	09/20/16 20:10		X	X	X
L32770-06	09/20/16 20:12		X	X	X
L32770-06SDL	09/20/16 20:14		X	X	X
L32770-07	09/20/16 20:17		X	X	X
L32770-08	09/20/16 20:19		X	X	X
WG410083CCV2	09/20/16 20:21	MS160914-3	X	X	X
WG410083CCB2	09/20/16 20:23		X	X	X

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Teck Alaska Incorporated
1370966-SVC

ACZ Project ID: L32770
Date Received: 09/07/2016 14:43
Received By: kmo
Date Printed: 9/7/2016

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
4718	2.1	NA	15	Yes

Was ice present in the shipment container(s)?

Yes - Gel ice was present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Teck Alaska Incorporated
1370966-SVC

ACZ Project ID:	L32770
Date Received:	09/07/2016 14:43
Received By:	kmo
Date Printed:	9/7/2016

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

L32770

TECK ALASKA INC - CHAIN OF CUSTODY

TO:
Sue Webber
ACZ Laboratories
2773 Downhill Drive
Steamboat Springs, CO 80487
Phone: 970-879-6590 ext. 110
Lab Phone: 800-334-5493

FROM:
Teck Alaska Inc.
3105 Lakeshore Drive
Bldg A - Suite 101
Anchorage Alaska 99517
Project Manager: Joe Diehl
Phone: 907-754-5109

Teck	PROJECT:	Marine Sediment Sampling			PO# 1330199-SVC		
	PROJECT COORDINATOR:	Joe Diehl/ Johanna Salatas			Page 1 of 1		
Sample I.D.	Location	TYPE	#Bottles	ANALYSIS	Collection Date	Collection Time	LAB I.D.
1. 16-035_NMM-A	Marine Sediment NMM	SD	1	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	13:00	
2. 16-036_NMGZ-A	Marine Sediment NMGZ	SD	1	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	13:14	
3. 16-037_NMN-A	Marine Sediment NMN	SD	1	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	13:52	
4. 16-038_NMO-A	Marine Sediment NMO	SD	2	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	14:02	
5. 16-039_NMO-B	Marine Sediment NMO	SD	1	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	14:10	
6. 16-040_NML-A	Marine Sediment NML	SD	1	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	14:43	
7. 16-041_NMD-A	Marine Sediment NMD	SD	1	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	14:54	
8. 16-042_NMAA-A	Marine Sediment NMAA	SD	1	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	15:14	
16-043_EB	Marine Sediment Resinate Water	H2O	4	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	15:34	
16-044_SB	Marine Sediment Resinate Water	H2O	4	Pb, Zn, Cd, by ICP MS, Total Solids	9/4/2016	15:37	

SAMPLE RELEASE BY:		SAMPLE RECEIVED BY:		SPECIAL INSTRUCTIONS:
Name:	Marisse Attard	Name:	KPG	E-MAIL RESULTS TO: Enviro.Transfer@teck.com
Signature:		Signature:		NO IMPORT EDD REQUIRED. ANALYSIS REPORT ONLY.
Firm:	Teck Alaska Inc.	Firm:	ACZ	Also please e-mail Final Report to: joe.diehl@teck.com rebecca.hager@teck.com
Date/Time:	9-6-16 10:00	Date/Time:	9-7-16 1443	