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March 18, 2020

Mr. Nikia Greene
U.S. Environmental Protection Agency
Region 8 Montana Field Office
Federal Building, Suite 3200
10 West 15th Street
Helena, MT 59626

Mr. Daryl Reed
State of Montana
Department of Environmental Quality
100 North Last Chance Gulch
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Helena, MT 59620-0901

Re: Butte Mine Flooding Operable Unit (BMFOU) – Final 2020 Berkeley Pit Waterfowl Protection Plan

Dear Nikia and Daryl:

Montana Resources, LLP and Atlantic Richfield Company (collectively referred to as ‘the Parties’) submit the following attachments (described further herein) in response to the comments provided by the U.S. Environmental Protection Agency (EPA), in consultation with the Montana Department of Environmental Quality (DEQ) (collectively referred to as the Agencies) and U.S. Fish and Wildlife Service (USFWS) on February 25, 2020 for the *Final 2019 Berkeley Pit Waterfowl Protection Plan*.

The Parties present this submittal in whole to include Attachment A. Agencies' Final Approval Letter dated February 25, 2020, and Attachment B. Final 2020 Berkeley Pit Waterfowl Protection Plan dated March 18, 2019 (Plan). The attached Plan (Attachment B) includes all figures, tables, appendices and incorporates and/or addresses the comments included in the Agencies' February 25, 2020 approval with comments letter.

The Parties updated the Plan as follows:

- As requested by the Agencies, appropriately bookmarked the electronic version of the Plan;
- Dates were updated to reflect the 2020 update of the Plan;
- Section 5.3 was updated to describe the seasonal reports submittal protocol; and
- The hazing log in Appendix D was updated to include a checkbox to indicate if waterfowl were observed to be deterred from landing.

Please contact either one of us once you have had an opportunity to review the attachments and we would be happy to schedule a time to discuss them further.

On behalf of the Settling Defendants,



Mark Thompson
Vice President of Environmental Affairs
Montana Resources LLP
600 Shields Avenue
Butte, MT 59701



Tim Hilmo, P.E.
Operations Project Manager
Remediation Management Services Company
An Affiliate of Atlantic Richfield Company
317 Anaconda Road
Butte, MT 59701

Attachments: Attachment A. Agencies' Final Approval Letter
Attachment B. Final 2020 Berkeley Pit Waterfowl Protection Plan

cc: Henry Elsen, Esq., EPA (email copy)
Allie Archer, EPA (email copy)
Joe Vranka, EPA (email copy)
Jonathan Morgan, Esq., DEQ (email copy)
Jenny Chambers, DEQ (email copy)
Carolina Balliew, DEQ (email copy)
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Don Booth, Booth Consulting (email copy)
Jim Jonas, Copper (email copy)
Rich Keeland, Pioneer Technical (email copy)
Ted Decker, Pioneer Technical (email copy)
Mason Bowditch, Pioneer Technical (email copy)
Ted Duaine, MBMG (email copy)
Gary Icopini MBMG (email copy)
Stella Capoccia, Montana Tech/Waterfowl Mitigation Advisory Board (email copy)
Jon Sesso, BSB (email copy)
Julia Crain, BSB (email copy)

ATTACHMENT A

**AGENCIES' FINAL APPROVAL
LETTER DATED FEBRUARY 25, 2020**



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8, MONTANA OFFICE

FEDERAL BUILDING, 10 West 15TH Street, Suite 3200
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Ref: 8MO

February 25, 2020

Mark Thompson
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Tim Hilmo, P.E.
Operations Project Manager
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An affiliate of Atlantic Richfield Company
317 Anaconda Road
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Re: Approval for: *Final 2019 Berkeley Pit Waterfowl Protection Plan; Mine Flooding Operable Unit*, dated October 30, 2019

Dear Mark and Tim:

The U.S. Environmental Protection Agency, in consultation with the Department of Environmental Quality and U.S. Fish and Wildlife Service, has reviewed the above-described plan from the Mine Flooding Settling Defendants, and approves the plan. Please submit the plan electronically with appropriate bookmarks and this letter attached.

This approved plan supersedes and replaces the prior Berkeley Pit Waterfowl Protection Plan, titled "Berkeley Pit Migratory Waterfowl Mitigation Plan Observation and Hazing Program", and dated February 2002.

If you have any questions, please contact me at 406-457-5019.

Sincerely,

A handwritten signature in blue ink, appearing to read "Nikia Greene".

Nikia Greene
Remedial Project Manager

Cord Harris, ARCO/BP
Loren Burmeister, ARCO/BP
Jean Martin, ARCO/BP counsel
William Duffy, counsel on behalf of ARCO
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Stella Capoccia, Researcher/PI
David Rouse, USFWS
Mona Iannelli, USFWS
Matt Vincent, on behalf of ARCO

ATTACHMENT B

**FINAL 2020 BERKELEY PIT
WATERFOWL PROTECTION PLAN
DATED MARCH 18, 2020**

**SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE MINE FLOODING OPERABLE UNIT**

Final

***2020 Berkeley Pit
Waterfowl Protection Plan***

***Atlantic Richfield Company &
Montana Resources, LLP***

March 18, 2020

SILVER BOW CREEK/BUTTE AREA NPL SITE BUTTE MINE FLOODING OPERABLE UNIT

Final

2020 Berkeley Pit Waterfowl Protection Plan

Prepared for:

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March 18, 2020

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
1.1 Site Description.....	2
2.0 WATERFOWL PROTECTION BACKGROUND	3
2.1 November – December 2016 Event.....	3
2.2 Pathway to Final Draft/Updated Plan	4
3.0 MIGRATION MONITORING & COMMUNICATION, OBSERVATION & HAZING PROGRAM.....	6
3.1 Migration Monitoring & Communication	6
3.1.1 Migration Checkpoints.....	6
3.1.2 Spring Migration Strategy.....	6
3.1.3 Fall Migration Strategy	6
3.2 Observation Program	7
3.2.1 Observation Locations and Schedule.....	7
3.2.2 Observation Equipment	8
3.2.3 Observation and Hazing Logs.....	8
3.2.4 Observation Training	8
3.3 Hazing Efforts.....	9
3.3.1 Passive/Preventative Deterrents.....	9
3.3.2 Active/On-the-Water Deterrents	9
3.3.3 Capture, Transport, Release and/or Removal of Waterfowl.....	10
4.0 SITE/DETERRENT SPECIFIC SAFETY AND PROTOCOLS	11
5.0 REPORTING AND NOTIFICATION	11
5.1 Weekly Communication	11
5.2 Monthly Reports	11
5.3 Seasonal Reports.....	12
5.4 Community Notification.....	12
5.5 Mortality Reporting and Notification	12
6.0 ADAPTIVE MANAGEMENT.....	13
6.1 Waterfowl Advisory Board.....	13
6.2 Evaluation of Protection Efforts, Technology and Site Conditions.....	14
6.2.1 Protection Efforts	14
6.2.2 Technology	14
6.2.3 Site Conditions.....	14
6.3 Data Management and Analyses.....	14
7.0 REFERENCES	15

LIST OF FIGURES

Figure 1. Berkeley Pit Site Location Map
Figure 2. Prediction and Prevention Flow Chart

LIST OF TABLES

Table 1. Applicable or Relevant and Appropriate Requirements (ARARs)
Table 2. Deterrents Evaluated for use at Berkeley Pit (1996 – 2018)

LIST OF APPENDICES

Appendix A. Berkeley Pit Summary of Recorded Waterfowl Activities, 1996 – 2018
Appendix B. Standard Operating Procedures
Appendix C. Bird Guide to the Berkeley Pit
Appendix D. Observation and Hazing Logs and Special Comments Forms
Appendix E. Response to Comments (electronic format only)

1.0 INTRODUCTION

A waterfowl observation and hazing program has been implemented at the Berkeley Pit (Pit) since 1996. Since then, Montana Resources, LLP (MR) and Atlantic Richfield Company (Atlantic Richfield), collectively herein referred to as “the Parties,” on behalf of the Settling Defendants¹, have updated and revised the initial Waterfowl Mitigation Plan twice, first in 1998 and again in 2002. Additionally, following a slough event in the southeast corner of the Pit in 2013 causing safety concerns, MR submitted the *Butte Mine Flooding Operable Unit – Request for Variance in Waterfowl Mitigation Plan* (MR, 2013) on April 17, 2013. The U.S. Environmental Protection Agency (EPA) and Montana Department of Environmental Quality (DEQ), collectively herein referred to as “the Agencies,” granted a variance for human safety in 2013 that suspended specific portions of the previous plan that required manned watercraft on the Pit for waterfowl hazing, retrieval and other activities. The *Berkeley Pit Migratory Waterfowl Mitigation Plan Observation and Hazing Program* (the Parties, 2002a) (Waterfowl Mitigation Plan) expressly anticipated that effectiveness assessments would be conducted to determine if changes or modifications were needed. Since a significant mortality event in late 2016, the Parties have been engaged in a comprehensive effectiveness assessment. This *Final Berkeley Pit Waterfowl Protection Plan* (Plan) is an update to the Waterfowl Mitigation Plan and continues to fulfill the requirements of Section IG of the *Statement of Work (SOW) for the Silver Bow Creek/Butte Area NPL Site, Butte Mine Flooding Operable Unit, Remedial Design/Remedial Action (RD/RA)* (the Parties, 2002b).

Waterfowl mitigation, henceforth referred to as waterfowl protection, is still adequately defined as the particular activities conducted to minimize (insofar as is practical) the contact of waterfowl with waters of the Pit. For the purpose of this Plan, “waterfowl” includes waterfowl, shorebirds and water birds that may use the Pit. Mitigating the risks and protecting migratory and other waterfowl from hazards associated with contacting Pit water via a written plan is a component of the EPA’s Superfund *Record of Decision: Butte Mine Flooding Operable Unit, Silver Bow Creek/Butte Area NPL Site, Butte, Montana*, (EPA ID: MTD980502777, OU 03) (BMFOU ROD) (EPA, 1994), the *BMFOU Explanation of Significant Differences* (ESD) (EPA, 2002), and the *Consent Decree for the Butte Mine Flooding Site* (BMFOU CD) (EPA, 2002). The obligations and requirements of this Plan are the responsibility of the existing Settling Defendants¹ named in the BMFOU CD and the actions described in the Plan are required pursuant to the BMFOU CD. All activities conducted by the Parties under this Plan shall comply with all Applicable or Relevant and Appropriate Requirements (ARARs) as outlined in the BMFOU ROD. The ARARs that are specifically applicable to this Plan are detailed in Table 1

This Plan contains and places a primary focus on the following: a) experience since implementing the Waterfowl Mitigation Plan; b) data from the November-December 2016 event; c) the results and lessons learned from implementing interim measures during the 2017 and 2018 migration seasons; and d) review and recommendations from the Berkeley Pit Waterfowl Mitigation Advisory Board (Waterfowl Advisory Board). The Plan also updates site characteristics of the Pit and results of the observation and hazing activities undertaken from 1996 to the present. Moving forward the observation and hazing activities at the Pit focus on

¹ The term Settling Defendants, as used in this document, collectively refers to AR; MR; Montana Resources, Inc.; and Dennis Washington.

improvements to migratory observation, early warning and adaptive management efforts to ensure the Plan is evaluated, and when necessary updated, for effectiveness on an on-going basis. The main objectives of this Plan remain generally unchanged from the Waterfowl Mitigation Plan:

- a) Minimize insofar as is practical the contact of waterfowl with waters of the Pit;
- b) Employ observation and hazing programs that are appropriate for this unique site, and in a manner that is protective of waterfowl and safe for the people responsible for their implementation;
- c) Re-evaluate the effectiveness of the protection program on an on-going basis and modify the program to accommodate changing conditions over time at the site; and
- d) Meeting the BMFOU ROD requirements of developing and maintaining a formal Plan.

In an effort to provide a clear basis of understanding for developing this Plan, all versions of the Responses to Agency Comment letters were consolidated and are provided in Appendix D of this Plan.

1.1 Site Description

The BMFOU is part of the Silver Bow Creek/Butte Area National Priorities List (NPL) site and is located adjacent to the eastern boundaries of Butte and Walkerville, Montana. The Mine Flooding Site as defined in the BMFOU CD, shall mean the Butte Mine Flooding Operable Unit, the surface boundaries of which are depicted on Figure 1 of the BMFOU ROD and which are further defined in the Response Decision Document, and which consists of the following: a) the waters within Berkeley Pit; b) the underground mine workings hydraulically connected to the Berkeley Pit; c) the alluvial aquifer near the Berkeley Pit that drains into the Berkeley Pit; d) the bedrock aquifers including the bedrock aquifer in and near the Continental Pit shown in the BMFOU ROD and the Response Decision Document; e) other contributing sources of inflow to Berkeley Pit/East Camp system including surface runoff, leach pad, storm water that enters Berkeley Pit from the BPSOU, tailings slurry circuit overflows and Horseshoe Bend surface water flows; f) the Travona/West Camp groundwater system; and g) surface area designated for potential development of a sludge repository (BMFOU CD).

The feature relevant to this Plan is the Pit. The Pit is located in the west-central portion of the BMFOU. The Pit has a water depth of approximately 1,000 feet, an approximate surface area encompassing over 430 acres and an estimated volume of over 50 billion gallons of contaminated water (May 2018 estimates) (site features are shown on Figure 1).

The Pit is filling with water originating from the surrounding bedrock and alluvial aquifers and from surface inflows. The water accumulating in the Pit and in the bedrock aquifer remain acidic² and contain elevated concentrations of metals and other major ions. The source of the contamination is from acid mine drainage (AMD) from the bedrock and mine workings, waste

²According to the water quality sampling data from the Pit performed by the Montana Bureau of Mines and Geology on March 27, 2018, field pH has increased to approximately 4.15 standard units (S.U.) and concentrations of certain metals/ions have changed (GWIC, 2018).

rock dumps, and leach pads. Presently, because all East Camp area bedrock groundwater flows toward the Pit; contaminated mine water is being contained in the East and West Camps and water from these systems is being treated via the Horseshoe Bend Water Treatment Plant and Butte Treatment Lagoons (BTL), respectively. Water levels will continue to rise but will not be allowed to rise above the protective, critical water levels (CWLs) at any of the monitoring points established in the BMFOU ROD (East Camp – 5,410 feet, West Camp – 5,435.5 feet [USGS datum]).

2.0 WATERFOWL PROTECTION BACKGROUND

A compilation of past waterfowl protection efforts and a summary of observations and hazing results from March 1996 to July 2018 are attached in Appendix A and illustrate the high level of effectiveness (>99% hazing success rate) in achieving the objectives listed in Section 1.0 above.

Notable data compiled since the most recent version of the Waterfowl Mitigation Plan (2002) that differ from the observations made prior to 2002 include:

- Recent observations indicate that fall migrations may be occurring later in the season, resulting in the potential for waterfowl to be frequenting the Pit throughout the month of December.
- While most of the mortalities observed prior to 2002 indicated species comprised of “diver ducks and several mallards,” more recent data indicate that the majority of mortalities since then have been geese, primarily light geese and Canada geese.
- The Waterfowl Mitigation Plan included an observation that “*the water surface of the Pit is normally frozen to a substantial depth through the winter months between November and March,*” and that “*the incidence of freezing is somewhat predictable, based on ambient air temperatures.*” More recently, the Pit does not typically freeze over in the winter and an open-water condition generally exists year-round.
- On February 8, 2013, there was a slough event in the southeast corner of the Pit that caused a large wave across the Pit water surface and caused the level of water in the Pit to rise. As a result, MR submitted the *Butte Mine Flooding Operable Unit – Request for Variance in Waterfowl Mitigation Plan* (MR, 2013) on April 17, 2013. Subsequently the Agencies granted the Parties a safety waiver in 2013 that suspended the use of a boat manned with personnel for all waterfowl protection and water sampling activities previously performed with a manned boat at the Pit. The cause of the slough and the likelihood of additional sloughing activity at the Pit were evaluated in 2015 and are now being monitored continuously. A variety of on-the-water and aerial drone technology applications continue to be evaluated and are presently used at the Pit for certain waterfowl protection activities, as described further herein.

2.1 November – December 2016 Event

The historical record of over 22 years of successfully implementing the waterfowl protection demonstrated its effectiveness during normal conditions. However, some limitations were identified during an unprecedented event that began in November and continued into December 2016. The following is a summary of this event.

On the evening of November 28, 2016, flocks totaling approximately 60,000 (Arcadis, 2017a) (the Parties, 2017a) waterfowl landed on the Pit. The flock was composed predominantly of lesser snow geese (*Chen caerulescens*) and Ross's geese (*Chen rossii*), hereafter referred to as "light geese." A flock of that size landing on the Pit was unprecedented during the previous 20 years when the Parties conducted extensive observation and hazing activities at the Pit (1996 to the present). The Parties have typically observed flocks of 68 or fewer birds, as determined over the course of 13 years of record keeping with 1,058 days of observed waterfowl on the Berkeley Pit. The November 28 event occurred during a large-scale, late fall migration of waterfowl from southern Canada through western and central Montana. Historical data for light geese migration through western Montana indicate that fall migration typically occurs between the end of September and early November. During this migration event, large flocks of co-mingled light geese species on the West-Central Flyways crossed the Continental Divide north of Butte and landed on the Pit in response to adverse weather conditions during the evening of November 28.

Following the arrival of the flock at the Pit, heightened observation and hazing activities began pursuant to the Waterfowl Mitigation Plan and continued for approximately 12 days. Although intensive hazing was effective in getting the vast majority of these waterfowl to leave the Pit within a day, poor flight conditions and the very large flock size resulted in a portion of the flock remaining. Enhanced hazing efforts, including the use of flare guns, fireworks, lasers, a drone boat (Goosinator) and drone flights were initiated, and additional waterfowl left the Pit. However, several thousand waterfowl did not respond to hazing efforts and remained on the Pit as of December 1, 2016 when personnel began to observe mortalities. A review of aerial photographs collected by drone and manned aircraft flights, including the cumulative number of dead birds collected prior to the imagery flights show that more than 2,900 waterfowl did not respond to the hazing, remained in the Pit, and ultimately died as detailed in the *Berkeley Mine Pit Snow Goose Assessment* (USFWS, 2016) and *Berkeley Pit – November 28, 2016 Event, Waterfowl Count Technical memo* (Arcadis, 2017b).

A detailed evaluation of the 2016 event, providing a sound basis for modifications to the waterfowl mitigation/protection plan to mitigate exposure and mortality during future events of this extreme nature, a discussion of the causes of, and responses to, is provided in the following documents: *November and December 2016 Berkeley Pit Migratory Waterfowl Mitigation Monthly Report* (the Parties, 2017a), *Berkeley Pit – November 28, 2016 Event Light Geese Migration Evaluation Technical Memo* (Arcadis, 2017a), the *Berkeley Pit – November 28, 2016 Event Waterfowl Count Technical Memo* (Arcadis, 2017b), the *Berkeley Pit – Waterfowl Observation and Hazing Technical Memorandum* (Arcadis, 2017c), and the *Evaluations of water samples and bird tissues collected at the Berkeley Pit, Butte, Montana in December 2016 Summary Report* (Stubblefield & Löhr, 2018) (Stubblefield & Löhr Report).

2.2 Pathway to Final Draft/Updated Plan

The Waterfowl Mitigation Plan expressly anticipated that effectiveness assessments would be conducted to determine if changes or modifications were needed. Since the significant mortality event that occurred in late 2016, the Parties have been engaged in a comprehensive effectiveness assessment. A systematic approach was followed to assess and update this Plan that included:

1. Forming a Waterfowl Advisory Board of recognized experts in avian topics, including those with an emphasis on regional waterfowl, to review relevant information and provide

recommendations on protection practices (summarized above in Section 1.0, as well as below in Section 6.1);

2. Conducting a literature review of up-to-date and state-of-the-art deterrent and hazing techniques;
3. Testing various deterrent and hazing options as interim measures during 2017 and 2018; and
4. Integrating the information developed from the above work, along with other information or limitations (such as the 2013 human safety variance described above) into this Plan.

The Waterfowl Advisory Board met numerous times in 2017 and 2018 to discuss a variety of topics including, but not limited to, the November-December 2016 event and available waterfowl deterrent options. Recommendations from the Waterfowl Advisory Board were incorporated in the interim measures plans and into this revised Plan. In addition, as discussed further in Section 6.0, under an adaptive management approach, the Waterfowl Advisory Board will continue to meet periodically to review information on program effectiveness and advise the Parties on potential improvements.

The primary scope of the literature review was to identify additional hazing methods used at other mining/industrial/agricultural sites or recommended by vendors to consider deploying during extreme events like the one encountered during the 2016 event. The results presented in the *Berkeley Pit – Waterfowl Observation and Hazing Technical Memorandum* (Arcadis, 2017c) and information from other sources are summarized in Table 2.

A variety of hazing/deterrent options (identified by the Parties and the Waterfowl Advisory Board and/or the literature review) were tested during the spring and fall 2017 and 2018 migrations under a series of interim measures. To obtain Agency review and approval for the proposed activities the Parties submitted the *Butte Mine Flooding Operable Unit (BMFOU) – Berkeley Pit Waterfowl Mitigation Plan, Interim Measures for Spring 2017 Migration* (the Parties, 2017b) (Spring Interim Plan) to the Agencies on February 21, 2017. The Agencies approved the Spring Interim Plan on March 3, 2017. Additionally, the Parties submitted the *Butte Mine Flooding Operable Unit (BMFOU) – Berkeley Pit Waterfowl Mitigation Plan, Interim Measures for Fall 2017 Migration* (the Parties, 2017c) (Fall Interim Plan) on August 18, 2017. The Fall Interim Plan was verbally approved during the Waterfowl Advisory Board Meeting on August 15, 2017. Through these plans the Parties implemented and evaluated new and/or different hazing techniques.

Hazing/deterrent techniques that were tested/used at the Pit in 2017/2018 included: propane cannons, Phoenix wailers, Montana Tech sampling drone boat, a remote-controlled speed boat, handheld lasers, automatic lasers, a searchlight, a rifle, fireworks, Unmanned Aerial Vehicles (UAVs) and a Vortex Ring Avian Deterrent (VRAD).

This Plan uses experience from implementing the 2017-18 Spring and Fall Interim Plans as a guide for setting protocols. In addition, this Plan adheres to the 2013 human safety variance to the Waterfowl Mitigation Plan for on-the-water presence. These deterrents were evaluated, under the Spring and Fall Interim Plans, based on their effectiveness at preventing waterfowl from landing on the Pit as well as hazing waterfowl off the surface of the Pit after they have landed. While the Parties have ruled out further consideration of specific deterrents, continued evaluation of all deterrents is a component of this Plan (see Adaptive Management, Section 6.0). More detailed information on deterrents that were evaluated to date are contained in Table 2.

3.0 MIGRATION MONITORING & COMMUNICATION, OBSERVATION & HAZING PROGRAM

This Plan incorporates an adaptive approach to provide warning of the potential arrival of waterfowl through an enhanced and broader migration monitoring and communication program, an observation program to identify and record waterfowl species approaching or landing in the Pit, a passive hazing program to deter waterfowl from landing and an active hazing program to get waterfowl that have landed to leave the Pit. The program is shown as a flow chart on Figure 2 and discussed in detail in the sections below.

3.1 Migration Monitoring & Communication

Migratory monitoring and early warning of large migration events are important for meeting the goals and objectives of this Plan. In addition, as outlined in the *Berkeley Pit Waterfowl Mitigation Plan Review and Recommendation* (Waterfowl Advisory Board, 2017), the Waterfowl Advisory Board identifies *prediction and prevention* as one of the components which should be included in a comprehensive strategy for waterfowl protection at the Pit. The Waterfowl Advisory Board outlines detailed weather conditions/parameters and frequencies to monitor along migration flyways, as well as increased communication with an expanded network of wildlife refuges to identify waterfowl flocks and migration activities in advance of their potential arrival in the Butte area. Details on migration monitoring tasks and contacts are provided in *WPP-SOP-01 Migration Monitoring & Communication* included in Appendix B.

3.1.1 Migration Checkpoints

To enhance prediction and early warning of flocks and migration activities, this Plan includes an expanded network of wildlife refuges, wildlife management facilities, and contacts near local water bodies. This expanded network has been established by the Waterfowl Advisory Board and the Parties to obtain current and relevant migration information. The use of this information will prepare personnel associated with waterfowl protection activities in advance of changing migration conditions.

3.1.2 Spring Migration Strategy

Spring migration is a much faster migration than that of the fall, due to condensed flocks of experienced, mature, adult waterfowl taking longer flights with shorter rest periods. The goal of spring migration is for waterfowl to reach breeding grounds as quickly as possible. The challenge in monitoring the spring migration is that waterfowl come from a wider geographic range, latitudinal and longitudinal.

3.1.3 Fall Migration Strategy

Seasonal weather conditions and forage availability to the north are the main drivers for fall migration. Unlike spring migration, migrating flocks are accompanied by inexperienced, first-year offspring. Winter storms can condense these migrating waterfowl into flocks increasing the potential for a large migration event.

3.2 Observation Program

This section provides a description of how waterfowl are observed and documented on the Pit as well as the available resources. Details on waterfowl observation standard operating procedures (SOPs) are described in *WPP-SOP-02 Berkeley Pit Waterfowl Observation* provided in Appendix B.

3.2.1 Observation Locations and Schedule

The primary observation station, referred to as the “Bird Shack,” is located on the south rim of the Pit. The Bird Shack was improved in 2017 and 2018 to include new roof/siding, observation windows, permanent electricity, and climate control. However, the entire Pit cannot be viewed from the Bird Shack, therefore, alternate viewing locations were established so that the blind spot from the Bird Shack can be checked for birds from alternate locations. The entire blind spot from the Bird Shack can be viewed from any/all of the alternate observation locations (Figure 1).

If the Pit surface is frozen, with no open water, observations are to occur daily to confirm the presence of ice/open water. Once open water is observed, applicable observation procedures will resume as described below.

Non-migration Period Observation Schedule:

January 1 to February 28 and June 1 to August 14

Personnel shall observe the Pit at a minimum of every four hours throughout daylight hours.

Migration Period Observation Schedule:

March 1 to May 31 and August 15 to December 31

Personnel shall observe the Pit hourly from the Bird Shack and once daily from an alternate observation location throughout daylight hours. Personnel shall observe the Pit, using a searchlight, every 4 hours from the Bird Shack throughout the night.

Three-tier Hazing Status Classification

Observation and hazing status are directed by the information compiled from weather forecasts, the migration monitoring checkpoints, and monitoring sites for each migration season, respectively. This information is used to determine an appropriate status level.

Level 1 - Standard: Observation and hazing schedule are normal as defined above.

Level 2 - Heightened: Observation and hazing schedule are normal. However, personnel may make additional observations at night or from alternative locations and be made aware of the possibility of large flocks of migrating waterfowl moving through the area.

Level 3 - Urgent: Personnel should be on full alert for large groups of waterfowl known to be present in the area. Night observations shall be made hourly. The Bird Shack may also be occupied full time to conduct observation and hazing activities.

3.2.2 Observation Equipment

Optics

Binoculars and spotting scopes are used to observe and identify waterfowl species. Personnel use the high magnification, professional-grade spotting scope and binoculars available in the Bird Shack. Digital image recordings may be taken using the digiscope adapter for the spotting scope. Instances in which image recordings may be used are for species confirmation, waterfowl count confirmation, and waterfowl mortalities.

Identification Guides

Personnel may use a site-specific color-coded guide titled “*Bird Guide to the Berkeley Pit*” to aid in species identification (Appendix C). This guide groups waterfowl by type (e.g., divers, dabblers, etc.), provides images and tips for identification, and includes additional information for each of the expected species. Bound, laminated copies of the guide are available in the Bird Shack.

A quick-reference poster titled “*Waterfowl of the Upper Clark Fork Watershed*” is also displayed in the Bird Shack to aid in species identification.

3.2.3 Observation and Hazing Logs

Personnel will document and report observation and hazing activities on the schedule described in Section 3.2.1. Observation and hazing logs will be used to document waterfowl locations on the Pit and hazing techniques employed throughout the monitoring period. Examples of these logs can be found in Appendix D.

3.2.4 Observation Training

Personnel involved in waterfowl observation will be trained annually on the following topics:

- Waterfowl identification:
 - How to detect the distinguishing characteristics for each species.
 - How to use the “*Bird Guide to the Berkeley Pit*” (Appendix C) and associated poster.
- Waterfowl Counts:
 - How to accurately count and record waterfowl present on the Pit.
- Use of Optics:
 - How to properly use and care for binoculars and spotting scopes.
 - How to use the digiscope to document unknown species.

3.3 Hazing Efforts

Both passive and active hazing are included in this Plan. Certain, specific passive hazing will be implemented during migration (i.e., Phoenix wailers and propane cannons; see SOPs included in Appendix B). Active efforts, on a species-specific basis, will only be used if waterfowl are observed on or in the immediate area of the Pit.

Passive or preventative hazing may not be successful, and waterfowl may still land on the Pit. It is suspected that waterfowl that use the Pit do so either to rest during migration or to avoid inclement weather conditions. Exhausted waterfowl are resistant to hazing, therefore the best practice is to allow waterfowl to rest for a short time before hazing them. Dabbling ducks, gulls, shore birds, and geese normally leave the Pit after a brief rest with a limited amount of active hazing pressure.

Active hazing is generally ineffective for fatigued waterfowl whose main defense is diving (i.e., grebes, loons, coots, diving ducks). Over-hazing these species may increase and/or prolong exposure to Pit water and increase negative biological effects. Diving waterfowl will be initially hazed, depending on other factors and variables; otherwise, waterfowl are left to rest until midday or dusk (whichever comes first). An important component to this Plan is training observation and hazing personnel to enable accurate identification of the different species and apply the species-specific hazing approach, known as precision hazing. Details on this strategy are further described in *WPP-SOP-03 Hazing Strategy* provided in Appendix B.

3.3.1 Passive/Preventative Deterrents

The purpose of passive/preventative deterrents is to deter airborne waterfowl from landing on the Pit. The following passive methods are used during migration seasons to deter waterfowl from landing on the Pit as well as hazing them once they have landed:

- Propane cannons. Propane cannons shall be placed at various locations around the Pit. The cannons are solar panel/battery charged with automatic timers. Details on propane cannon SOPs are provided in *WPP-SOP-04 Propane Cannons* included in Appendix B.
- Phoenix Wailers. Phoenix Wailers shall be placed at various locations around the Pit. Each Wailer acts as a passive audio deterrent and is fitted with multiple speakers. Details on Phoenix Wailers SOPs are provided in *WPP-SOP-05 Phoenix Wailers* included in Appendix B.

3.3.2 Active/On-the-Water Deterrents

Active hazing targets waterfowl that have landed on the Pit and shall be done using the methods below. These methods may also be used passively to prevent landing.

- Firearms. The most effective, active hazing method on the Pit is the use of firearms; specifically, high-powered rifles. The sound and splash generated by the projectile (bullet) alarms waterfowl into vacating the Pit. To employ this method, the shooter must know if the technique is appropriate dependent upon what species are present on the water and be able to

target shots next to waterfowl without hitting waterfowl. Both a bolt-action and a semi-automatic rifle are available in the Bird Shack, along with a locked magazine. The bolt-action, single-shot rifle has a scope which aids in species-specific hazing and accuracy at long distances. The semi-automatic rifle is effective for hazing groups of waterfowl, or in preventing waterfowl from re-landing elsewhere on the Pit. Details on firearm SOPs are provided in *WPP-SOP-06 Firearms* included in Appendix B.

- Hand-held Lasers. Hazing with lasers has proven effective on the Pit during low-light hours, but ineffective during daylight. Personnel have been provided with high-powered, (Class 3, 532 nm wavelength) hand-held lasers. These devices are aimed toward waterfowl and moved in a sweeping motion across the surface of the water. This agitates the waterfowl, frequently causing them to leave the vicinity. Details on laser SOPs are provided in *WPP-SOP-07 Handheld Lasers* included in Appendix B.
- Searchlight. A high-powered searchlight is installed at the Bird Shack. The searchlight aids with observation, possible species identification, and hazing during low-light hours. The searchlight is also effective as a deterrent. Details on searchlight SOPs are provided in *WPP-SOP-08 Searchlight* included in Appendix B.
- UAVs or “drones.” The use of UAVs for hazing, monitoring, documenting, and data collection is ongoing. The Parties have secured multiple sized hexa- and quad-copter UAVs fitted with advanced positioning, navigation, and hazing tools (i.e., sirens, and the ability to drop objects). These aerial UAVs can transmit real-time footage of hazing, waterfowl species and behaviors, and documentation of major events. The UAVs will undoubtedly become more advanced and even more valuable to this effort over time. Staying up-to-date with UAV technology and implementation falls under adaptive management and is described in Section 6.0.
- Speed Boat. Remote controlled fan-powered speed boats are high speed, on-the-water drones with real-time video and sound transmission/recording capability, that can be used for hazing waterfowl off the Pit.
- Fireworks. Fireworks produce loud noises and/or bright light displays that will be used to haze/deter waterfowl from the Pit.

3.3.3 Capture, Transport, Release and/or Removal of Waterfowl

In 2013, the Parties were granted a temporary variance regarding manned on-the-water operations due to the instability of the Pit walls. Since that time, personnel are no longer allowed to board watercraft to capture and transport sick or dead waterfowl found on the Pit water surface. However, with technology developed for this Plan (i.e., unmanned vehicles) and on the rare occasions when waterfowl can be reached safely from shore, capture and transport of waterfowl may be conducted if feasible.

Based on experience at the site and the results based on the Stubblefield & Löhr Report, waterfowl in good condition are generally able to continue on their migratory path after short rest in the Pit. The SOP, *WPP-SOP-13 Capture, Transport, Release and/or Removal of Waterfowl*,

included in Appendix B is designed to assist in the recovery of unwell (i.e., demonstrating toxicity symptoms as being lethargic or unable to fly) waterfowl.

The intention is to release waterfowl that are in good condition (as determined by a competent individual), in a short time frame to minimize stress. Waterfowl shall be released in an area that aligns with the biology of the species, in a manner that incorporates the species flock needs, in weather conditions that do not hinder the continuation of their migration, considering the specifics of the time of year. These specific decisions will be made by a competent individual such as a veterinarian, wildlife expert, and/or permitted waterfowl rehabilitator with the appropriate legal authorization.

Human safety and welfare of personnel will take ultimate priority in conducting all components of the Plan. Waterfowl on the water that are identified as merely distressed should be left in place. If waterfowl can be captured with minimal/moderate effort it is probably unwell and may benefit from being captured and given medical attention. Included in Appendix B is *WPP-SOP-13 Capture, Transport, Release and/or Removal of Waterfowl* which describes the SOPs for personnel who may be involved in capturing and transporting waterfowl to a veterinarian and/or releasing them. Capturing and transporting waterfowl will be done in consultation with a biologist or technician with knowledge of avian physiology and/or a veterinarian.

If collection of a carcass occurs, U.S. Fish and Wildlife Service - Law Enforcement will be notified. The carcass will be retained in a frozen condition, when possible, until U.S. Fish and Wildlife Service - Law Enforcement takes possession of the carcass or releases the carcass for disposal. If released for disposal, the carcass will be placed into MR's on-site landfill in a manner that precludes scavenging. With permission from the Agencies (including U.S. Fish and Wildlife Service - Law Enforcement), and with all appropriate permits, as may be required, the carcass may be submitted for necropsy.

4.0 SITE/DETERRENT SPECIFIC SAFETY AND PROTOCOLS

All activities at the site will be in accordance with appropriate safety plans. Refer to Appendix B for deterrent specific safety protocols and procedures.

5.0 REPORTING AND NOTIFICATION

5.1 Weekly Communication

During spring and fall migration, weekly update emails shall be sent to the Agencies. The weekly updates will summarize current conditions, recommended hazing level and the top species that are observed to be in the Pit.

5.2 Monthly Reports

The Parties shall send out monthly emails, summarizing observation and hazing activities, to the Agencies during spring and fall migration. Monthly emails will include Observation and Hazing Logs and Special Comments Forms (see Appendix D). Information summarized in the monthly emails will be documented as outlined in Section 5.3 below. The Observation and Hazing Logs shall include, but are not limited to the following: date, time, observer, number of waterfowl

observed, species, action taken to haze, and outcome of action (with a note indicating whether waterfowl had landed on the Pit).

5.3 Seasonal Reports

Observation and hazing activities shall be documented and reported twice a year in seasonal reports. The spring seasonal report will cover January 1 through the spring migration end date (i.e., May 31 or as indicated) and will be submitted during the subsequent third quarter. The fall seasonal report will cover June 1 through the fall migration end date (i.e., December 31 or as indicated) and will be submitted during the subsequent first quarter. These seasonal reports will be standalone documents submitted to the Agencies summarizing waterfowl protection activities during their respective timeframes.

5.4 Community Notification

Information regarding waterfowl protection activities will be shared with the Waterfowl Advisory Board. Information regarding implementation of this Plan will be shared with the public, via the press/media, PitWatch website and social media as deemed appropriate by the Agencies and/or the Parties.

5.5 Mortality Reporting and Notification

In the event that a migratory waterfowl mortality is discovered, a Special Comments Form shall be filled out identifying the number and species of waterfowl found and any information regarding the circumstances surrounding the death of the waterfowl. If dead waterfowl can be retrieved, the Agencies will be consulted for further handling. A UAV may be used to capture aerial images of the Pit surface to supplement the visual mortality counts performed by personnel.

If a waterfowl mortality is discovered the following MR and Atlantic Richfield personnel will be immediately notified (alternate will be notified during absence of primary MR or Atlantic Richfield personnel):

MR personnel:

Mark Thompson
MR Waterfowl Protection Manager
(406) 533-5817
mthompson@montanaresources.com

Jeremy Fleege
Alternate MR Waterfowl Protection Manager
(406) 498-8360
jfleege@montanaresources.com

Atlantic Richfield personnel:

Tim Hilmo
Atlantic Richfield Waterfowl Protection
Manager
(406) 490-4375
tim.hilmo@bp.com

Dave Griffis
Alternate Atlantic Richfield Waterfowl Protection
Manager
(406) 490-4210
dave.griffis@bp.com

If a waterfowl mortality is discovered the following Agencies (inclusive of U.S. Fish and Wildlife Service) will be notified in a timely manner:

Mr. Nikia Greene
EPA Project Coordinator
Butte Mine Flooding Operable Unit
EPA Montana Operations Office
Federal Building 10 West 15th Street, Suite 3200
Helena, Montana 59626-0096
(406) 457-5042
Greene.Nikia@epa.gov

Ms. Mona Iannelli
Special Agent
U.S. Fish and Wildlife Service
Office of Law Enforcement
Missoula, MT 59812
(406) 591-1512
mona_iannelli@fws.gov

Mr. Daryl Reed
State Project Officer
MT Department of Environmental Quality
Environmental Remediation Division
1225 Cedar Street, Helena, MT 59601
P.O. Box 200901
Helena, MT 59620-0901
(406) 444-1420
dreed@mt.gov

6.0 ADAPTIVE MANAGEMENT

The fundamental principle that guides adaptive management is developing flexibility into this Plan. Implementing adaptive management provides the ability to adjust management decisions in an on-going basis as changes occur over time.

6.1 Waterfowl Advisory Board

The main goal of the Waterfowl Advisory Board is to advise the Parties on the best-practice management approaches to predict, prevent and reduce waterfowl activity and mortality at the Pit. Through an on-going evaluation of the Parties' efforts to achieve this Plan's main objectives (see Section 1.0: Introduction), the Waterfowl Advisory Board will:

- Review predictive measures and hazing techniques and suggest appropriate and practicable measures to minimize contact of waterfowl with the Pit. Consideration of these measures will include the unique site conditions and ensure that responsible implementation prioritizes human safety.

- Review observation, hazing and other relevant program data as a means to continually evaluate the effectiveness of waterfowl protection efforts at the Pit and suggest modifications to the program to accommodate changing conditions and technological developments.

The Parties will meet with the Waterfowl Advisory Board on an as-needed basis to achieve the goals above.

6.2 Evaluation of Protection Efforts, Technology and Site Conditions

Detering and hazing waterfowl from the Pit can be complex and implementation of new tools and technologies is expected over the course of this Plan. Additionally, new techniques and technologies have already been established at the Pit during the 2017 Fall Migration Period as described in the Fall Interim Plan. By continually monitoring and evaluating the efficacy of the current protocol and technologies as well as emerging technology, the Parties can ensure that this Plan is as effective as possible while allowing for the flexibility to deal with environmental and social variables and the evolution of expertise.

6.2.1 Protection Efforts

The most effective way to evaluate the efficacy of waterfowl deterrent and hazing is to analyze the data recorded in the Observation and Hazing logs. These data can provide overall success percentages, species specific deterrent/hazing information, and a variety of other insights which will guide the adaptive management of this Plan over the course of time. The management and analysis of these data are described below in Section 6.3.

6.2.2 Technology

The tools and strategies for using them will undergo continuous evaluation to ensure that they are effectual and used in a way that maximizes their potential. An evaluation table has been developed (Table 2) for existing technologies. The table will be expanded when necessary to encompass additional waterfowl protection resources that will undoubtedly emerge over time.

6.2.3 Site Conditions

Site conditions are expected to change over time. Approaching these changes with the flexibility provided by adaptive management will allow the Parties to adjust to these changing conditions so that they do not, unnecessarily, interfere with the goals of this Plan. Continual evaluation of site conditions will be concurrent with the evaluations of protection efforts and technologies.

6.3 Data Management and Analyses

The Parties will collect relevant data and manage appropriately for additional analyses. Analyses will be used to better define preventative and active hazing protocols and procedures as needed. Data used in these analyses will be contained in Observation and Hazing Logs as noted in Section 3.2.3 and in reports as noted in Section 5.0 above. Other data not included in the reports will be made available to the Agencies upon request.

7.0 REFERENCES

- Arcadis, 2017a. November 28, 2016 Event Light Geese Migration Evaluation Technical Memo. November 2017.
- Arcadis, 2017b. Berkeley Pit – November 28, 2016 Event Waterfowl Count Technical Memo. November 2017.
- Arcadis, 2017c Berkeley Pit – Waterfowl Observation and Hazing Technical Memorandum. November 2017.
- EPA, 1994. EPA Superfund Record of Decision: Butte Mine Flooding Operable Unit, Silver Bow Creek/Butte Area NPL Site, Butte, Montana, (EPA ID: MTD980502777, OU 03). September 1994.
- EPA, 2002. Consent Decree for the Butte Mine Flooding Site. March 2002.
- GWIC, 2018. Ground-Water Information Center, MBMG Data Center. Montana Bureau of Mines and Geology, Montana Tech of the University of Montana. GWIC ID 120678. Sample ID: 229517/120678 and 229514/120678. Sample Date: March 27, 2018. Report accessed December 26, 2018. MR, 2013. Butte Mine Flooding Operable Unit – Request for Variance in Waterfowl Mitigation Plan. April 2013.
- MR, 2013. Butte Mine Flooding Operable Unit – Request for Variance in Waterfowl Mitigation Plan. April 17, 2013.
- Stubblefield & Löhr, 2018. Evaluations of water samples and bird tissues collected at the Berkeley Pit, Butte, Montana in December 2016 Summary Report. February 2018.
- The Parties, 2017a. November and December 2016 Berkeley Pit Migratory Waterfowl Mitigation Monthly Report. February 2017.
- The Parties, 2017b. Silver Bow Creek/Butte Area NPL Site Butte Priority Soils Operable Unit – Berkeley Pit Waterfowl Mitigation Plan, Interim Measures for Spring Migration. February 2017.
- The Parties, 2017c. Silver Bow Creek/Butte Area NPL Site Butte Priority Soils Operable Unit – Berkeley Pit Waterfowl Mitigation Plan, Interim Measures for Fall Migration. August 2017.
- The Parties, 2002a. Section IG of the Statement of Work (SOW) for the Silver Bow Creek/Butte Area NPL Site, Mine Flooding Operable Unit, Remedial Design/Remedial Action (RD/RA). 2002.
- The Parties, 2002b. Silver Bow Creek/Butte Area NPL Site Butte Priority Soils Operable Unit – Berkeley Pit Waterfowl Mitigation Plan, Operation and Hazing Program. February 2002.

USFWS, 2016. Berkeley Mine Pit Snow Goose Assessment. December 2016.

Waterfowl Advisory Board, 2017. Berkeley Pit Waterfowl Mitigation Plan Review and Recommendation. August 2017.

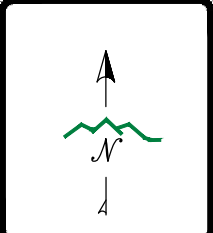
Waterfowl Advisory Board, 2017. Berkeley Pit Waterfowl Mitigation Plan Review and Recommendation.

FIGURES



LEGEND:
—— SECTOR LINE

NOTE:
1. THE BIRD SHACK IS THE PRIMARY OBSERVATION LOCATION. THE TIN DUMP AND PITSMONT ARE ALTERNATE OBSERVATION LOCATIONS.



DISPLAYED AS:	
COORD SYS/ZONE:	MSP
DATUM:	NAD 83
UNITS:	INT. FEET
SOURCE:	NAIP 2015
SCALE IN FEET	
0 500 1000	

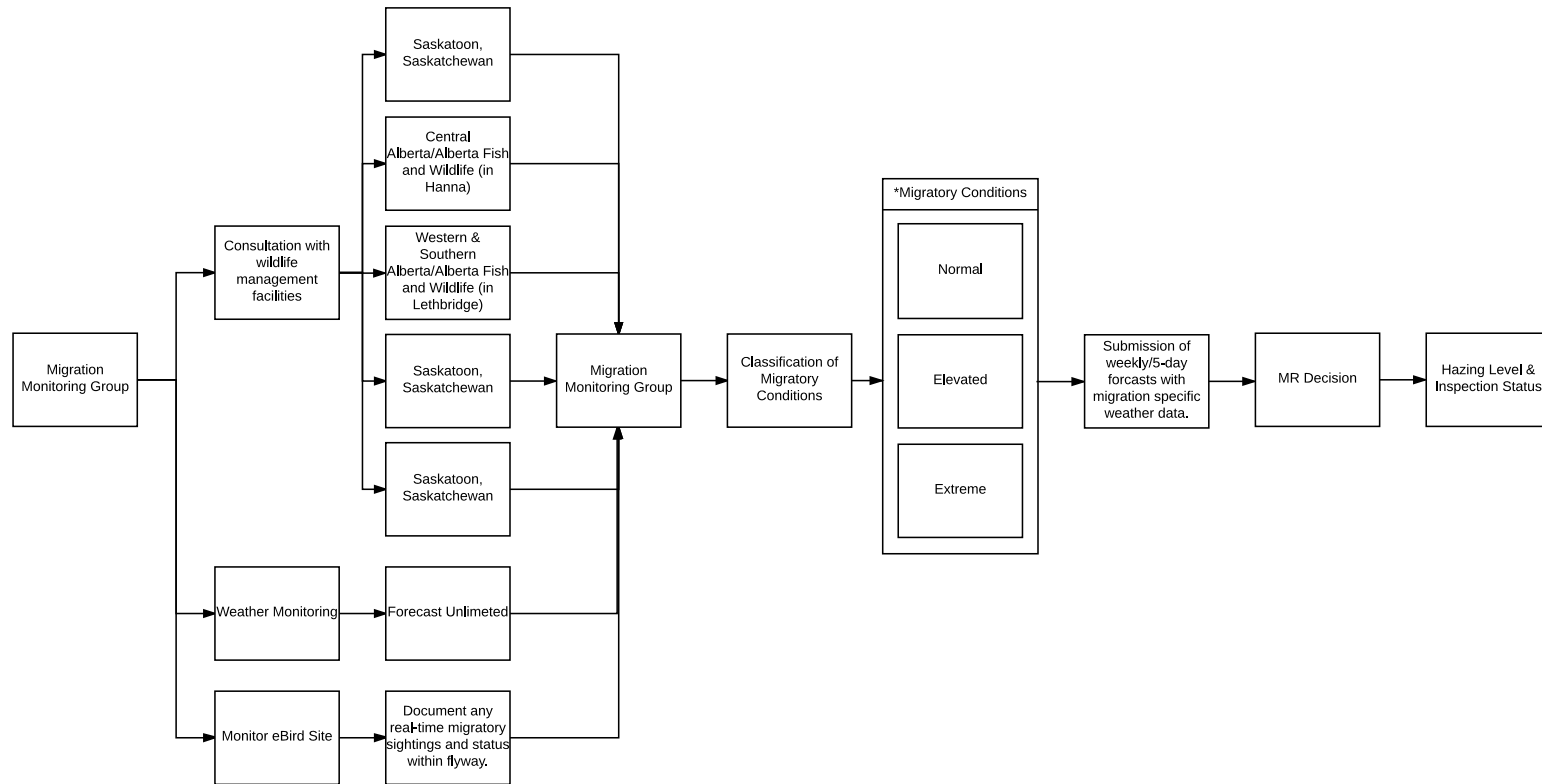
FIGURE 1

PIONEER
TECHNICAL SERVICES, INC.
201 E. BROADWAY, SUITE C
HELENA, MT 59601
(406) 457-8252

BERKLEY PIT SITE
LOCATION MAP

DATE: 10-26-18

Prediction and Prevention Flow Chart



****Deterrants Levels & Inspection Status:**

Level 1 (Standard)	Level 2 (Heightened Alert)	Level 3 (Urgent)
Rifle Fire	Level 1 (Standard)	Level 2 (Heightened Alert)
Propane Cannons	Drone Boats/Water Crafts	MR Employees observing the Pit at all times
Phoenix Wailers	UAVs	Fireworks / pyrotechnics
Lasers	Hourly Inspections during daylight	
Hourly Inspections during daylight	Hourly Inspection at night	
Inspections every 4 hours at night		

Notes:

***Migratory conditions:**

- Normal - standard warming/cooling trends, average precipitation, no unusual activity/accumulation of birds, normal waterfowl mitigation.
- Elevated - migration labeled early/late by biologists and/or weather patterns deviate from normal
- Extreme - when extreme weather (e.g. hail, large snow events, above average rainfall, significantly higher or lower trends in temperature, smoke, high winds) coincide with normal/elevated migration classification, preparation for potential higher-than-normal waterfowl presence and/or birds under extreme stress

****Deterrent Levels:**

- Level 1 (Standard) - This level of hazing coincides with the "normal" migratory condition classification; Level 1 would follow Waterfowl Mitigation Plan and standard deterrents.
- Level 2 (Heightened Alert) - This level will likely coincide with "elevated" migratory conditions; Level 2 in conjunction with "elevated" classification employs closer monitoring of migration activity and weather patterns, as well as preparation for additional urgency and the potential deployment of more urgent methods.
- Level 3 (Urgent) - This level of urgency is expected to occur when extreme weather conditions and/or communication with refuge contacts and/or eBird suggests a high potential for the imminent arrival of large flocks of sensitive species of migratory waterfowl; Calls for concurrent preparation for deployment of all available deterrents, focusing first on prevention of landing

TABLES

TABLE 1: APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

PERFORMANCE REQUIREMENTS CATEGORY ¹	Waterfowl Protection Plan Section Reference	Method of Compliance (How design achieves compliance)	Point of Compliance	Time of Compliance
FEDERAL LOCATION SPECIFIC REQUIREMENTS				
<u>Fish and Wildlife Coordination Act</u>				
16 U.S.C. §§ 1531 - 1566 and 40 CFR § 6.302(g)	3.0	These standards are found at 16 U.S.C. §§ 1531 - 1566 and 40 CFR § 6.302(g). They require that federally funded or authorized projects ensure that any modification of any stream or other water body affected by a funded or authorized action provide for adequate protection of fish and wildlife resources. Compliance with this ARAR necessitates consultation with the U.S. Fish and Wildlife Service and the State of Montana Department of Fish, Wildlife, and Parks. Further consultation with these agencies will occur during cleanup design and implementation, and specific mitigative or other measures may be identified to achieve compliance with this ARAR	The Waterfowl Protection Plan will be implemented in consultation with the appropriate agencies and consistent with input from the Waterfowl Advisory Board	Upon approval of the Waterfowl Protection Plan and during implementation of requirements of the Waterfowl Protection Plan.
<u>The Endangered Species Act</u>				
16 U.S.C. §§ 1531 - 1543, 50 CFR Part 402, and 40 CFR § 6.302(h)	3.0	Compliance with this requirement involves continued consultation with USFWS, on the topic of whether any proposed activities will impact such wildlife or habitat.	The Waterfowl Protection Plan will be implemented in consultation with the appropriate agencies and consistent with input from the Waterfowl Advisory Board	Upon approval of the Waterfowl Protection Plan and during implementation of requirements of the Waterfowl Protection Plan.
<u>Migratory Bird Treaty Act</u>				
16 U.S.C. §§ 703 et seq.	3.0	This requirement (16 U.S.C. §§ 703 et seq.) establishes a federal responsibility for the protection of the international migratory bird resource and requires continued consultation with the U.S. FWS during remedial design and remedial construction to ensure that the cleanup of the site does not unnecessarily impact migratory birds. Specific mitigative measures may be identified for compliance with this requirement.	The Waterfowl Protection Plan will be implemented in consultation with the appropriate agencies and consistent with input from the Waterfowl Advisory Board	Upon approval of the Waterfowl Protection Plan and during implementation of requirements of the Waterfowl Protection Plan.
<u>Bald Eagle Protection Act</u>				
16 U.S.C. §§ 668 et. seq.	3.0	This requirement (16 U.S.C. §§ 668 et. seq.) establishes a federal responsibility for protection of bald and golden eagles, and requires continued consultation with the U.S. FWS during remedial design and remedial construction to ensure that any cleanup of the site does not unnecessarily adversely affect the bald and golden eagle. Specific mitigative measures may be identified for compliance with this requirement.	The Waterfowl Protection Plan will be implemented in consultation with the appropriate agencies and consistent with input from the Waterfowl Advisory Board	Upon approval of the Waterfowl Protection Plan and during implementation of requirements of the Waterfowl Protection Plan.
Notes: 1. Standards are from BMOU ROD. 1994. This is not intended to be a complete list of ARARs from the BMOU ROD.				

TABLE 2: DETERRENTS EVALUATED FOR USE AT THE BERKELEY PIT (1996 – 2018)

DETERRENT	ACTIVE/ PASSIVE	CURRENTLY USED (YES/NO)	DESCRIPTION	EVALUATION
Rifle (Live Ammo)	Active	Yes	Currently a .308 rifle is used at the Berkeley Pit for hazing. The rifle is a high-powered firearm with live ammo used to haze waterfowl from the water's surface of the Pit.	The rifle has been evaluated as being an effective deterrent for hazing waterfowl and will continue to be used in the future. The level of effectiveness is based on the specific type of species that is being hazed.
Search Light (A.K.A Spotlight)	Active	Yes	A mounted 350 Watt Xenon Searchlight (spotlight) from The Carlisle & Finch Company was installed on April 5th and 6th, 2018. The spotlight is manually operated at night to help locate and deter waterfowl in the Pit.	The spotlight has been evaluated as being an effective waterfowl deterrent and is useful for locating waterfowl in the Pit. The spotlight will continue to be used in the future.
Phoenix Wailer	Passive	Yes	Five phoenix wailers are located around the Berkeley Pit at the following locations: Bird Shack, Pittston, Tin Dump, North Ramp, and South Ramp. The phoenix wailers are automatic audible speaker systems that project natural and electronic sounds by random 3-4 minute intervals.	The phoenix wailers have been evaluated as being low maintenance systems. Although the phoenix wailers do not seem to have a high success rate in deterring waterfowl due to habituation, phoenix wailers will continue to be used in the future to aid in deterring waterfowl from the Pit.
Propane Cannon	Passive	Yes	Six propane cannons are located around the Berkeley Pit at the following locations: Bird Shack, Slide, Pittsmont, Tin Dump, North Ramp and South Ramp.	The propane cannons have been evaluated as being low maintenance systems. Although the propane cannons do not seem to have a high success rate in deterring waterfowl due to habituation, propane cannons will continue to be used in the future to aid in deterring waterfowl from the Pit.
Hand-held Laser	Active	Yes	The following types of hand-held lasers have been utilized at the Berkeley Pit for night time hazing starting on DATE.	Hand-held lasers have proven to be an effective waterfowl deterrent in low light conditions.
Stationary Lasers (automated)	Passive	No	Automated, stationary lasers pre-programmed with random patterns to deter/haze waterfowl from the Pit.	Currently being researched for further evaluation.
Aerial Drones (UAVs)	Active	Yes	The following types of UAVs have been used at the Berkeley Pit:...	Currently being evaluated for effectiveness. Certain types of bird species are deterred/hazed but further evaluation is needed.

TABLE 2: DETERRENTS EVALUATED FOR USE AT THE BERKELEY PIT (1996 – 2018)

DETERRENT	ACTIVE/ PASSIVE	CURRENTLY USED (YES/NO)	DESCRIPTION	EVALUATION
Vortex Ring Avian Deterrent (VRAD)	Active	No	The VRAD generates a sound wave that can be directed at waterfowl. The VRAD uses a combination of acetylene and oxygen to generate the sound wave.	Currently the VRAD has been evaluated as being unsafe and has product/technology limitations. In the event that these safety issues and limitations can be addressed, the Parties may reserve the right to reconsider/reevaluate the technology’s use in the future.
Fireworks	Active	Yes	Fireworks produce loud noises and produce bright lights to deter/hazer waterfowl at the Pit.	Fireworks have proven to be an effective deterrent at the Pit. The level of effectiveness is based on pre-preparedness and setup. Fireworks will be used in the future to aid in deterring/hazing waterfowl from the Pit.
Strobe Lights	Passive	No	Bright flashing light(s) with adjustable flashing frequencies and colors.	Currently being researched for further evaluation.
Air Boat	Active	Yes	The airboat is designed to ease launch and retrieval of the boat as well as mitigate the potential for fouling of the engine propeller in a typical boat design (either due to the acidic water or debris floating in the Pit). It is approximately 3’ x 5’ with a 60cc 2-cycle, single cylinder, engine turning a 22-24 inch propeller. It weighs approximately 40 lbs and has a duration of about 1 hour before needing to be refueled. Cruising speed is 10-15 mph with a top speed of 30+ mph. It is remotely-controlled and can be semi-autonomously controlled up to 2 miles.	Currently being evaluated for effectiveness. Certain types of bird species are deterred/hazed but further evaluation is needed.
MT Tech Drone Sampling Boat	Active	Yes	A drift boat equipped with a propane cannon.	Due to the slow speed of the boat this boat is not highly effective in deterring birds from the Pit.
Goosinator	Active	No	Water-based drone made of foam, plywood, and plastic and painted bright orange. It is powered by a propeller run by an electric motor, about the size of the motor in a ceiling fan but much noisier (90 decibels). A remote control maneuvers the Goosinator back and forth. Dimensions are 17 x 24 x 24 inches.	Had limited success in deterring waterfowl until power source failed and the drone was lost in the Pit. Refer to November/December waterfowl report for more information.
Deterrents Evaluated But Not Recommended				
Pyrotechnics (cartridges and signal flares). Shotguns with cracker shells.	Active	No	Noise or flare making cartridges fired from a launcher or a standard 12-huage shotgun. Anti-bird strike cartridges emit a 150-decibel report.	Ineffective or Not Feasible
Dye	Passive	No	A colored dye added to the Berkeley Pit to change the appearance of the water’s surface that may deter birds from landing.	Ineffective or Not Feasible

TABLE 2: DETERRENTS EVALUATED FOR USE AT THE BERKELEY PIT (1996 – 2018)

DETERRENT	ACTIVE/ PASSIVE	CURRENTLY USED (YES/NO)	DESCRIPTION	EVALUATION
Away with Geese Land Unit Light	Passive	No	Shaped like a small pole with the lower end intended to be staked into the ground. The top features a cylindrical amber light that constantly flashes every 2 seconds during the night, disturbing bird sleep patterns.	Ineffective or Not Feasible
Lights on Water Surface	Passive	No	A network of spotlights, preferably of different colors, shining on the surface of the Pit to change the appearance of the water surface and deter birds from landing. Steady white light may attract them, so colors could be green or blue, which have not altered their migration course (Poot et al. 2003). Orange-colored water has deterred mallards, and orange light could be tested to mimic the effect of a dye.	Ineffective or Not Feasible
Radar Integrated Deterrent System	Passive	No	The radar can continuously monitor 360 degrees about the site and can cover an area from 1 acre to 10 square miles or larger.	Ineffective or Not Feasible
Animal Effigies of Predators or Scarecrows	Passive	No	Lifelike animal effigies or scarecrows used to deter birds. Can be stationary or designed with some motion and be accompanied by noise to increase effectiveness. Radar-deterrent integrated system uses peregrine falcon scarecrows with wing movement and falcon calls. Additional options for large birds are the use of coyote effigies that have a moving component. Predator calls can also be incorporated.	Ineffective or Not Feasible
Fogging/Aerosol Repellant/Sheen	Active or Passive	No	A machine that produces low lying fog to cover the surface of the Pit.	Ineffective or Not Feasible
Floating Barge/Dock to Place Deterrents	Passive	No	A barge or dock for deterrent deployment.	Ineffective or Not Feasible

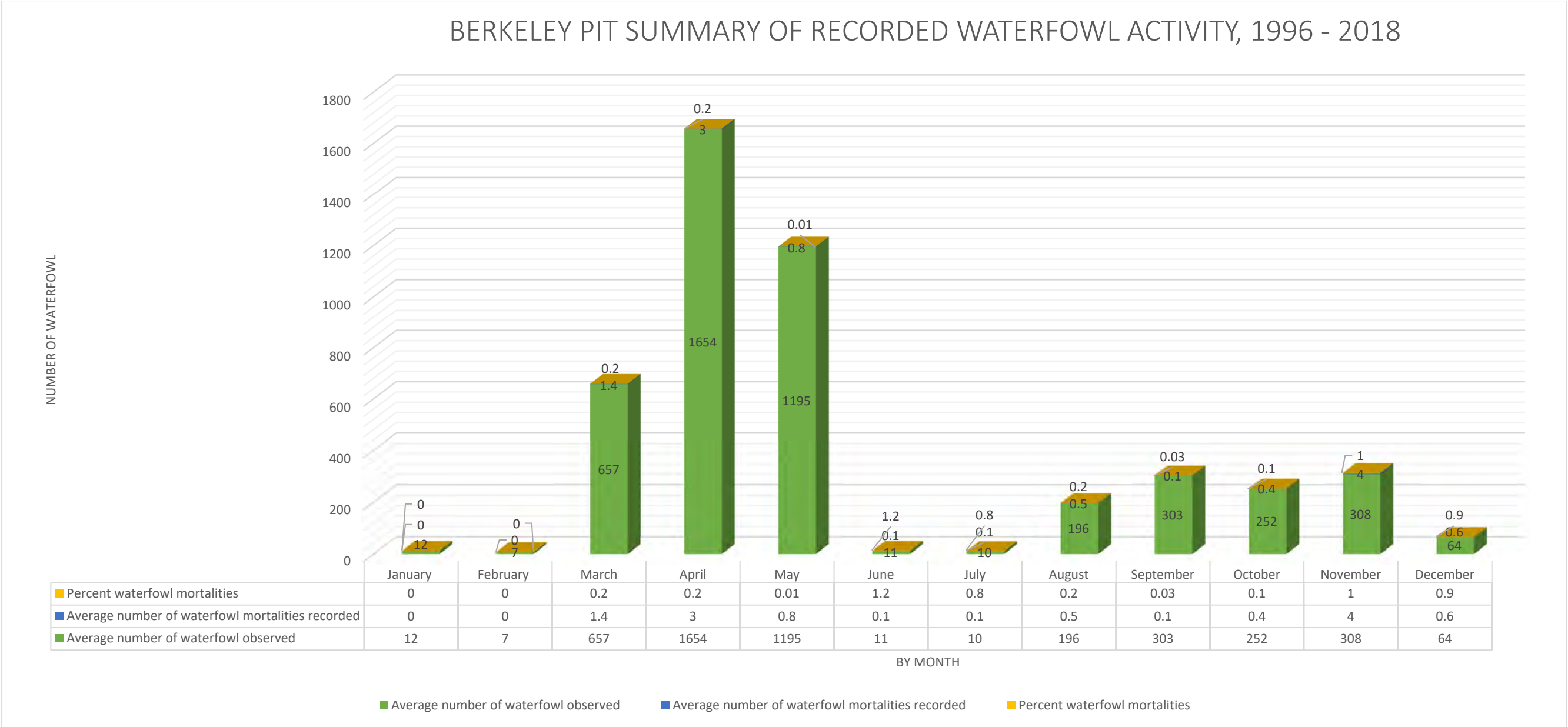
TABLE 2: DETERRENTS EVALUATED FOR USE AT THE BERKELEY PIT (1996 – 2018)

DETERRENT	ACTIVE/ PASSIVE	CURRENTLY USED (YES/NO)	DESCRIPTION	EVALUATION
Visual Barriers (Bright Orange Construction Barricades)	Passive	No	A highly visible, plastic, orange jersey barrier to ack as a visual deterrent.	Ineffective or Not Feasible
Canine Harassment	Active	No	A coyote decoy or similar to visual deter birds from the Pit	Ineffective or Not Feasible
Netting	Passive	No	A giant net spanning the length and width of the Pit to prevent birds from contacting the water’s surface.	Due to the large size of the pit it was determined that a netting would not be an adequate tool for deterring birds at the Pit
Bird Balls, Floating Discs, Floating Covers	Passive	No	Hollow Ball Covers used to camouflage the Pits to prevent birds from landing. The U.V. Black Hollow Float Balls cover 91% of the surface area. Installation is easy and requires no construction or infrastructure to build and maintain. The Chemical Resistant HDPE Balls withstand sun, rain, ice, snow and wind.	Due to the large size of the pit it was determined that a netting would not be an adequate tool for deterring birds at the Pit
Airsoft Gun	Active	No	A gun that uses plastic BBs launched using compressed gas.	Not Evaluated but similar to rifle fire
Helikite	Active	No	A type of kite-balloon that uses helium and wind for lift.	Ineffective or Not Feasible
Reflective Materials (Windmills, Mylar balloons, large sheets)	Passive	No	Highly reflective material such as Mylar can be used in large sheets attached to new or existing structures in the Berkley Pit, or as an anchored helium filled balloon that remains airborne to act as a deterrent. Steel windmills with 36” blades painted with a UV light reflecting paint can also be mounted to any new or existing pole of any height.	Ineffective or Not Feasible
Wind dancers/flags	Passive	No	A wind dancer is a 10- to 18-foot-tall colorful tube with arms with a blower attached to the bottom that causes the tube to move around. The wind flags are 8- to 15-foot-tall flags on poles.	Ineffective or Not Feasible

APPENDIX A

BERKELEY PIT SUMMARY OF RECORDED WATERFOWL ACTIVITY, 1996 – 2018

APPENDIX A



Notes:

- This data representation reflects monthly averages of available records from waterfowl observations collected on the Berkeley Pit from March 1996 to July 2018. Please note, data collection methods and information varied throughout the years depending on weather conditions and other personnel demands.
- The November/December 2016 event is omitted from the dataset used in the depiction above, as it is an outlier.
- Using the complete data set (including the November/December 2016 event), from March 1996 through July 2018 the hazing success rate ($\frac{(waterfowl\ observed - waterfowl\ mortalities)}{waterfowl\ observed}$) is approximately 98%.
- Using the complete data set (excluding the November/December 2016 event), from March 1996 to July 2018 the hazing success rate ($\frac{(waterfowl\ observed - waterfowl\ mortalities)}{waterfowl\ observed}$) is approximately 99.8%.

APPENDIX B

STANDARD OPERATING PROCEDURES

APPENDIX B : STANDARD OPERATING PROCEDURES (SOPs)

SOP #	SOP NAME
WPP-SOP-01	Migration Monitoring and Communication
WPP-SOP-02	Berkeley Pit Waterfowl Observation
WPP-SOP-03	Hazing Strategy
WPP-SOP-04	Propane Cannon
WPP-SOP-05	Phoenix Wailer
WPP-SOP-06	Firearms
WPP-SOP-07	Handheld Lasers
WPP-SOP-08	Searchlight
WPP-SOP-13	Capture, Transport, Release, and/or Removal of Waterfowl

This table represents a list of SOPs to be used in support of the Waterfowl Protection Plan at the Berkeley Pit. This list will be updated as necessary.

**WPP-SOP-01;
MIGRATION MONITORING AND COMMUNICATION**

**AUTHORIZED
VERSION:
DATE: 3/12/2019
PAGE 1 of 1**

PURPOSE	This Standard Operating Procedure (SOP) outlines the standard instructions for documenting and monitoring Berkeley Pit (Pit) waterfowl activities. These procedures shall apply to the Spring and Fall migration periods as stated in the Butte Mine Flooding Operable Unit (BMFOU) Waterfowl Protection Plan.
SCOPE	This practice has been prepared for the BMFOU waterfowl protection personnel. Personnel who conduct the work shall be trained and competent in the risk-assessed work described below.
WORK INSTRUCTIONS The following instructions are intended to provide sufficient guidance to perform the task in a safe, accurate, and reliable manner. All work performed under this SOP will be consistent with procedures and policies described in the appropriate Operations Manual (where applicable).	
TASK	INSTRUCTIONS
1. Migration Monitoring	Waterfowl migration activity shall be monitored and reported on a weekly basis during Spring (March 1 through May 31) and Fall (August 15 through December 31) migration seasons. The following information on migration activity and parameters will be collected and included in the weekly reports: • Waterfowl species numbers and activity at appropriate migration monitoring sites and checkpoints (e.g. Spring or Fall). • Recommendations on additional observation/monitoring activity • Appropriate observation and hazing level (Standard, Heightened or Urgent) to guide waterfowl protection efforts at the Pit.
2. Weather Observation	Weather trends/forecasts and relevant environmental conditions (e.g. drought, wildfires) shall also be monitored during the spring and fall migration periods. Information on weather activity and parameters will be included in the weekly reports: Additionally, daily forecast information, during migration seasons can be found on the following website: http://montanaresourcesweather.weebly.com/
3. Communication	Reports on tasks 1 – 2 will be disseminated weekly to members of the Waterfowl Protection team and Agencies.

WPP-SOP-02; BERKELEY PIT WATERFOWL OBSERVATION	AUTHORIZED VERSION: DATE: 3/12/2019 PAGE 1 of 3

PURPOSE	This Standard Operating Procedure (SOP) outlines the standard instructions for documenting and monitoring Berkeley Pit (Pit) waterfowl activities. These procedures shall apply to the Butte Mine Flooding Operable Unit (BMFOU) Waterfowl Protection Plan.
SCOPE	This practice has been prepared for the BMFOU waterfowl protection personnel. Personnel who conduct the work shall be trained and competent in the risk-assessed work described below.

WORK INSTRUCTIONS

The following instructions are intended to provide sufficient guidance to perform the task in a safe, accurate, and reliable manner. All work performed under this SOP will be consistent with procedures and policies described in the appropriate equipment operations manual(s), where applicable.

TASK	INSTRUCTIONS								
1. Observation Procedures	Migratory Season Observation Procedures (Spring, March 1 – May 31) and (Fall, August 15 – December 31): During daylight, from the Bird Shack, observe the surface of the Pit hourly using binoculars and/or a spotting scope for signs of waterfowl. Slowly sweep the surface of the Pit using the binoculars and/or spotting scope. Additionally, an observation is to be made from an alternate observation point (e.g. Pittsmont Observation or Tin Dump Observation; see Figure 1), once per day, to increase the areas of the Pit that are viewable. During night, from the Bird Shack, observe the surface of the Pit every 4 hours using the high-powered searchlight. Slowly sweep the surface of the Pit using the high-powered searchlight for presence of waterfowl. Non-migratory Season Observation Procedures (January 1 – February 28 and June 1 – August 14): During daylight, from the Bird Shack, observe the surface of the Pit every 4 hours using binoculars and/or a spotting scope for signs of waterfowl. Slowly sweep the surface of the Pit using the binoculars and/or spotting scope. If the Pit surface is frozen, with no open water, observations are to occur daily to confirm the presence of ice/open water. Once open water is observed, revert to applicable observation procedures. Fill out the <i>Berkeley Pit Waterfowl Observation Log</i> for every observation. Information may include: <table><tr><td>Name</td><td>Date</td><td>Time Arrived</td><td>Time Departed</td></tr><tr><td>Temp (°F)</td><td>Weather Conditions</td><td>Birds Sighted? (yes/no)</td><td>Comments</td></tr></table> If no waterfowl are sighted, observation procedures are finished for the observation period.	Name	Date	Time Arrived	Time Departed	Temp (°F)	Weather Conditions	Birds Sighted? (yes/no)	Comments
Name	Date	Time Arrived	Time Departed						
Temp (°F)	Weather Conditions	Birds Sighted? (yes/no)	Comments						

WPP-SOP-02;
BERKELEY PIT WATERFOWL OBSERVATION

AUTHORIZED VERSION:
DATE: 3/12/2019
PAGE 2 of 3

	If waterfowl are sighted proceed to: 2. <i>Hazing Procedures</i> .										
2. Hazing Procedures	Using optics and the <i>Bird Guide to the Berkeley Pit</i> identify the species of waterfowl that are present on the Pit. Count the number of each species, if applicable, and record the number and sector location (see Sector Map on wall of Bird Shack or logbook) in the Berkeley Pit Migratory Bird Hazing Log. Completion of this schedule may include: <table border="1"><thead><tr><th>Date</th><th>Time</th><th>Personnel Involved</th><th>Species Code</th></tr></thead><tbody><tr><td>ID Confidence (High, Med, Low)</td><td>Number of Birds</td><td>Location / Sector</td><td>Bird Activity</td></tr></tbody></table> Refer to the <i>WPP-SOP-03 Hazing Strategy</i> and/or the <i>Bird Guide to the Berkeley Pit</i> for species specific standard operating procedures. Initiate standard hazing techniques as outlined in the appropriate SOP(s). Document hazing techniques, on the <i>Berkeley Pit Migratory Waterfowl Hazing Log</i>, including: <table border="1"><thead><tr><th>Hazing Action Taken</th><th>Results of Action</th></tr></thead></table> If waterfowl leave the Pit, hazing procedures are finished for the hazing period. If waterfowl remain in the Pit proceed to 3. <i>Waterfowl Conditions Assessment</i>	Date	Time	Personnel Involved	Species Code	ID Confidence (High, Med, Low)	Number of Birds	Location / Sector	Bird Activity	Hazing Action Taken	Results of Action
Date	Time	Personnel Involved	Species Code								
ID Confidence (High, Med, Low)	Number of Birds	Location / Sector	Bird Activity								
Hazing Action Taken	Results of Action										
3. Notification Procedures	If any of the following are observed, notify Waterfowl Protection Manager or Alternate: • More than 250 unresponsive waterfowl on the Pit. • Less than 250 unresponsive waterfowl on the Pit – stop hazing to allow waterfowl to rest. Resume hazing after waterfowl have had a chance to rest. Once waterfowl have had a chance, to rest start back at 1. <i>Observation Procedures</i>. • A mortality and/or suspected mortality The following observation details should be included with the notification: <table border="1"><thead><tr><th>Species</th><th>Counts</th><th>Hazing Efforts</th><th>Videos/Photos</th><th>Mortalities</th></tr></thead></table> The Waterfowl Protection Manager is responsible for additional notifications. The Parties will consult with a waterfowl expert on the situation and determine an appropriate strategy.	Species	Counts	Hazing Efforts	Videos/Photos	Mortalities					
Species	Counts	Hazing Efforts	Videos/Photos	Mortalities							

WPP-SOP-02; BERKELEY PIT WATERFOWL OBSERVATION	AUTHORIZED VERSION: DATE: 3/12/2019 PAGE 3 of 3

DRAWINGS, DOCUMENTS, AND TOOLS/EQUIPMENT The following documents should be referenced to assist in completing the associated task.	
DRAWINGS	
RELATED SOPs/ PROCEDURES/ WORK PLANS	<i>WPP-SOP-03 Hazing Strategy</i>
TOOLS	Optics (binoculars and spotting scope), searchlight, camera,
FORMS/ CHECKLIST	<i>Berkeley Pit Waterfowl Observation Log</i> <i>Berkeley Pit Migratory Waterfowl Hazing Log</i> <i>Bird Guide to the Berkeley Pit</i>

**WPP-SOP-03;
HAZING STRATEGY**

AUTHORIZED VERSION:
DATE: 8/1/2019
PAGE 1 of 6

PURPOSE	This Standard Operating Procedure (SOP) outlines the standard instructions for documenting and monitoring Berkeley Pit (Pit) waterfowl activities. These procedures shall apply to the Spring and Fall migration periods as stated in the Butte Mine Flooding Operable Unit (BMFOU) Waterfowl Protection Plan.
SCOPE	This practice has been prepared for the BMFOU waterfowl protection personnel. Personnel who conduct the work shall be trained and competent in the risk-assessed work described below.

WORK INSTRUCTIONS

The following instructions are intended to provide sufficient guidance to perform the task in a safe, accurate, and reliable manner. All work performed under this SOP will be consistent with procedures and policies described in the appropriate Operations Manual (where applicable).

TASK	INSTRUCTIONS														
1. Definitions	After completing tasks 1. <i>Observation</i> and 2. <i>Hazing Procedures</i> as outlined in <i>WPP-SOP-02 Berkeley Pit Waterfowl Observation</i> refer to the correct task for species specific hazing as outlined in this SOP. Conventional Hazing: Upon initial discovery of waterfowl species, perform initial hazing techniques. Continue intermittent hazing of these waterfowl species throughout the day (if necessary) to ensure they leave the Pit as soon as possible. Allow these waterfowl species to rest as needed. Refer to the specific hazing tasks based on species below for more detailed information Protective Hazing: Upon initial discovery of waterfowl species, perform initial hazing techniques. If waterfowl dive, relocate, or stay despite initial hazing attempts, let these species rest until dusk and begin Conventional Hazing. Hazing Technique: <table><tr><td>Firearms</td><td>A high-powered rifle with live ammunition.</td></tr><tr><td>Speed Boat</td><td>A remote-controlled fan-powered, high speed boat with real-time video and sound transmission/recording capability.</td></tr><tr><td>UAV(s)</td><td>Unmanned Aerial Vehicle(s) that can transmit real-time footage of hazing activities.</td></tr><tr><td>Searchlight</td><td>A high-powered light which aids with observation and species identification. Hazing during lowlight conditions.</td></tr><tr><td>Handheld Lasers</td><td>High powered Class 3, 532 nm handheld lasers used for hazing during low light condition.</td></tr><tr><td>Fireworks</td><td>A device that makes loud noises and/or bright light displays through the use of explosives.</td></tr><tr><td>All</td><td>Include all hazing techniques listed above.</td></tr></table>	Firearms	A high-powered rifle with live ammunition.	Speed Boat	A remote-controlled fan-powered, high speed boat with real-time video and sound transmission/recording capability.	UAV(s)	Unmanned Aerial Vehicle(s) that can transmit real-time footage of hazing activities.	Searchlight	A high-powered light which aids with observation and species identification. Hazing during lowlight conditions.	Handheld Lasers	High powered Class 3, 532 nm handheld lasers used for hazing during low light condition.	Fireworks	A device that makes loud noises and/or bright light displays through the use of explosives.	All	Include all hazing techniques listed above.
Firearms	A high-powered rifle with live ammunition.														
Speed Boat	A remote-controlled fan-powered, high speed boat with real-time video and sound transmission/recording capability.														
UAV(s)	Unmanned Aerial Vehicle(s) that can transmit real-time footage of hazing activities.														
Searchlight	A high-powered light which aids with observation and species identification. Hazing during lowlight conditions.														
Handheld Lasers	High powered Class 3, 532 nm handheld lasers used for hazing during low light condition.														
Fireworks	A device that makes loud noises and/or bright light displays through the use of explosives.														
All	Include all hazing techniques listed above.														

**WPP-SOP-03;
HAZING STRATEGY**

AUTHORIZED VERSION:
DATE: 8/1/2019
PAGE 2 of 6

**2. Geese, Swans
and Dabbling
Ducks Hazing
Procedures**

Species (4-Letter Alpha Code)	Conventional Hazing	Protective Hazing	Applicable Hazing Techniques			
			Dawn	Day	Dusk	Night
GWFG (Greater White-fronted Goose)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
SNGO (Snow Goose)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
ROGO (Ross's Goose)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
CACG (Cackling Goose)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
CANG (Canada Goose)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
TRUS (Trumpeter Swan)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
TUSW (Tundra Swan)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
GADW (Gadwall)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
AMWI (American Wigeon)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
MALL (Mallard)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
BWTE (Blue-winged Teal)	X		ALL	Firearms, Speed Boat,	ALL	Firearms, Searchlight, Lasers, Fireworks

AUTHORIZED VERSION:
DATE: 8/1/2019
PAGE 3 of 6

					UAV, Fireworks		
	CITE (Cinnamon Teal)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
	GWTE (Green-winged Teal)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
	NOPI (Northern Pintail)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
	NSHO (Northern Shoveler)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
	WODU (Wood Duck)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
3. Diving Ducks Hazing Procedures							
	Species (4-Letter Alpha Code)	Conventional Hazing	Protective Hazing	Applicable Hazing Techniques			
				Dawn	Day	Dusk	Night
	CANV (Canvasback)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
	REDH (Redhead)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
	RNDU (Ring-necked Duck)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
	GRSC (Greater Scaup)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
	LESC (Lesser Scaup)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
	SUSC (Surf Scoter)		X	ALL	NA	ALL	Firearms, Searchlight, Lasers, Fireworks
WWSC		X	ALL	NA	ALL	Firearms, Searchlight,	

AUTHORIZED VERSION:
DATE: 8/1/2019
PAGE 4 of 6

	(White-winged Scoter)						Lasers, Fireworks
	BUFF (Bufflehead)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
	COGO (Common Goldeneye)		X	ALL	NA	ALL	Firearms, Searchlight, Lasers, Fireworks
	BAGO (Barrow's Goldeneye)		X	ALL	NA	ALL	Firearms, Searchlight, Lasers, Fireworks
	RUDU (Ruddy Duck)		X	ALL	NA	ALL	Firearms, Searchlight, Lasers, Fireworks
4. Water Birds Hazing Procedures							
	Species (4-Letter Alpha Code)	Conventional Hazing	Protective Hazing	Applicable Hazing Techniques			
				Dawn	Day	Dusk	Night
	COME (Common Merganser)		X	ALL	NA	ALL	Firearms, Searchlight, Lasers, Fireworks
	HOME (Hooded Merganser)		X	ALL	NA	ALL	Firearms, Searchlight, Lasers, Fireworks
	RBME (Red-breasted Merganser)		X	ALL	NA	ALL	Firearms, Searchlight, Lasers, Fireworks
	PBGR (Pied-billed Grebe)		X	ALL	NA	ALL	Firearms, Searchlight, Lasers, Fireworks
	HOGR (Horned Grebe)		X	ALL	NA	ALL	Firearms, Searchlight, Lasers, Fireworks
	RNGR (Red-necked Grebe)		X	ALL	NA	ALL	Firearms, Searchlight, Lasers, Fireworks
	EAGR (Eared Grebe)		X	ALL	NA	ALL	Firearms, Searchlight, Lasers, Fireworks
	WEGR (Western Grebe)		X	ALL	NA	ALL	Firearms, Searchlight, Lasers, Fireworks
	AMCO		X	ALL	NA	ALL	Firearms, Searchlight,

AUTHORIZED VERSION:
DATE: 8/1/2019
PAGE 5 of 6

	(American Coot)						Lasers, Fireworks																																																					
	COLO (Common Loon)		X	ALL	NA	ALL	Firearms, Searchlight, Lasers, Fireworks																																																					
	DCCO (Double-crested Cormorant)		X	ALL	NA	ALL	Firearms, Searchlight, Lasers, Fireworks																																																					
	AMWP (American White Pelican)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks																																																					
	RNPH (Red-necked Phalarope)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks																																																					
	WIPH (Wilson’s Phalarope)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks																																																					
5. Gulls and Shorebirds Hazing Procedures	<table><tr><th rowspan="2">Species (4-Letter Alpha Code)</th><th rowspan="2">Conventional Hazing</th><th rowspan="2">Protective Hazing</th><th colspan="4">Applicable Hazing Techniques</th></tr><tr><th>Dawn</th><th>Day</th><th>Dusk</th><th>Night</th></tr><tr><td>RBGU (Ring-billed Gull)</td><td>X</td><td></td><td>ALL</td><td>Firearms, Speed Boat, UAV, Fireworks</td><td>ALL</td><td>Firearms, Searchlight, Lasers, Fireworks</td></tr><tr><td>CAGU (California Gull)</td><td>X</td><td></td><td>ALL</td><td>Firearms, Speed Boat, UAV, Fireworks</td><td>ALL</td><td>Firearms, Searchlight, Lasers, Fireworks</td></tr><tr><td>AMAV (American Avocet)</td><td>X</td><td></td><td>ALL</td><td>Firearms, Speed Boat, UAV, Fireworks</td><td>ALL</td><td>Firearms, Searchlight, Lasers, Fireworks</td></tr><tr><td>BOGU (Bonaparte’s Gull)</td><td>X</td><td></td><td>ALL</td><td>Firearms, Speed Boat, UAV, Fireworks</td><td>ALL</td><td>Firearms, Searchlight, Lasers, Fireworks</td></tr><tr><td>MAGO (Marbled Godwit)</td><td>X</td><td></td><td>ALL</td><td>Firearms, Speed Boat, UAV, Fireworks</td><td>ALL</td><td>Firearms, Searchlight, Lasers, Fireworks</td></tr><tr><td>BNST (Black-necked Stilt)</td><td>X</td><td></td><td>ALL</td><td>Firearms, Speed Boat, UAV, Fireworks</td><td>ALL</td><td>Firearms, Searchlight, Lasers, Fireworks</td></tr></table>							Species (4-Letter Alpha Code)	Conventional Hazing	Protective Hazing	Applicable Hazing Techniques				Dawn	Day	Dusk	Night	RBGU (Ring-billed Gull)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks	CAGU (California Gull)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks	AMAV (American Avocet)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks	BOGU (Bonaparte’s Gull)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks	MAGO (Marbled Godwit)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks	BNST (Black-necked Stilt)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks
	Species (4-Letter Alpha Code)	Conventional Hazing	Protective Hazing	Applicable Hazing Techniques																																																								
				Dawn	Day	Dusk	Night																																																					
	RBGU (Ring-billed Gull)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks																																																					
	CAGU (California Gull)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks																																																					
	AMAV (American Avocet)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks																																																					
	BOGU (Bonaparte’s Gull)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks																																																					
	MAGO (Marbled Godwit)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks																																																					
BNST (Black-necked Stilt)	X		ALL	Firearms, Speed Boat, UAV, Fireworks	ALL	Firearms, Searchlight, Lasers, Fireworks																																																						

**WPP-SOP-03;
HAZING STRATEGY**

**AUTHORIZED VERSION:
DATE: 8/1/2019
PAGE 6 of 6**

DRAWINGS, DOCUMENTS, AND TOOLS/EQUIPMENT

The following documents should be referenced to assist in completing the associated task.

DRAWINGS	
RELATED SOPs/ PROCEDURES /WORK PLANS	<i>Most Current Waterfowl Protection Plan WPP-SOP-02 Berkeley Pit Waterfowl Observation WPP-SOP-06 Firearms WPP-SOP-07 Handheld Lasers WPP-SOP-08 Searchlights</i>
TOOLS	Firearms, lasers, searchlight, UAV's, Speed Boat, Fireworks,
FORMS/ CHECKLIST	<i>Berkeley Pit Waterfowl Observation Log Berkeley Pit Migratory Waterfowl Hazing Log Special Comments Form</i>

WPP-SOP-04
PROPANE CANNON

AUTHORIZED VERSION:
DATE: 3/12/2019
PAGE 1 of 3

PURPOSE	This Standard Operating Procedure (SOP) outlines the standard instructions for operation and maintenance of propane cannons at the Berkeley Pit (Pit). These procedures shall apply to the Spring and Fall migration periods as stated in the Butte Mine Flooding Operable Unit (BMFOU) Waterfowl Protection Plan but may extend into non-migratory periods.
SCOPE	This practice has been prepared for the BMFOU waterfowl protection personnel. Personnel who conduct the work shall be trained and competent in the risk-assessed work described below.

WORK INSTRUCTIONS

The following instructions are intended to provide sufficient guidance to perform the task in a safe, accurate, and reliable manner. All work performed under this SOP will be consistent with procedures and policies described in the appropriate Operations Manual (where applicable).

TASK	INSTRUCTIONS
1. Initial Setup	Spring (March 1 – May 31) and Fall (August 15 – December 31) Migration Setup: Setup a minimum of four (4) and up to six (6) propane cannons at various locations around the Pit. Refer to the product manual for additional setup details.
2. Operation Activities	Operate the propane cannons with the following guidelines: • Orientation: point cannon toward the Pit. • Operating frequency: typically every 3-5 minutes. • Shots per firing frequency: 1-3 shots. Refer to the product manual for additional setup details.
3. Monitoring and Maintenance Activities	Monitor the propane cannons and perform maintenance on a weekly basis as follows:  • Inspect the propane cannons for any damaged parts. • Listen to make sure each cannon fires successfully

- Check the life of the propane tanks and replace if necessary. If propane tank is empty, replace with a full tank.
- Confirm the operating frequency and number of shots of the propane cannons. Operating frequencies are typically set between 3-5 minutes. Shot counts can be set between 1-3 shots. The operating frequency dial is located inside the unit and is accessible by opening the latches on the rear of the cannon, with the shot number switch located on the side of the frequency dial.



- Clean any dirt and debris covering the solar panel.



4. Troubleshooting

If the propane tank is not empty and the cannon fails to properly fire:

- Change the battery out with a charged battery. Clean off the solar panel and make sure that it is receiving ample sunlight.



- Listen to hear if propane is being discharged. If not, clean the injector nozzle with the nozzle cleaning tool. If nozzle is plugged, replace it with a new nozzle (see product manual).

	• Listen to hear if the electrical system is creating a spark (should immediately follow the sound of propane entering the chamber). If not (and battery has already been replaced) pull the spark plug (see product manual) and check for corrosion, build-up, or damages. Service or replace with new spark plug. • If a successful troubleshooting cannot be attained in the field, replace with a backup cannon until non-functioning cannon can be returned to service.												
5. Documentation	Document Monitoring and Maintenance activities on a <i>BMFOU Waterfowl Protection Cannon/Wailer Inspection Form</i>. A copy of the form is included in Appendix D of the Waterfowl Protection Plan. Phoenix Cannon documentation includes: <table><tr><td>Date</td><td>Personnel</td><td>Weather</td></tr><tr><td>Start Time</td><td>End Time</td><td>Temp (°F)</td></tr><tr><td>Operating Frequency (min)</td><td>Shot Count</td><td>Propane Changed (Y or N)</td></tr><tr><td>Solar Panel Cleaned (Y or N)</td><td>Location</td><td>Comments</td></tr></table> Document any damages and/or malfunctions that were observed along with the location and the action taken to repair any damages or correct any malfunctions. Document this information under <i>List of damages/malfunctions (if applicable)</i> on the inspection form. If additional non-routine observations are observed note these observations under Additional Comments/Recommendations on the inspection form.	Date	Personnel	Weather	Start Time	End Time	Temp (°F)	Operating Frequency (min)	Shot Count	Propane Changed (Y or N)	Solar Panel Cleaned (Y or N)	Location	Comments
Date	Personnel	Weather											
Start Time	End Time	Temp (°F)											
Operating Frequency (min)	Shot Count	Propane Changed (Y or N)											
Solar Panel Cleaned (Y or N)	Location	Comments											

DRAWINGS, DOCUMENTS, AND TOOLS/EQUIPMENT	
The following documents should be referenced to assist in completing the associated task.	
DRAWINGS	
RELATED SOPs/ PROCEDURES /WORK PLANS	
TOOLS	Propane cannon tool kit: spark plug wrench; screwdriver; spare spark plugs; spare nozzle; ratchet wrench, owner's manual, spare battery.
FORMS/ CHECKLIST	<i>BMFOU Waterfowl Protection Cannon/Wailer Inspection Form</i>

PURPOSE	This Standard Operating Procedure (SOP) outlines the standard instructions for the use of Phoenix Wailers at the Berkeley Pit (Pit). These procedures shall apply to the Spring and Fall migration periods as stated in the Butte Mine Flooding Operable Unit (BMFOU) Waterfowl Protection Plan and may extend into the non-migratory periods.
SCOPE	This practice has been prepared for the BMFOU waterfowl protection personnel. Personnel who conduct the work shall be trained and competent in the risk-assessed work described below.
WORK INSTRUCTIONS The following instructions are intended to provide sufficient guidance to perform the task in a safe, accurate, and reliable manner. All work performed under this SOP will be consistent with procedures and policies described in the appropriate Operations Manual (where applicable).	
TASK	INSTRUCTIONS
1. Initial Setup	Spring (March 1 – May 31) and Fall (August 15 – December 31) Migration Setup: Setup a minimum of three (3) and up to four (4) Phoenix Wailers at various locations around the Pit. Refer to the product manual for more detail
2. Programming	Refer to the product manual.
3. Operation, Maintenance and Monitoring (OMM) Activities	Inspect the Phoenix Wailers on a weekly basis as follows:  • Inspect the wailer, solar panel, and battery for any damaged parts. • Check the life of the battery:



- o **If the Battery is overcharged**, unplug the wailer from the solar panel. If overcharging persists, rotate the solar panel so that it receives less sunlight
- o **If the battery is fully discharged**, replace with charged battery, make sure solar panel is clean/clear and facing in appropriate direction, and make sure that sunlight is not blocked by anything (i.e. vehicle, waste rock).
- Confirm the operating frequency of the audio sounds. Operating frequencies are typically between 3-5 minutes. The programed default is 4 minutes.
- Clean any dirt, snow/ice and debris covering the solar panel

4. Documentation

Document inspection and maintenance activities on a *BMFOU Waterfowl Protection Cannon/Wailer Inspection Form*. A copy of the form is included in Appendix D of the Waterfowl Protection Plan. Phoenix Wailer documentation includes:

Date	Personnel	Weather
Start Time	End Time	Temp (°F)
Batter Life (%)	Operating Frequency (min)	Battery Charged (Y or N)
Solar Panel Cleaned (Y or N)	Location	Comments

Document any damages and/or malfunctions that were observed along with the location and the action taken to repair any damages or correct any malfunctions. Document this information under *List of damages/malfunctions (if applicable)* on the inspection form.

If additional non-routine observations are observed note these observations under Additional Comments/Recommendations on the inspection form.

DRAWINGS, DOCUMENTS, AND TOOLS/EQUIPMENT

The following documents should be referenced to assist in completing the associated task.

DRAWINGS	
RELATED SOPs/ PROCEDURES /WORK PLANS	
TOOLS	Spare battery; propane tank
FORMS/ CHECKLIST	<i>BMFOU Waterfowl Protection Cannon/Wailer Inspection Form</i>

**WPP-SOP-06;
FIREARMS**

**AUTHORIZED VERSION:
DATE 3/12/2019
PAGE 1 of 2**

PURPOSE	This Standard Operating Procedure (SOP) outlines the standard instructions for documenting and monitoring Berkeley Pit (Pit) waterfowl activities. Specifically, this SOP outlines Firearm procedures. These procedures shall apply to the Spring and Fall migration periods as stated in the Butte Mine Flooding Operable Unit (BMFOU) Waterfowl Protection Plan.
SCOPE	This practice has been prepared for the BMFOU waterfowl protection personnel. Personnel who conduct the work shall be trained and competent in the risk-assessed work described below. <i>WPP-SOP-03 Hazing Strategy</i> shall be utilized in conjunction with this SOP for conducting active hazing.
WORK INSTRUCTIONS The following instructions are intended to provide sufficient guidance to perform the task in a safe, accurate, and reliable manner. All work performed under this SOP will be consistent with procedures and policies described in the appropriate Operation's Manual (where applicable).	
TASK	INSTRUCTIONS
1. Pre-Operation	Prior to operating the firearm ensure that the following tasks are completed: • <i>If the gun lockbox is locked-out, do not attempt to use any firearm at the Pit.</i> • Unlock the gun lockbox in the Bird Shack and visually inspect the firearm for damage. • Don hearing protection and ensure that all observers also have hearing protection. • Establish and maintain a safe distance, for any observers, behind the shooter.
2. Operation	Once all pre-operation tasks have been completed follow these procedures for operating the firearm: • Load the firearm and put the safety on until ready to fire. • Determine location of Pit where firearm will be aimed. • Notify observers that you are going to begin firing. • Put the firearm in firing mode and fire rounds near targeted waterfowl. The projectile has potential to skip or bounce off of the surface of the water; therefore, do not shoot in front of waterfowl, especially if in large groups, as incidental injury or death of waterfowl may occur. • Determine if more firearm hazing is warranted based on waterfowl reactions and if additional groups are present (See <i>WPP-SOP-03 Hazing Strategy</i> SOP for more details) • Once firearm hazing is completed remove all ammunition from firearm and return the firearm to the Bird Shack lockbox for storage.
3. Operation, Maintenance and Monitoring (OMM) Activities	Inspect the Firearm on a weekly basis as follows: • Inspect the firearm and scope for any damaged parts. • Check the firearm for dirt and debris. Clean the firearm, as necessary, based upon the rifle manufacturer's recommendation. • Ensure that the lock on the lockbox is functioning properly. • Check the quantity of ammunition that is in the lockbox and restock ammunition if necessary.

WPP-SOP-06; FIREARMS	AUTHORIZED VERSION: DATE 3/12/2019 PAGE 2 of 2

4. Documentation	Document Monitoring and Maintenance activities on a <i>BMFOU Waterfowl Protection Cannon/Wailer Inspection Form</i>. A copy of the form is included in Appendix D of the Waterfowl Protection Plan. Firearm documentation includes: <table><tr><td>Date</td><td>Personnel</td><td>Weather</td><td>Firearm Cleaned (Yes or No)</td></tr><tr><td>Start Time</td><td>End Time</td><td>Temp (°F)</td><td>Ammo Refilled (Yes or No)</td></tr></table> Document any damages and/or malfunctions that were observed along with the action taken to repair any damages or correct any malfunctions. Document this information under List of damages/malfunctions (if applicable) on the <i>BMFOU Waterfowl Mitigation Cannon/Wailer Inspection Form</i>.	Date	Personnel	Weather	Firearm Cleaned (Yes or No)	Start Time	End Time	Temp (°F)	Ammo Refilled (Yes or No)
Date	Personnel	Weather	Firearm Cleaned (Yes or No)						
Start Time	End Time	Temp (°F)	Ammo Refilled (Yes or No)						
5. Storage	Store the firearm inside of the Bird Shack in the appropriate lockbox when not in use. Ensure that the lockbox is locked after the firearm has been returned.								

DRAWINGS, DOCUMENTS, AND TOOLS/EQUIPMENT	
The following documents should be referenced to assist in completing the associated task.	
DRAWINGS	
RELATED SOPs/ PROCEDURES /WORK PLANS	<i>WPP-SOP-03 Hazing Strategy</i> <i>Bird Guide to the Berkeley Pit</i>
TOOLS	Firearm(s), cleaning kit, hearing protection
FORMS/ CHECKLIST	<i>BMFOU Waterfowl Protection Cannon/Wailer Inspection Form.</i>

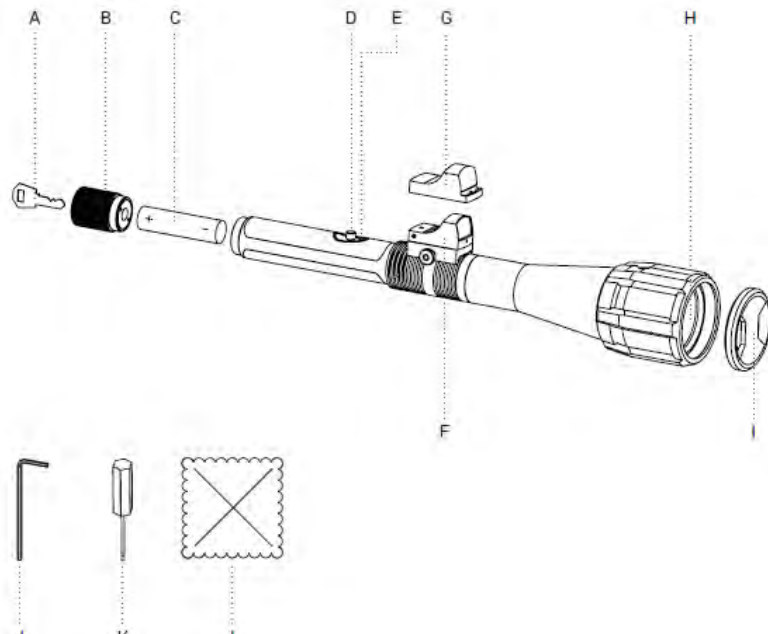
**WPP-SOP-07;
HANDHELD LASERS**

AUTHORIZED VERSION:
DATE: 3/12/2019
PAGE 1 of 2

PURPOSE	This Standard Operating Procedure (SOP) outlines the standard instructions for the use of handheld lasers at the Berkeley Pit (Pit) for waterfowl activities. These procedures shall apply to the Spring and Fall migration periods as stated in the Butte Mine Flooding Operable Unit (BMFOU) Waterfowl Protection Plan.
SCOPE	This practice has been prepared for the BMFOU waterfowl protection personnel. A certified Laser Safety Officer reviewed and approved the protocols described herein. Personnel shall be trained and competent in the safe operation of handheld laser(s). <i>WPP-SOP-03 Hazing Strategy</i> shall be utilized in conjunction with this SOP for conducting active hazing.

WORK INSTRUCTIONS

The following instructions are intended to provide sufficient guidance to perform the task in a safe, accurate, and reliable manner. All work performed under this SOP will be consistent with procedures and policies described in the appropriate Operations Manual (where applicable).

TASK	INSTRUCTIONS												
1.Initial Setup	Refer to the User Manual for <i>Initial Setup</i> details. See the image below for common handheld laser tools and parts:  <i>Image taken from the User Manual</i> <table><tr><td>A – Safety Key</td><td>D – On/Off button</td><td>G – Aiming sight protection cap</td><td>J – Hex key</td></tr><tr><td>B – Screw Cap</td><td>E – Output indicator</td><td>H – Laser aperture</td><td>K – Screwdriver</td></tr><tr><td>C – 18650 Rechargeable Li-ion battery</td><td>F – Aiming sight</td><td>I – Lens cap</td><td>L – Cleaning cloth</td></tr></table>	A – Safety Key	D – On/Off button	G – Aiming sight protection cap	J – Hex key	B – Screw Cap	E – Output indicator	H – Laser aperture	K – Screwdriver	C – 18650 Rechargeable Li-ion battery	F – Aiming sight	I – Lens cap	L – Cleaning cloth
A – Safety Key	D – On/Off button	G – Aiming sight protection cap	J – Hex key										
B – Screw Cap	E – Output indicator	H – Laser aperture	K – Screwdriver										
C – 18650 Rechargeable Li-ion battery	F – Aiming sight	I – Lens cap	L – Cleaning cloth										

**WPP-SOP-07;
HANDHELD LASERS**

AUTHORIZED VERSION:
DATE: 3/12/2019
PAGE 2 of 2

2. Restrictions	• Do not use the laser if any manned aircraft can be seen or heard. • If manned aircraft is seen or heard during laser use, turn the laser off immediately and discontinue use until aircraft can no longer be seen/heard. • The laser should only be used to haze waterfowl that are on the water surface in the Pit. The laser beam should never be pointed above the rim of the Pit for any reason.
3. Operation	1. Refer to <i>WPP-SOP-03 Hazing Strategy</i> to determine the suitability of implementing the use of handheld lasers for hazing. 2. Turn the safety key to the on position. 3. Point the laser at the ground in front of you and engage the on/off button. 4. Move the laser in the direction of waterfowl. 5. Sweep the laser beam back and forth or in circular motions around the waterfowl. 6. Release the on/off button and observe waterfowl behavior. 7. Refer to <i>WPP-SOP-03 Hazing Strategy</i> to determine if continued hazing is necessary.
4. Maintenance and Storage	Refer to the User Manual for <i>Maintenance and Storage</i> details.

DRAWINGS, DOCUMENTS, AND TOOLS/EQUIPMENT

The following documents should be referenced to assist in completing the associated task.

DRAWINGS	
RELATED SOPs/ PROCEDURES /WORK PLANS	<i>WPP-SOP-03 Hazing Strategy</i>
TOOLS	Handheld laser
FORMS/ CHECKLIST	

PURPOSE	This Standard Operating Procedure (SOP) outlines the standard instructions for documenting and monitoring Berkeley Pit (Pit) waterfowl activities. These procedures shall apply to the Spring and Fall migration periods as stated in the Butte Mine Flooding Operable Unit (BMFOU) Waterfowl Protection Plan.
SCOPE	This practice has been prepared for the BMFOU waterfowl protection personnel. Personnel who conduct the work shall be trained and competent in the risk-assessed work described below. <i>WPP-SOP-03 Hazing Strategy</i> shall be utilized in conjunction with this SOP for conducting active hazing.

WORK INSTRUCTIONS

The following instructions are intended to provide sufficient guidance to perform the task in a safe, accurate, and reliable manner. All work performed under this SOP will be consistent with procedures and policies described in the appropriate Operation's Manual (where applicable).

TASK	INSTRUCTIONS
1. Initial Setup	1. Turn the power switch, on the searchlight control panel attached to the Bird Shack, to ON. 2. Push the green Start Button on the searchlight control panel. 
2. Operation	Sweep the searchlight's beam across the surface of the Pit water to detect waterfowl presence. When completed, turn the power switch on the searchlight control panel to OFF .



3. Maintenance

- Periodically clean the glass on the searchlight.
- Check wiring for damage and report damage to electrical personnel.

DRAWINGS, DOCUMENTS, AND TOOLS/EQUIPMENT

The following documents should be referenced to assist in completing the associated task.

DRAWINGS	
RELATED SOPs/ PROCEDURES /WORK PLANS	WPP-SOP-03 Hazing Strategy
TOOLS	Searchlight
FORMS/ CHECKLIST	

**WPP-SOP-13;
CAPTURE, TRANSPORT, RELEASE, AND/OR REMOVAL OF
WATERFOWL**

AUTHORIZED VERSION:
DATE: 10/29/2019
PAGE 1 of 3

PURPOSE	This Standard Operating Procedure (SOP) outlines the standard instructions for the capture, transport, release and/or removal of waterfowl at the Berkeley Pit (Pit). These procedures shall apply to the Butte Mine Flooding Operable Unit (BMFOU) Waterfowl Protection Plan.
SCOPE	This practice has been prepared for the BMFOU waterfowl protection personnel. Personnel who conduct the work shall be trained and competent in the risk-assessed work described below.
WORK INSTRUCTIONS The following instructions are intended to provide sufficient guidance to perform the task in a safe, accurate, and reliable manner. All work performed under this SOP will be consistent with procedures and policies described in the appropriate equipment operations manual(s), where applicable.	
TASK	INSTRUCTIONS
1. Identification	Unwell waterfowl can be characterized by behavior and/or posture. Typical characteristics of unwell birds may include: • If waterfowl show limited response to hazing and/or activity that would typically trigger a flight response, • If waterfowl are present, but isolated (species dependent), • If waterfowl are in a group but do not show similar behavior(s) to the remaining group, • If the neck is outstretched. If waterfowl are characterized as being unwell, document the following: • Time; • Location; • Behavior and posture; • Obtain an image or video confirmation if possible. • Report unwell waterfowl to the Waterfowl Protection Manager(s) as outlined in the SOP.
2. Monitoring	If unwell waterfowl are on the shore, but seems mobile and active OR if the bird is on the water and is unreachable. • Monitor unwell waterfowl; • Communicate location and condition between observation sessions; • Report any changes in behavior to the Waterfowl Protection Manager(s).
3. Capturing and Transporting	For individual unwell waterfowl that are on a ramp shoreline and can be reached safely. A minimum of two people should be present for any capture effort. Note: If waterfowl are mobile, capture may not be possible. Capture will be based on a case-by-case basis and will be species specific/dependent. This will

**WPP-SOP-13;
CAPTURE, TRANSPORT, RELEASE, AND/OR REMOVAL OF
WATERFOWL**

AUTHORIZED VERSION:
DATE: 10/29/2019
PAGE 2 of 3

	be done in consultation with a biologist or technician with knowledge of avian physiology and/or a veterinarian. Waterfowl that are held in temporary captivity: • Should be contained in a manner that minimizes injury. (i.e. plenty of room to stretch wings, avoid trampling by others and escape excrement buildup). • The structure used for confinement should provide some shelter from the elements. • Clean water should be made available for contained waterfowl. • Forage should be provided to waterfowl (species specific). The ability to handle and recapture waterfowl should be strongly considered when establishing temporary containment.
4. Treatment	Any treatment should be performed by a permitted rehabilitator and/or veterinarian. Specific treatment will vary depending on species, age, and condition of the bird. Waterfowl that have undergone treatment should be released (<i>See Task 6. Release</i>) as soon as possible to provide the best chance of a successful migration for the treated waterfowl. If it is determined that waterfowl are not healthy enough to continue on their migratory route, experts will be consulted on additional treatments including euthanasia.
5. Release	The main priorities for releasing waterfowl captured at the Pit are: • Waterfowl must be healthy enough to continue on their migratory route; • The release site has to be biologically appropriate which will vary by species and current conditions. • Waterfowl should be released during supportive weather conditions. Captured waterfowl that are semi-flighted and/or actively walking, may be candidates for immediate release or release within a 24 hour time period with no intervention other than fresh water. Waterfowl that have sustained treatment should be evaluated prior to release. They must be in a condition that allows them to be able to survive in harsh migratory conditions that they might face on a migratory route. Release times and sites will be made by a competent individual such as a veterinarian and/or wildlife expert with the appropriate legal authorization.

WPP-SOP-13; CAPTURE, TRANSPORT, RELEASE, AND/OR REMOVAL OF WATERFOWL	AUTHORIZED VERSION: DATE: 10/29/2019 PAGE 3 of 3

DRAWINGS, DOCUMENTS, AND TOOLS/EQUIPMENT The following documents should be referenced to assist in completing the associated task.	
DRAWINGS	
RELATED SOPs/ PROCEDURES/ WORK PLANS	
TOOLS	Crate(s), net(s), towel(s), sheet(s)
FORMS/ CHECKLIST	

APPENDIX C

BIRD GUIDE TO THE BERKELEY PIT

Bird Guide to the Berkeley Pit



Montana Resources



Table of Contents

Geese and Swans

1. Greater white-fronted goose - **GWFG**
2. Snow goose - **SNGO**
3. Ross's goose - **ROGO**
4. Cackling goose - **CACG** (Unlikely)
5. Canada goose - **CANG**
6. Trumpeter Swan - **TRUS**
7. Tundra swan - **TUSW**



Dabbling Ducks

8. Gadwall - **GADW**
9. American wigeon - **AMWI**
10. Mallard - **MALL**
11. Blue-winged teal - **BWTE**
12. Cinnamon teal - **CITE**
13. Green-winged teal - **GWTE**
14. Northern pintail - **NOPI**
15. Northern shoveler - **NSHO**
16. Wood duck - **WODU**



Diving Ducks

17. Canvasback - **CANV**
18. Redhead - **REDH**
19. Ring-necked duck - **RNDU**
20. Greater scaup - **GRSC**
21. Lesser Scaup - **LESC**
22. Surf scoter - **SUSC**
23. White-winged scoter - **WWSC**
24. Bufflehead - **BUFF**
25. Common goldeneye - **COGO**
26. Barrows goldeneye - **BAGO**



27. Ruddy duck - **RUDU**
28. Common merganser - **COME**
29. Hooded merganser - **HOME**
30. Red-breasted merganser - **RBME** (Unlikely)



Water Birds

31. Pie-billed grebe - **PBGR**
32. Horned grebe - **HOGH**
33. Red-necked grebe - **RNGR**
34. Eared grebe - **EAGR**
35. Western grebe - **WEGR**
36. American coot - **AMCO**
37. Common loon - **COLO**
38. Double-crested cormorant - **DCCO**
39. American white pelican - **AWPE**



Shorebirds

40. American avocet - **AMAV**
41. Black-necked stilt - **BNST**
42. Marbled godwit - **MAGO**
43. Wilson's phalarope - **WIPH**
44. Red-necked phalarope - **RNPH**



Gulls

45. Bonaparte's gull - **BOGU**
46. Franklin's gull - **FRGU**
47. Ring-billed gull - **RBGU**
48. California gull - **CAGU**



1

GWFG

Greater White-Fronted Goose

Anser albifrons

IUCN Conservation Status: Least Concern



Alternate Morphs:

- No Alternate Morph

Similar Species:

- No Similar Species

Size & Shape: Medium sized goose. Gray-brown body with a white belly and rump. Orange bill and legs. **White ring around base of bill.** Heavy white rear.

Color Pattern: Male and female are indistinguishable.

Season: Small overwintering populations rarely seen. Transient migration.

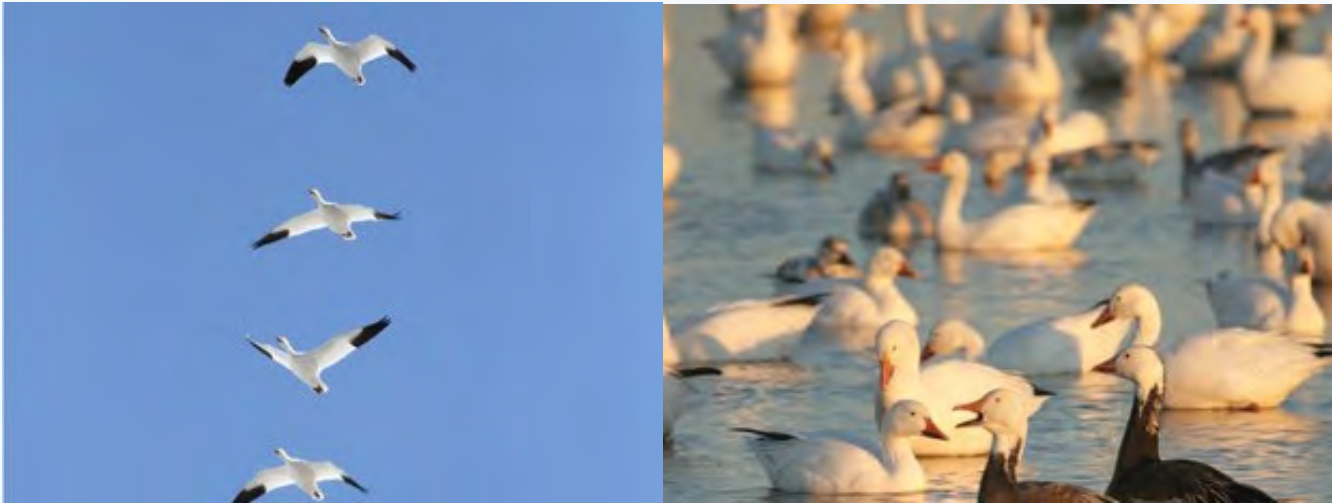
Arrival: **early March**

Departure: **mid September– early November.**

Snow Goose

Chen caerulescens

IUCN Conservation Status: Least Concern



Size & Shape: Medium sized body with a sturdy bill and long neck. Two color morphologies exist. **White Morph** and less common **Blue Morph**. Legs and bill are pink. Black patch visible on lower mandible.

Color Pattern: Male and female are indistinguishable.

Season: Transient migration.

Arrival: **early March – May**

Departure: **late October - December**

Flocks mix with Ross's geese and may be just a few individuals or 1000+ birds

Alternate Morphs: Blue phase



- White morph will show golden face from mud and dirt.

Similar Species: Ross's Goose: Shorter Bill with a concave profile



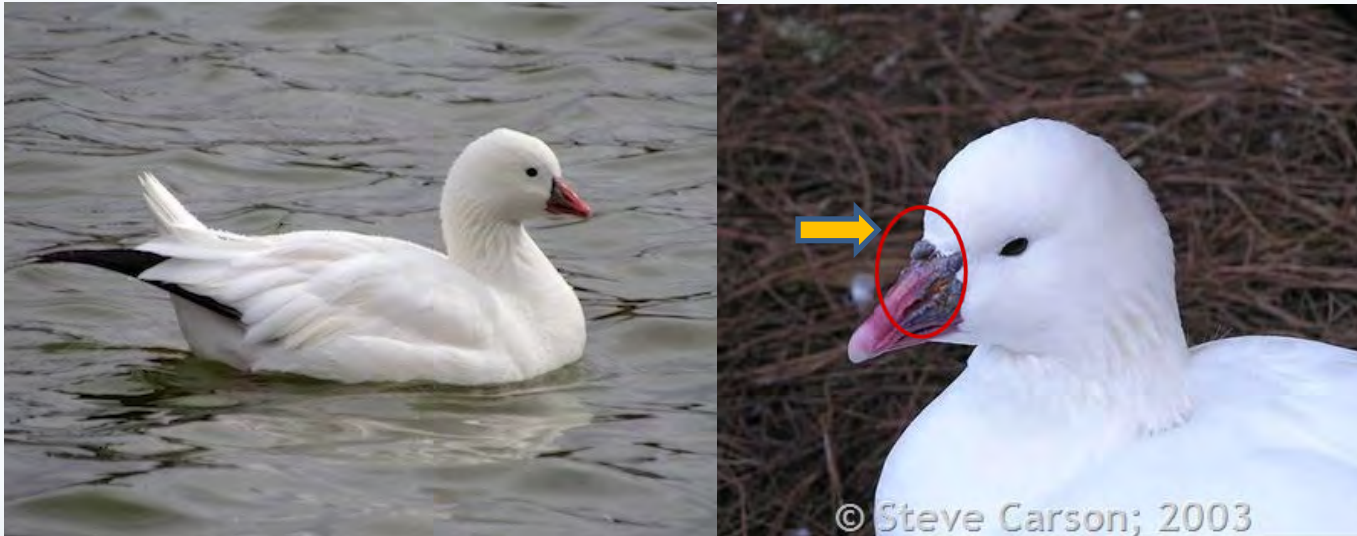
May also resemble pelicans in flight



Ross's Goose

Chen rossii

IUCN Conservation Status: Least Concern



Size & Shape: Small goose with plump body. Almost completely white, except for black primaries. Orange bill and legs. Lacks black patch on lower bill that the Snow Goose has. Similar to a Snow Goose, but a smaller version with a shorter bill that **fades to grey toward face**.

Color Pattern: Male and female are indistinguishable.

Season: Transient migration.

Arrival: **March – May**

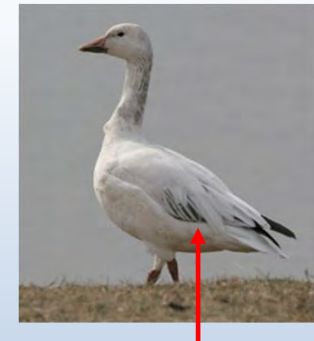
Departure: **November – December.**

Flocks mix with Snow geese and may be just a few individuals or 1000+ birds

Alternate Morphs: Blue Morph



Similar Species: Snow Goose



- Note grey underwing in Snow Goose
- Larger bill with a flatter profile

https://www.flickr.com/photos/steve_byland/6722892283

Cackling Goose

Unlikely

Branta hutchinsii

IUCN Conservation Status: Least Concern



Size & Shape: Medium sized waterbird, small goose. Similar to the Canada Goose (next page). Resemble each other greatly, however the cackling goose is smaller. Easiest distinction is the size of the bill.

Color Pattern: Male and female are indistinguishable.

Season: Transient migration. Seen around or near Canada Goose
Most likely to be seen in **April and November – December**.

Alternate Morphs:

- No Alternate Morph

Similar Species: Canada Goose



- **Canada Goose** (left) larger
- **Cackling Goose** (right) smaller, but almost identical subspecies

Canada Goose

Branta canadensis

IUCN Conservation Status: Least Concern



Alternate Morphs:

- No Alternate Morph

Similar Species:



- **Cackling Goose** (right) smaller, but almost identical subspecies
- **Canada Goose** (left) larger

Size & Shape: Large waterbird with long neck. Distinguishable by black neck and head with white chinstrap. Very wide wingspan Migrate in small single-digit packs to flocks of thousands. Typically in V formation. Commonly mistaken for Cackling Goose (previous page).

Color Pattern: Male and female are indistinguishable.

Season: Seen year round throughout Montana.

May be just a few individuals or flocks of up to a few hundred

Trumpeter Swan

Cygnus buccinator

IUCN Conservation Status: Least Concern



Size & Shape: Very large waterfowl with thick bodies and long necks. Large black bill sloping gradually from forehead. Commonly mistaken for Tundra Swan (next).

Color Pattern: Male and female are indistinguishable.

Season: Year round colonies - seen **breeding** throughout **September**

Migrant colonies - Transient migration:

Arrival: **late February – early April**

Departure: **mid November - mid December**

Alternate Morphs: juveniles are grey in color



Similar Species: Tundra Swan



- **Very difficult** to distinguish from the Trumpeter.
- Bill is sometimes grey to yellow towards face
- Feet typically visible when not swimming in water

Tundra Swan

Cygnus columbianus

IUCN Conservation Status: Least Concern



Size & Shape: Large waterfowl with long necks and all white body. **Feet are usually visible when not swimming in water.** Bill has more aggressive slope than Trumpeter Swan (previous).

Color Pattern: Male and female are indistinguishable. Look for a gray or yellow patch (depends on season) at base of bill to identify.

Season: Rare overwintering in Montana

Transient migration

Arrival: **mid March – mid April**

Departure: **late October – early December.**

Alternate Morphs: juveniles are grey in color



Juvenile (gray)

Similar Species: Trumpeter Swan



<http://www.buzzle.com/articles/how-is-a-trumpeter-swan-different-from-a-tundra-swan.html>

Gadwall

Anas strepera

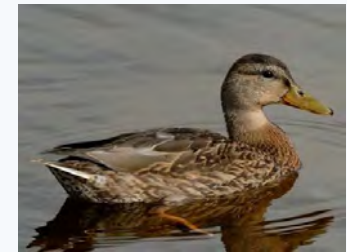
IUCN Conservation Status: Least Concern



Alternate Morphs:

- No Alternate Morph

Similar Species: Mallard



Size & Shape: Mid-large sized dabbling duck. Female and juvenile males resemble female Mallards.

Color Pattern: Breeding Male (Left)

- Rounded body with speckled white and black breast
- Black lower tail with bright white speculum
- Black bill
- **Thick black butt** sits high out of water

Female (Right)

- Light brown body with prominent spotting
- Smaller body than male
- Yellow-brown bill

First Year/Juvenile Mallard male

- Lacks white speculum
- Body is not as soft as Gadwall
- **Mallard** has **yellow bill**
- Black eye streak is in front and behind eye on Mallard

Season:

Seen breeding **mid May – July.**

Transient migration:

Arrival: **mid March – mid May**

Departure: **early October – mid November.**

American Wigeon

Anas americana

IUCN Conservation Status: Least Concern



Size & Shape: Medium sized duck. Compact bill with black tip. Abundant in population.

Color Pattern: Breeding Male (Left):

- Present with white crown.
- Large white patch in wings.
- Green face patch
- Pale bill with black tip
- Thick white tail with black rear



Female (Right):

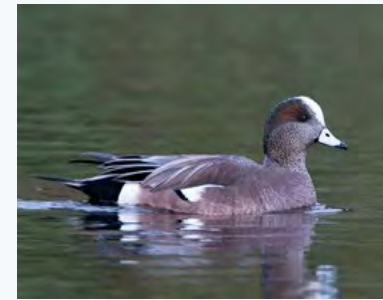
- Rusty brown body (pictured upper middle)
- Fine gray streaks on head
- Darker grey bill with black tip

Season:

Seen throughout Montana year round. Some colonies are migratory.

Breeds locally

Alternate Morphs: Juvenile male, green patch not present



Similar Species:



Green-winged Teal (male)



Mallard (female)

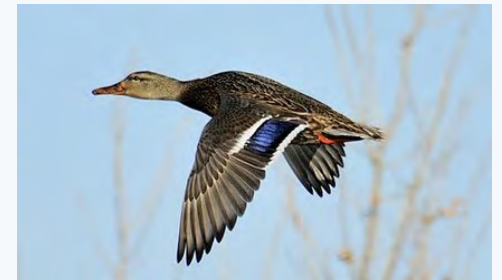
Mallard

Anas platyrhynchos

IUCN Conservation Status: Least Concern



Alternate Morphs: Nonbreeding Male/Female look nearly identical: Blue speculum bordered by white



Size & Shape: Large dabbling duck with hefty bodies, thick necks, and flat bills. Tail sits high out of the water. Can be mistaken for **Northern Shoveler**.

Color Pattern: Breeding Male (Left)

- Bright green head
- Yellow bill
- White ring at base of neck
- Dark blue speculum visible in flight

Breeding Female (Right)

- Dark orange-grey bill
- Dark blue speculum visible

Season:

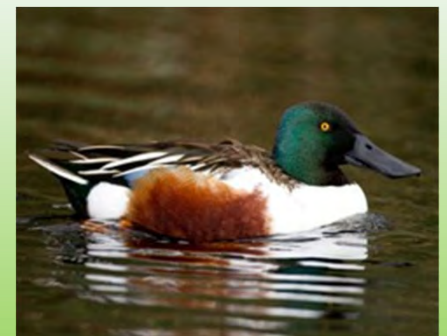
Seen throughout the year.

Transient migration:

Arrival: **late February – mid April.**

Departure: **mid October – late December.**

Similar Species: Northern Shoveler



Blue-Winged Teal

Anas discors

IUCN Conservation Status: Least Concern



Size & Shape: Small bodied dabbling duck. Rounded head with a larger bill. Nonbreeding male and mature female's share a strong resemblance.

Color Pattern: Breeding Male (Left)

- Brown bodied with dark speckling
- **Large white crescent behind bill**
- Slate blue head
- Dark bill

Female (Right)

- Patterned brown
- Pale face
- Brown-grey bill

Season: Seen breeding **May – July**. Transient migration: Arrival: **late April – May** Departure: **early September – mid October**

Alternate Morphs: Juveniles, non-breeding males and females all look similar

Similar Species:

Gadwall



Mallard
(Female, Juvenile, non-breeding male)

Cinnamon Teal

Anas cyanoptera

IUCN Conservation Status: Least Concern



Alternate Morphs:

- No Alternate Morph

Similar Species: Gadwall



Size & Shape: Small bodied, brightly colored dabbling duck.

Color Pattern: Breeding Male (Left)

- Burnt orange/cinnamon body and head
- Red eye
- Thick tail and rump

Female (Right)

- Light brown body
- Dark outer wings
- Lighter bill than males

Season: Seen breeding **May – June.**

Transient migration:

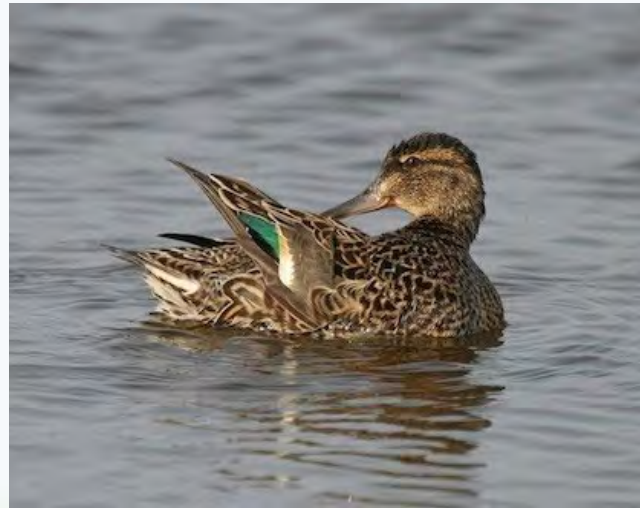
Arrival: **late April – late May**

Departure: **No discernable movement**

Green-winged Teal

Anas crecca

IUCN Conservation Status: Least Concern



Alternate Morphs: darker head line on male



Size & Shape: Smallest dabbling duck in North America. Short, blocky bodies, sit high in water. Both sexes show a green speculum in flight, mostly hidden when in water.

Color Pattern: Breeding Male (Left)

- Grey bodies with a vertical white stripe on shoulder
- Cinnamon head with bright green swoop

Female (Right)

- Brown body with yellow streak on tail
- Speckled body with black spots

Season:

Seen breeding **May – mid July.**

Year round resident

Arrival: **mid March – mid May**

Departure: **mid September– early November.**

Similar Species: American Widgeon



Northern Pintail

Anas acuta

IUCN Conservation Status: Least Concern



Alternate Morphs: Immature similar to adult female



Similar Species:

- No similar species

Size & Shape: Medium-sized dabbling duck with long, thin necks, and pointed tail. **Tail extremely long in males.**

Color Pattern: Breeding Male (Left)

- Chocolate-brown head
- White neck and underparts
- White extending up back of neck in thin line
- Very long black central tail feathers

Breeding Female (Right)

- Crown and face tan
- Back and rump brown with lighter edges to feathers
- Upper breast buff or tan
- Tail pointed, with central tail feathers longest

Season:

Transient migration:

Arrival: **March – Early May.**

Departure: **Late September to late November.**

Northern Shoveler

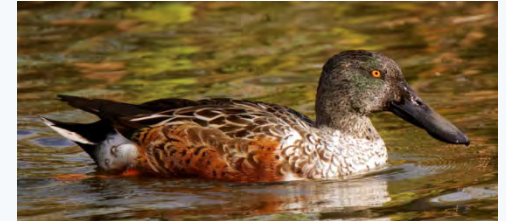
Anas clypeata

IUCN Conservation Status: Least Concern



Alternate Morphs:

Non-breeding male



<https://www.flickr.com/photos/blingsister/15794599315>

Similar Species: Mallard



Size & Shape: Medium sized dabbling duck. Easiest determination by large bill and bill color. Nonbreeding male can be mistaken for **female Mallard (page 10)**.

Color Pattern: Breeding Male (Left) Breeding Female (Right)

- Bright green head - Large black bill - Bright rust-orange side - Grey and brown plumage on back - Bright yellow eye	- Grey-brown plumage throughout body - Large orange bill - Black eye

Season: Breeding: **May - June**

Transient migration: Arrival: **early April – late May**

Departure: **early September – early November**

Wood Duck

Aix sponsa

IUCN Conservation Status: Least Concern



Alternate Morphs:

Non-breeding male



Similar Species:
Green-winged
Teal

Size & Shape: Medium sized dabbling duck. Easiest identification is the boxy shape and flamboyant colors of the male. **May be mistaken for a male Green-winged Teal (page 13).**

Color Pattern: Breeding Male (Left)

- Bright green head
- Large black bill
- Bright rust-orange side
- Grey and brown plumage on back
- Bright yellow eye

Breeding Female (Right)

- Grey-brown plumage throughout body
- Large orange bill
- Black eye

Season: Breeding: May - June

Transient migration: Arrival: **early April – late May**

Departure: **early September – early November**



Canvasback

Aythya valisineria

IUCN Conservation Status: Least Concern



Alternate Morphs:

- No Alternate Morph

Similar Species: Redhead



Size & Shape: Large diving duck with a long, slender body. Unique bill profile sloping to forehead. **Unique sloped profile of head.** Can be mistaken for **Redhead (next).**

Color Pattern: Breeding Male (Left)

- White body and black breast
- Orange-brown neck and head, black forehead
- Dark throat

Female (Right)

- Soft tan speckled body
- Smooth light brown neck.
- Black bill

Season:

Seen breeding **May – June.**

Transient migration:

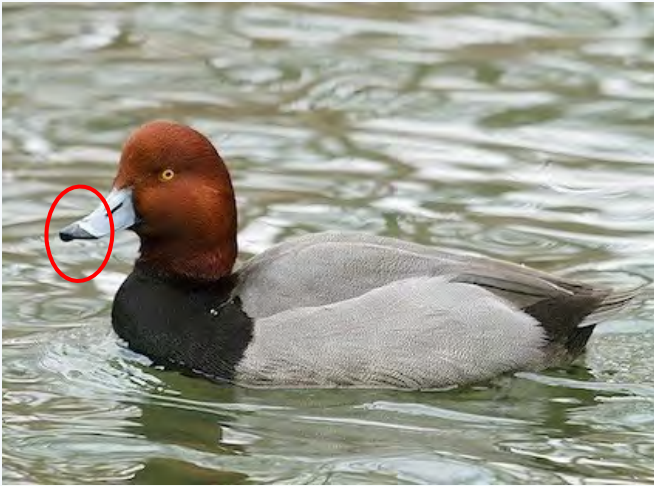
Arrival: **March – May**

Departure: **late September - December**

Redhead

Aythya americana

IUCN Conservation Status: Least Concern



Alternate Morphs:

- No Alternate Morph

Similar Species: Canvasback



Size & Shape: Medium sized diving duck with a long build similar to Mallard. Rounded head not sloped into bill. Can be mistaken **for Canvasback (previous)**.

Color Pattern: Breeding Male (Left)

- Light grey body with slightly darker back
- Breast is solid black
- **Light grey bill with black tip**

Female (Right)

- Soft brown body
- Long, black bill

Season:

Seen breeding **May – June**.

Transient migration:

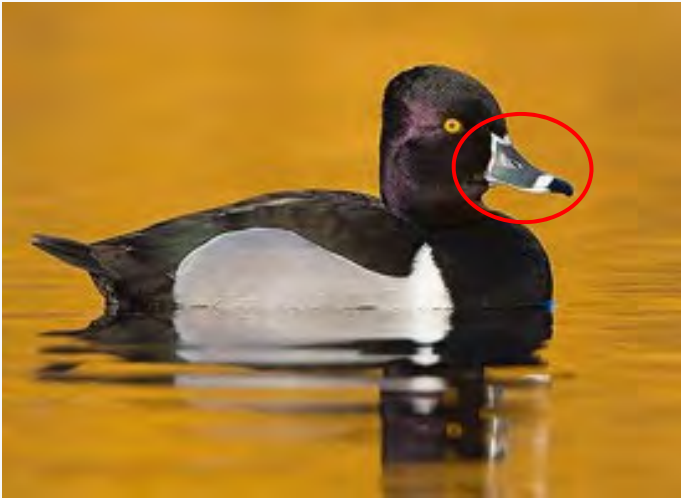
Arrival: **late March – late May**

Departure: **mid September – mid November**

Ring-necked Duck

Aythya collaris

IUCN Conservation Status: Least Concern



Size & Shape: Compact duck with a sloping forehead and peaked crown, flattening when diving. Ring-necked is a misnomer; should be called “**Ring billed duck**”.

Color Pattern: Breeding Male (Left)

- Bold black breast and back
- Iridescent neck and head
- **Grey bill with black tip, separated by white band**
- Grey side

Season:

Seen breeding **late April – June.**

Year round resident

Arrival: **mid April – mid May**

Departure: **mid September – early November.**

Female (Right)

- Grey neck and head with peaked crown
- **Similar bill to males**
- Brown side

Alternate Morphs:

- No Alternate Morph

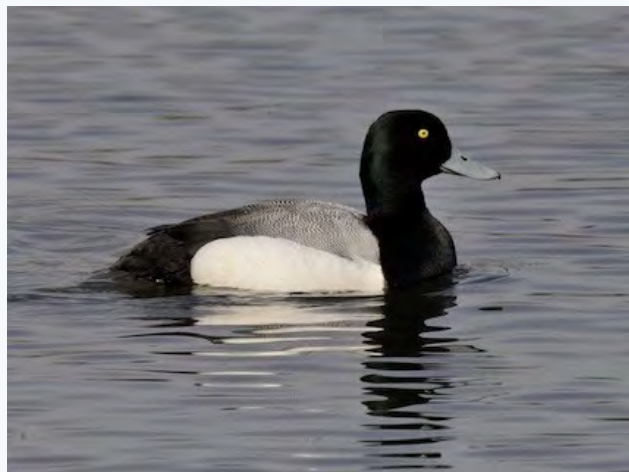
Similar Species: Greater/Lesser Scaup



Greater Scaup

Aythya marila

IUCN Conservation Status: Least Concern



Size & Shape: Medium sized diving duck. Has a large, round head. May easily be confused with **Lesser Scaup (next)**.

Color Pattern: Breeding Male (Left)

- Dark black head and neck
- White wings with grey upper back, fading to a black tail
- Blue-grey bill with black tip

Female (Right)

- Medium brown body with darker back and tail
- Dark brown head and neck
- Light brown face where bill meets

Season:

Transient Migration throughout Montana **March – November**.

Overwintering population:

Arrival: **early December**

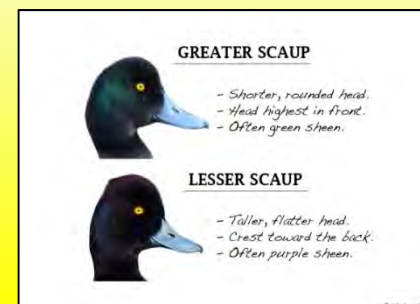
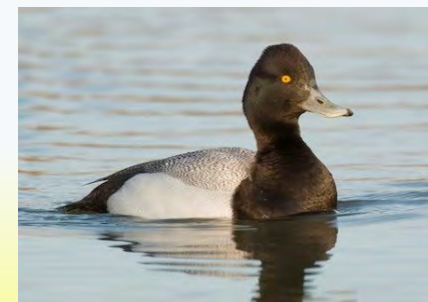
Departure: **late January**

Alternate Morphs:

- No Alternate Morph

Similar Species: Lesser Scaup

It is difficult to distinguish the Greater and Lesser Scaup. Head shape is the most accurate method of distinction.



<http://blog.nuttysbird.com/2015/03/learning-to-identify-lesser-and-greater.html#.WSsjfuvyEY>

Lesser Scaup

Aythya affinis

IUCN Conservation Status: Least Concern



Size & Shape: Medium sized diving duck. Slight bump on back of head. Bright yellow eye. May easily be confused with **Greater Scaup (previous)**. Head shape is the most accurate method of distinction.

Color Pattern: Breeding Male (Left)

- Dark black head and neck
- White wings with grey upper back, fading to a black tail
- Blue-grey bill with black tip

Female (Right)

- Medium brown body with darker back and tail
- Dark brown head and neck
- Light white face where bill meets.

Season:

Seen breeding **mid May – July**.

Year round resident

Arrival: mid April – **late May**

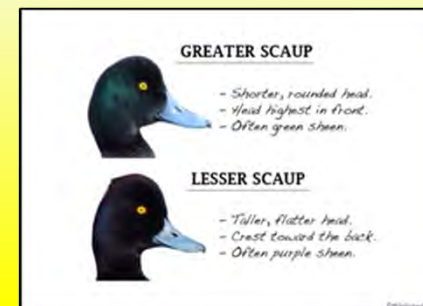
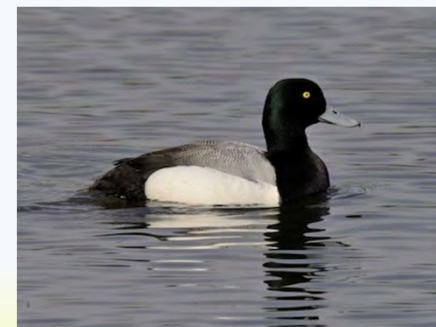
Departure: Early October – **mid November**.

It is difficult to distinguish the Greater and Lesser Scaup

Alternate Morphs:

- No Alternate Morph

Similar Species: Greater Scaup



Surf Scoter

Melanitta perspicillata

IUCN Conservation Status: Least Concern



Alternate Morphs:

- No alternate morphs

Similar Species: White-winged Scoter



Size & Shape: Large, stocky diving seaduck. Almost completely black.

Color Pattern: Breeding Male (Left):

- Black body
- White back of neck patch
- White patch on forehead
- Large orange bill with white mark on side
- Black circle within white mark

Female (Right):

- Black body with similar white on back of neck as male
- White ear
- Black bill with some grey
- Light patch in front of eye – can be faint

Season: Migrates south from tundra, only seen migrating.

Seen only **October – November**.

White-winged Scoter

Melanitta perspicillata

IUCN Conservation Status: Least Concern



Alternate Morphs:

- No alternate morphs

Similar Species: Surf Scoter



Size & Shape: Large, stocky diving seaduck. Almost completely black with white accents.

Color Pattern: Breeding Male (Left, behind female):

- Comma-shaped mark around eye
- Belly usually white
- Bill black at base with large hump
- Red-orange sides of bill
- White wing patch usually visible

Female (Right):

- Dark brown, almost black
- Light patches at base of bill
- White ear/cheek patch
- Reddish feet

Season:

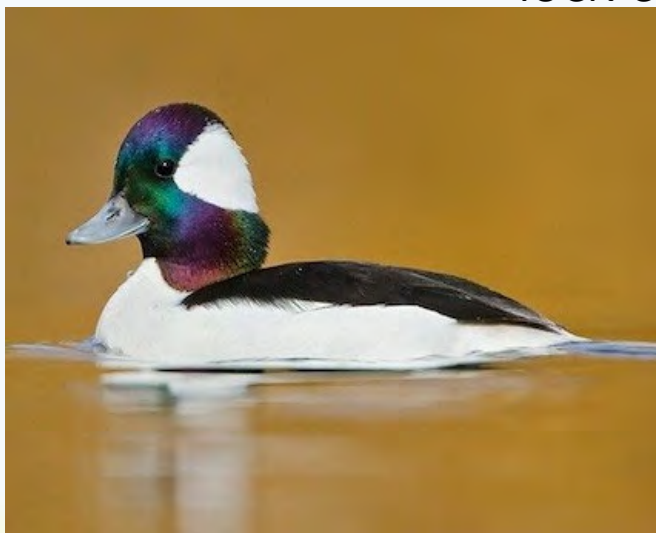
Transient migration.

Seen only late **September – November**.

Bufflehead

Bucephala albeola

IUCN Conservation Status: Least Concern



Size & Shape: Large headed diving duck with a small body.
Short, rounded bills.

Color Pattern: Breeding Male (Left)

- White body and black back
- Metallic multicolored head
- Large white patch wraps around head

Female (Right)

- Brown, black body and wings
- Small white patch wrapping head

Season: Some breeding individuals seen.

Transient migration: Arrival: **late March – late May**

Departure: **early September - December**

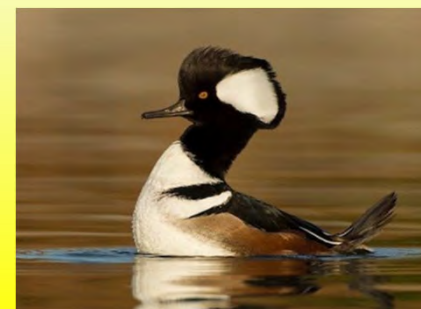
Alternate Morphs:



Adult Breeding Male

- White stripe from shoulder back sometimes visible in flight
- White neck

Similar Species:



Hooded Merganser

Common Goldeneye

Bucephala clangula

IUCN Conservation Status: Least Concern



Size & Shape: Medium sized diving duck with short, compact bill. Similar to **Barrows Goldeneye** (next page).

Color Pattern: Breeding Male (Left)

- Black head with large forehead
- Solid black bill
- **White spot behind bill on cheek**
- White body and feather plumage
- Prominent forehead

Female (Right)

- Dark brown head
- Dark bill with yellow tip

Season: Seen in Butte year round

Transient migration:

Arrival: **early March – May**

Departure: **early November - December**

Large Overwintering population throughout Montana

Alternate Morphs:

- No alternate morphs

Behavior is a key identifier: both sexes will throw head back



Similar Species:



Barrow's Goldeneye

Barrow's Goldeneye

Bucephala islandica

IUCN Conservation Status: Least Concern



Size & Shape: Medium sized diving duck, has a chunky body, and large head. Very bright, visible eye. Short, compact bill. Similar to **Common Goldeneye (previous page)**.

Color Pattern: Breeding Male (left)

- Shiny black-purple head
- White body and secondary's
- **White crescent behind bill**
- Black bill
- Prominent forehead

Female (right)

- Brown head
- Gray and brown body
- Yellow bill
- Prominent forehead

Season: Breeding: **May - June**

Transient migration: Arrival: **April**

Departure: **November - December**

Alternate Morphs:



Juvenile Male

- Similar to adult male, lacks iridescence on neck and head
- Plumage mottled

Similar Species:

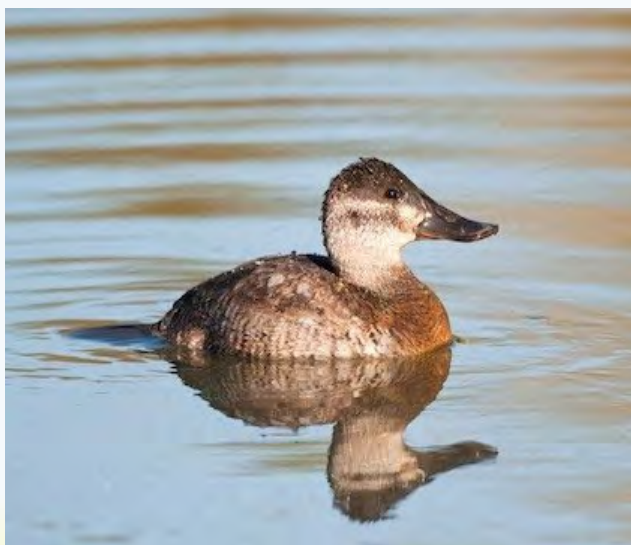


Common Goldeneye

Ruddy Duck

Oxyura jamaicensis

IUCN Conservation Status: Least Concern



Alternate Morphs:



Adult Breeding Female

- Can present an upward tail

Similar Species:

- No Similar Species

Size & Shape: Small, compact duck with upward pointing tails during breeding season. Very distinct sky blue bill on males.

Color Pattern: Breeding Male (Left) Female (Right)

- Black head with white cheeks - Chestnut neck and body - Vertically pointed tail - Mottled breast - Unique blue bill	- Dark brown-grey head with stripe through cheek - Light brown neck - Chestnut colored breast

Season: Breeding **May – June.**

Transient migration: Arrival: **mid April – mid May**

Departure: **mid September – late November.**

Common Merganser

Mergus merganser

IUCN Conservation Status: Least Concern



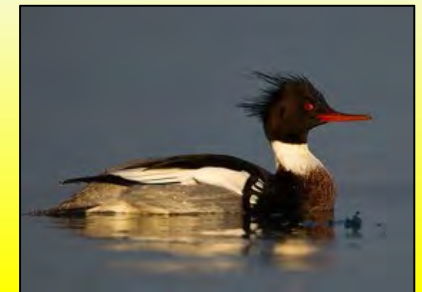
Alternate Morphs:



Winter plumage

- Similar to female

Similar Species:



Red Breasted Merganser (Male)

- Crest on back of head
- Red-orange breast
- Black shoulder
- Grey body

Size & Shape: Large diving duck with long, slender body. Both male and female have bright, almost fluorescent orange bills. Adult female and juvenile share resemblance. Similar to **Red Breasted Merganser (lower right)(next page).**

Color Pattern: Breeding Male (Left)

- Clean white body with black stripe on upper wing
- Dark gray-green metallic head
- Dark tip of bill

Female (Right)

- Soft burnt brown head with white throat
- Gray and white body
- Dark tip of bill

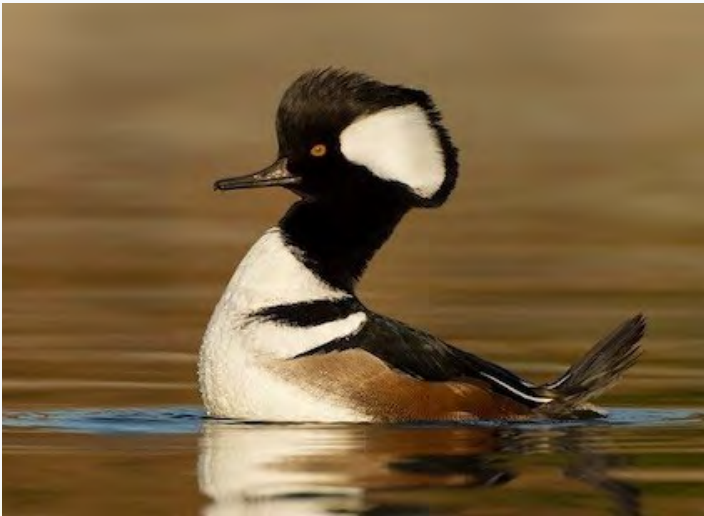
Season: Seen breeding **May – August.**

Year round resident in Montana.

Hooded Merganser

Lophodytes cucullatus

IUCN Conservation Status: Least Concern



Size & Shape: Small diving duck with a thin bill. Large “hood” is very distinct on both male and female. Distinct flight with rapid, shallow wingbeats.

Color Pattern: Breeding Male (Left)

- Black neck and head with a white side of head
- Bright gold eye
- White breast and belly with golden brown wing

Female (Right)

- Brown body with white breast
- Cinnamon head with prominent hood
- Small white patch on wing

Season:

Seen breeding **May – July**.

Year round resident in Montana.

Alternate Morphs:



Breeding Male

- Hood not raised. Appears as a white streak behind eye

Similar Species:



Bufflehead

Red-breasted Merganser

Unlikely

Mergus serrator

IUCN Conservation Status: Least Concern



Size & Shape: Large, thin diving duck. Long narrow bill.

Color Pattern: Breeding Male (Left)

- Iridescent green head and neck with white base
- Speckled brown breast
- Bright orange bill
- Thin shaggy crest on back of head

Female (Right)

- Side of head and neck rusty brown
- Bright orange bill
- White belly
- White patch in wing sometimes visible in water, visible in flight.

Season:

Transient migration: Arrival: **early April – mid May**

Departure: **late October – late November**

Most likely seen in spring

Alternate Morphs:



Immature Male

- Crest visible
- Brown head with dark ring around eye
- Bill is paler orange

Similar Species:

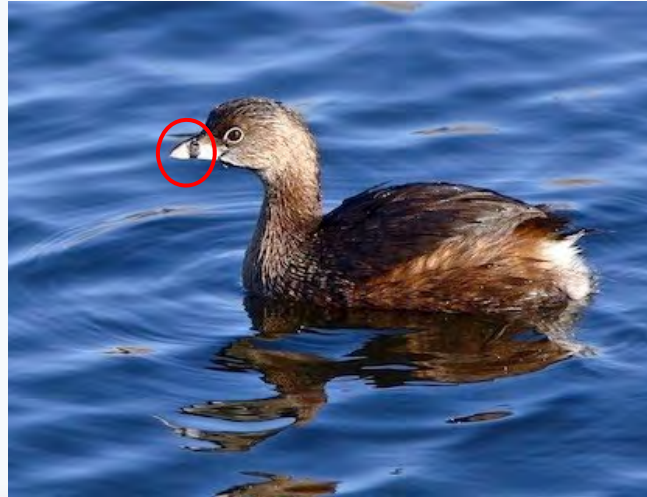
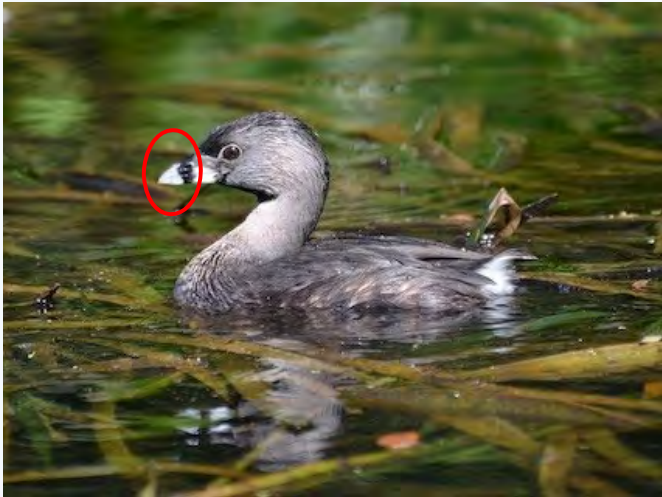


Common Merganser (female)

Pied-billed Grebe

Podilymbus podiceps

IUCN Conservation Status: Least Concern



Alternate Morphs



Juvenile

- Striped cheek.
- Bill is yellow, and does not possess black band.

Similar Species

- No Similar Species

Size & Shape: Small waterbird with a small head and short bill, possessing **black vertical stripe**. Very strong swimmers; part bird, part submarine. Possess long, slender necks.

Color Pattern: Breeding male and female are indistinguishable (left). Breeding adult turns more grey than brown, with a black throat. Nonbreeding adults (right) are brown in body with darker wing. Adults have banded bills.

Season:

Seen breeding **May – July**.

Year round resident in western Montana

Horned Grebe

Podiceps auritus

IUCN Conservation Status: Vulnerable



Alternate Morphs:



Nonbreeding Horned Grebe

- Lacks large "horns" on head
- Plumage is a dull grey-brown with a white neck and breast.

Similar Species:

- No Similar Species

Size & Shape: Small waterbird with a small head and short bill. Rounded body. Bright red eye. Red neck, with a black head. White-yellow "horns" behind eye in summer. Not to be confused with the **Eared Grebe (page 32)**.

Color Pattern: Breeding male and female are indistinguishable.

Season: Seen breeding **May – July**.

Transient migration: Arrival: **late March – early May**

Departure: **No discernable movement**

Red-necked Grebe

Podiceps grisegena

IUCN Conservation Status: Least Concern



Photo by: Gary Swant



Alternate Morphs:



Juvenile

- Little black present on bill
- Unique black and white "swirling" on face and upper neck

Similar Species:

- No Similar Species

Size & Shape: Medium sized waterbird with a large head, and long, sharp bill. Red ventral of neck, reaching to breast on most breeding males. Small tuft perpendicular to neck.

Color Pattern: Breeding male and female are indistinguishable (left). Nonbreeding adults (right) are brown in body with no extravagant markings.

Season:

Seen breeding **late May – early July.**

Transient migration **mid April – mid May** and **mid August – mid October**

Eared Grebe

Podiceps nigricollis

IUCN Conservation Status: Least Concern



Size & Shape: Small waterbird with thin, dark bill. Breeding adult (left) has tufted forehead with golden-red “ears” behind red eyes. Commonly mistaken for **Horned Grebe (bottom right) (page 30)**.

Juvenile (right) have grey bodies and back of head, with a black back, neck, and top of head.

Color Pattern: Breeding male and breeding female (left) are indistinguishable. Juvenile male and juvenile female (right) also indistinguishable.

Season: Seen breeding **May – July**.

Transient migration: Arrival: **mid April – early June**

Departure: **early August - November**

Alternate Morphs:

- No Alternate Morphs

Similar Species:



Horned Grebe

- Large off white “horns” rather than regular, non-projected “ears”.
- Lacks black forehead tufting.
- Slightly plumper body.

Western Grebe

Aechmophorus occidentalis

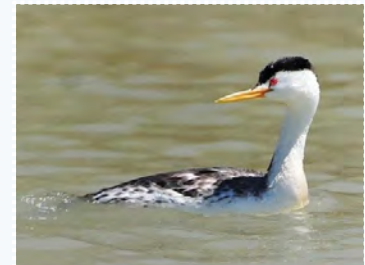
IUCN Conservation Status: Least Concern



Alternate Morphs:

- No alternate morphs

Similar Species:



Clark's Grebe

- Black cap does not extend below eyes
- Plumage is not as solid grey as Western Grebe

Size & Shape: Small bodied, long thin neck. Dark Grey face with long, slender yellow bill. White ventral side of neck and face, black dorsal side.

Color Pattern: Male and female are indistinguishable, male typically slightly larger, and possess greater plumage contrast. Juvenile and nonbreeding appear similar to adult, with smaller body. Note differences from Clarke's Grebe (bottom left).

Season:

Seen breeding **May – July.**

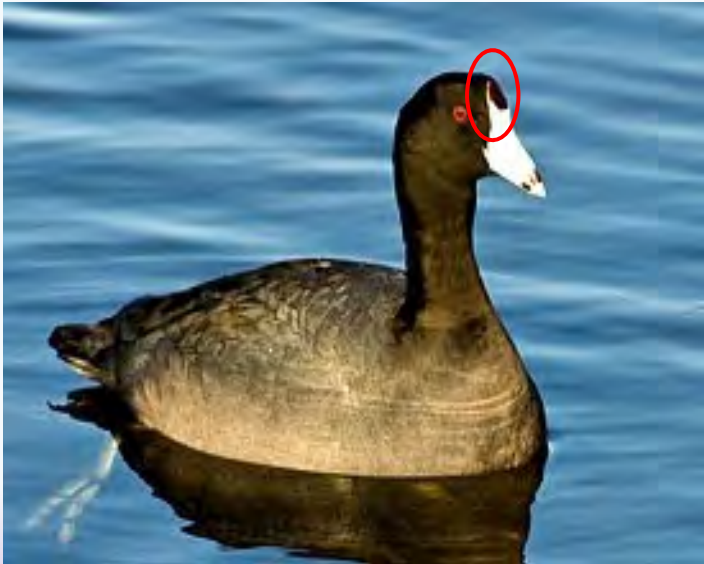
Transient migration: Arrival: **late April – mid June**

Departure: **No discernable movement**

American Coot

Fulica americana

IUCN Conservation Status: Least Concern



Alternate Morphs:

-No alternate morphs

Similar Species:

-No Similar Species

Size & Shape: Plump, chicken-like waterbird. Rounded head and steep sloping white bill, banded at the end. **Dark red forehead "shield"**. Bright red eye. Black head and neck with a dark grey body.

Color Pattern: Male and female are indistinguishable.

*Commonly found in large flocks

Season: Seen year round throughout ranges in Montana.

Breeding: **late May - July**

Transient migration: Arrival: **late March – late May**

Departure: **early September – mid November**

Common Loon

Gavia immer

IUCN Conservation Status: Least Concern



Alternate Morphs:



Nonbreeding Adult

- Dull grey body, not spotted like juvenile
- White throat unlike breeding adult
- Silver-grey bill

Similar Species:

- No Similar Species

Size & Shape: Large diving waterbird with rounded heads and sharp, dagger shaped bills. Long legs that extend past tail in flight (unlike ducks). Breeding adult has spotted back with a V-band on neck, black head and **black** bill.

Color Pattern: Breeding male and breeding female (left) are indistinguishable. Juvenile male and juvenile female (right) also indistinguishable.

Season:

Seen breeding **May – August**.

Transient migration: Arrival: **early March**

Departure: **late August – October**

More Commonly seen in fall.

Double-crested Cormorant

Phalacrocorax auritus

IUCN Conservation Status: Least Concern



Alternate Morphs:



Nonbreeding Adult

- Lack "crested ears"

Similar Species:

- No Similar Species

Size & Shape: Large bodied with small heads and long necks. Thin hooked bill. Sit low in water.

Color Pattern: Male and female are indistinguishable. Twin crests resembling ears, with an orange face. Metallic grey-black body, back and head. Blue eye.

Season:

Breeding **late April – early July.**

Transient migration: Arrival: **mid April – mid May**

Departure: **September – October.**

American White Pelican

Pelecanus erythrorhynchos

IUCN Conservation Status: Least Concern



Alternate Morphs:



Adult Male

- **Horn visible**
- Black flight feathers visible

Similar Species:

- May be confused with Snow or Ross's geese in flight

Size & Shape: Large water bird, huge body, large heavy bill. Has short legs, and a short, square tail. Males grow a "horn" on the upper bill during mating season. Small ornamental feathers on chest can become yellow in spring. Black flight feathers.

Color Pattern: Aside from mating horn, male and female are indistinguishable. Note: this is out of the ABA order

Season: Breeding: **June** in a few lakes

Transient migration: Arrival: **late March - April**

Departure: **late September - October**

American Avocet

Recurvirostra americana

IUCN Conservation Status: Least Concern



Size & Shape: The American Avocet is a large, long-legged shorebird with a bill that is long and upturned as well as a round head that leads to a long neck.

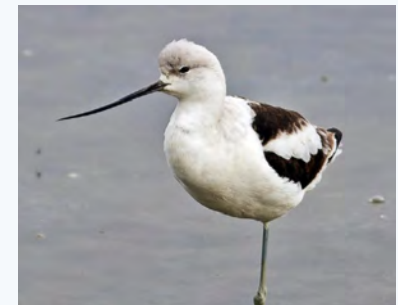
Color Pattern: During breeding season, birds have a rusty head and neck. The rusty coloration turns light grey after breeding. Two black patches, one on the back and one on the wings can be seen on the mostly white bird. Legs are a light grey with a blue tint.

Season: Breeding: **Late May**

Transient migration: Arrival: **Late April - May**

Departure: September - **October**

Alternate Morphs



Nonbreeding Adult

- White or light grey throat unlike breeding adult

Similar Species



- **Black-necked Stilt**

41

BNST

Black-necked Stilt

Himantopus mexicanus

IUCN Conservation Status: Least Concern



Alternate Morphs:

- No alternate morphs

Similar Species: American Avocet



Size & Shape: A large, long-legged, shorebird with a long thin bill.

Color Pattern: Black-necked Stilt's are large, shorebirds with long red legs and a black bill. The wings of the Black-necked Stilt are black and the bird has a black cap, the rest of the bird is white in color.

Season: Breeding: **May**

Marbled Godwit

Limosa fedoa

IUCN Conservation Status: Least Concern



Alternate Morphs:

- No alternate morphs

Similar Species: No similar species

Size & Shape: The Marbled Godwit is a large, shorebird with long legs, a thick neck and a long, upturned bill. long-legged shorebird with an extremely long, slightly upturned bill.

Color Pattern: The Marbled Godwit has barring covering its body and in a pattern that does not change during breeding season. The underwing is a light cinnamon color. The bill is bicolored with orange at the base during breeding season or pink during the nonbreeding season and black at the tip

Season: Breeding: **June**

Transient migration: Arrival: **May**

Departure: **September**

Wilson's Phalarope

Phalaropus tricolor

IUCN Conservation Status: Least Concern



Alternate Morphs:



- Juvenile- dark cap on head and rusty scale-like patches, on back

Similar Species:

Red-Necked Phalarope, Red Phalarope

Size & Shape: Wilson's Phalaropes are shorebirds, small in size with long, straight bills, and long legs.

Color Pattern: Grayish birds with cinnamon neck highlights. Females are more colorful than males with a dark line through the eye and down to the neck.

Season: Breeding: **Late May**

Transient migration: Arrival: **May**

Departure: **July - September**

Red-necked Phalarope

Phalaropus lobatus

IUCN Conservation Status: Least Concern



Alternate Morphs:



- Non-breeding

Similar Species:

Wilson's Phalarope, Red Phalarope

Size & Shape: Red-necked Phalaropes are shorebirds, small in size with long, straight bills, and long legs. Breeding plumage has more and darker red on their neck than the Wilson's Phalarope. Non breeding is gray and white and can be confused with the Red Phalarope. It is the smallest phalarope with the shortest bill. Females have more dramatic coloring than males.

Color Pattern: Mottled gray birds with chestnut neck markings. Females are more colorful than males.

Season: Breeding: **Late May**

Transient migration: Arrival: **May**

Departure: **July - September**

Bonaparte's gull

Larus philadelphia

IUCN Conservation Status: Least Concern



Size & Shape: These gulls are small with thin black bills.

Color Pattern: Breeding adults have a black head with a thin white crescent around each eye, red legs, and grey backs. Nonbreeding adults have pink legs, a black patch behind each eye, and grey backs.

Season: Breeding: **May - July**

Transient migration: Arrival: **May**

- pass through Montana early – mid-May

Alternate Morphs:



Juvenile

- Patches of brown and grey with a brown patch behind each eye.

Similar Species:



- Franklin's Gull

Franklin's gull

Larus pipixcan

IUCN Conservation Status: Least Concern



Alternate Morphs



First winter/ Juvenile

- Dark grey partial hood, grey on back with brown underwings.

Size & Shape: A small gull with a small bill, thick white eye crescents and black wing tips.

Color Pattern: During breeding season, birds have a black hood. Grey backs, red bills, white eye crescents, and limited black wing tips with white spots can be seen all year. Nonbreeding adults have a partial dark grey hood.

Season: Breeding: **May**

Transient migration: Arrival: **mid-April**

Departure: **mid-October**

Similar Species



- Bonaparte's Gull

Ring Billed Gull

Larus delawarensis

IUCN Conservation Status: Least Concern



Alternate Morphs:

- No alternate morphs

Similar Species: California gull



Size & Shape: The Ring-billed is a medium-sized gull with a fairly short, slim bill. When the gull perches, its long, slender wings extend well past its square-tipped tail. In flight, the birds move lightly on easy flaps of their fairly slender wings.

Color Pattern: Adults are clean gray above, with a white head, body and tail; their black wingtips are spotted with white. They have yellow legs and a yellow bill with a black band around it.

Season: Breeding: **Late April**

Transient migration: Arrival: **April - May**

Departure: **late August - November**

California Gull

Larus californicus

IUCN Conservation Status: Least Concern



Alternate Morphs:

- No alternate morphs

Similar Species: Ring billed gull



Size & Shape: The California Gull is a medium-sized gull with a round head. The bill is slender compared to other gull species. In flight the wings are long and pointed.

Color Pattern: Breeding adult California Gulls are white-headed gulls with a medium gray back, yellow legs, and a dark eye. Nonbreeding adults have brown streaking on the head. **Adults have a yellow bill with small black ring and a red spot on the lower mandible—brighter on breeding gulls.**

Season: Breeding: **Late April**

Transient migration: Arrival: **Late March - May**

Departure: **August - November**

Citations

Bird Guide to the Berkeley Pit developed by: Luke Domanico, Stella Capoccia, Gary Swant, Tina Pantano, & Mark Mariano

Waterfowl imagery sourced from the Cornell Lab of Ornithology **unless otherwise noted on the image**

- Allaboutbirds.org

Map imagery and data sourced from:

- Montana Natural Heritage Program – field guide
 - <http://fieldguide.mt.gov/displayOrders.aspx?class=Aves>
- Montana Bird Distribution, 7th edition. P.D. Skaar. Montana Bird Distribution Committee. Montana Audubon. Helena, MT. 2012.

Waterfowl Identification, spotting techniques, book editing, and data from Gary Swant - GoBirdMontana, LLC.

APPENDIX D

OBSERVATION AND HAZING LOGS AND SPECIAL COMMENTS FORMS

Berkeley Pit Waterfowl Observation Log

[illegible]

Berkeley Pit Migratory Waterfowl Hazing Log

Date:		Time:		Personnel Involved:			
Species Code	ID Confidence (High, Med, Low)	Number of Birds	Location / Sector	Bird Activity	Hazing Action Taken	Results of Action	Check if deterred from landing
							☐
							☐
							☐

Date:		Time:		Personnel Involved:			
Species Code	ID Confidence (High, Med, Low)	Number of Birds	Location / Sector	Bird Activity	Hazing Action Taken	Results of Action	Check if deterred from landing
							☐
							☐
							☐

Date:		Time:		Personnel Involved:			
Species Code	ID Confidence (High, Med, Low)	Number of Birds	Location / Sector	Bird Activity	Hazing Action Taken	Results of Action	Check if deterred from landing
							☐
							☐
							☐

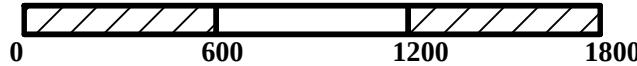
Date:		Time:		Personnel Involved:			
Species Code	ID Confidence (High, Med, Low)	Number of Birds	Location / Sector	Bird Activity	Hazing Action Taken	Results of Action	Check if deterred from landing
							☐
							☐
							☐



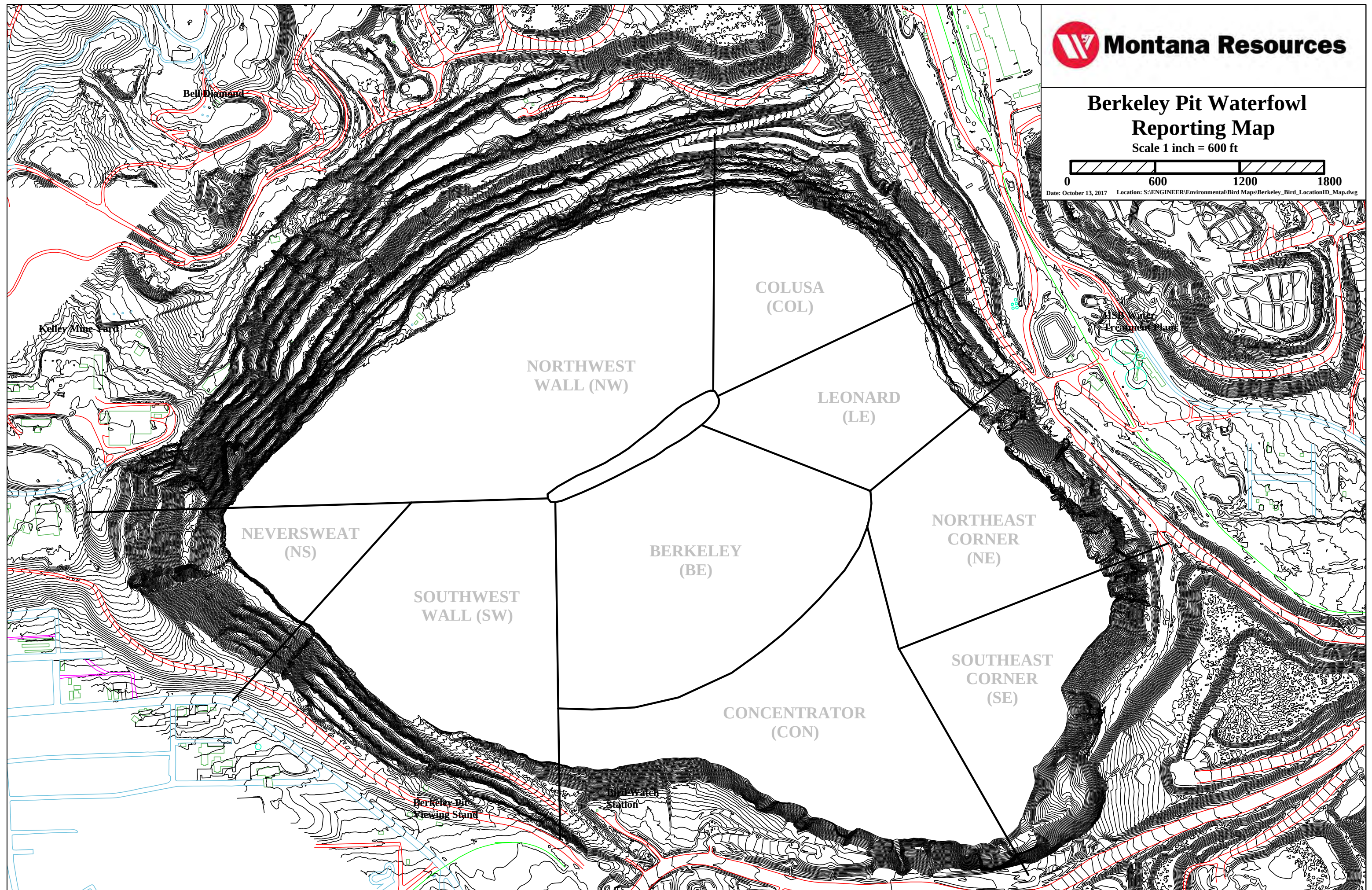
Montana Resources

Berkeley Pit Waterfowl Reporting Map

Scale 1 inch = 600 ft



Date: October 13, 2017 Location: S:\ENGINEER\Environmental\Bird Maps\Berkeley_Bird_LocationID_Map.dwg



SPECIAL COMMENTS FORM

Date and Time of Incident: _____

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Personnel: _____

APPENDIX E

**RESPONSE TO COMMENTS
(ELECTRONIC FORMAT ONLY)**

**Parties' Responses to EPA's Comment Letter from September 11, 2019
for the Butte Mine Flooding Operable Unit (BMFOU)
Final 2019 Waterfowl Protection Plan (August 2019)**

General Comments:

1. **Agency Comment:** *The USFWS requests that all birds taken from the pit for rehabilitation be taken to a permitted rehabilitator. A local veterinarian can accept sick birds, but would need to transfer the sick birds to a permitted rehabilitator once the bird is stable. The release of a recovered bird should only be done by a permitted rehabilitator. The USFWS is attaching a permit application in the event the veterinarian currently treating birds would like to become a permitted rehabilitator.*

Parties' Response: *The Parties would like to have further discussion with the USFWS on this issue as requested below in the response to Specific Comment 7. Specifically, the Parties appear to have a different definition of "rehabilitation" than USFWS and believe that a meeting with the Agencies (including USFWS) on this topic may be able to clarify the definition and intention of rehabilitation in the Plan.*

Agency Comment: *Clarifications need to be discussed and agreed to before approval will occur. Please add this discussion as an agenda item to the Thursday September 19, 2019 Water Advisory Board meeting*

Parties' Response: *The Parties have revised the fourth paragraph in Section 3.3.3, Capture, Transport, Release and/or Removal of Waterfowl to read as follows:*

The intention is to release waterfowl that are in good condition (as determined by a competent individual), in a short time frame to minimize stress. Waterfowl shall be released in an area that aligns with the biology of the species, in a manner that incorporates the species flock needs, in weather conditions that do not hinder the continuation of their migration, considering the specifics of the time of year. These specific decisions will be made by a competent individual such as a veterinarian, wildlife expert, and/or permitted waterfowl rehabilitator with the appropriate legal authorization.

2. **Agency Comment:** *In the next revision of the document, please include the response to comments that are contained in this version of the document.*

Parties' Response: *The Parties' responses herein refer to the Agencies' comments contained in the May 20, 2019 comment letter. Each revision is discussed in this Response to Comments under the specific comment from the Agencies; all revisions are reflected as a preface to the attached Plan (Attachment A).*

Agency Comments: *This comment was referring to the response to comments contained within the March 13, 2019 submittal of the Plan. Upon approval, response to comments are considered a component of the plan and official part of the record. At times, responses to comments provide additional detail that may not be contained within the document itself. As such, please include all responses to comments for both the March 13 and August 6, 2019 versions within the final document.*

Parties' Response: The Parties have included all response to comments, in electronic format, as Appendix E to the Plan.

Specific Comments:

1. *Section 3.3, Hazing Efforts, Observation Training: Second full sentence at the top of the page – Please define what “short-term” waterfowl exposure to pit water is specifically. Are there specific time periods that would be defined as “short-term” exposure for each species or each group using or potentially using the Berkeley Pit?*

Parties' Response: *The definition of “short-term” used in the Plan is in reference to the findings concluded in Stubblefield and Löhr, 2018. However, the Parties feel it is technically impracticable to define specific exposure times for each species or group of waterfowl potentially using the Berkeley Pit due to the variability not only from species to species and group to group of waterfowl, but also from the variability of individuals within each species and/or group.*

Agency Comment: *The response refers to the definition of “short-term” used in the Plan is in reference to the findings concluded in the Stubblefield and Löhr, 2018. A review of Stubblefield and Löhr, 2018 did not find the phrase “short-term” except as it related to ingestion of waterfowl tissue. Please include a description of the interpretation of “short-term” from the Stubblefield and Löhr report.*

Parties' Response: The Parties have revised the second paragraph in Section 3.3, Hazing Efforts to read as follows:

Passive or preventative hazing may not be successful, and waterfowl may still land on the Pit. It is suspected that waterfowl that use the Pit do so either to rest during migration or to avoid inclement weather conditions. Exhausted waterfowl are resistant to hazing, therefore the best practice is to allow waterfowl to rest for a short time before hazing them. Dabbling ducks, gulls, shore birds, and geese normally leave the Pit after a brief rest with a limited amount of active hazing pressure.



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August 6, 2019

Mr. Nikia Greene
U.S. Environmental Protection Agency
Region 8 Montana Field Office
Federal Building, Suite 3200
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Helena, MT 59626

Mr. Daryl Reed
State of Montana
Department of Environmental Quality
100 North Last Chance Gulch
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**Re: Submittal of the Butte Mine Flooding Operable Unit (BMFOU) – Final 2019
Berkeley Pit Waterfowl Protection Plan**

Dear Nikia and Daryl,

Montana Resources, LLP and Atlantic Richfield Company (collectively ‘the Parties’) submit the following attachments (described further herein) in response to the comments provided by the U.S. Environmental Protection Agency (EPA), in consultation with the Montana Department of Environmental Quality (DEQ) and U.S. Fish and Wildlife Service (USFWS), (EPA and DEQ collectively referred to as the Agencies) received by the Parties on May 20, 2019, on the *BMFOU – Draft Final 2019 Berkeley Pit Waterfowl Protection Plan* (the Parties, 2019).

As requested, the Parties, present this submittal in whole as: Attachment A. Final 2019 Berkeley Pit Waterfowl Protection Plan dated August 6, 2019 (Plan). The attached Plan (Attachment A) includes all figures, tables, appendices and incorporates and/or addresses the comments included in the Agencies’ May 20, 2019 letter.

In addition to the attached Plan, the Parties prepared responses in an effort to provide a clear basis for incorporating and/or addressing each of the comments provided by the Agencies in the May 20, 2019 letter. The format of the Response to Comments includes the full, original comments from the Agencies (General Comments, 1-3; Specific Comments, 1-8; and Additional Revisions) in italicized font, followed by the Parties’ responses.

The Parties respectfully request that the Agencies consider approving the Plan for 2019, as revised, while engaging in further mutual discussion to address comments (both general and specific) specifically regarding a permitted/licensed rehabilitator in the capture, transport, release and/or removal of waterfowl from the Berkeley Pit (Pit). This mutual discussion should be between the Agencies, including the USFWS, and the Parties; and may also include members of

the Berkeley Pit Waterfowl Mitigation Advisory Board (Waterfowl Advisory Board), if deemed necessary.

The Parties are recommending this conditional approval of the Plan in 2019 in order to allow for the many, significant improvements made to waterfowl protection efforts at the Pit over the past two years to become finalized in a plan, and to also allow the Agencies and Parties adequate time to work collaboratively to incorporate specific components of the Plan relative to the capture, transport, release and/or removal of waterfowl from the Pit (see General and Specific Comments below). The Parties believe this proposed conditional approval while collectively working to further refine specific components of the Plan is an appropriate example of the flexibility intended under adaptive management, as described in *Section 6. Adaptive Management* of the Plan.

Please contact either one of us once you have had an opportunity to review the attachments and we would be happy to schedule a time to discuss them further.

On behalf of the Settling Defendants,



Mark Thompson
Vice President of Environmental Affairs
Montana Resources LLP
600 Shields Avenue
Butte, MT 59701



Tim Hilmo, P.E.
Operations Project Manager
Remediation Management Services Company
An Affiliate of Atlantic Richfield Company
317 Anaconda Road
Butte, MT 59701

Attachments: Attachment A. Final 2019 Berkeley Pit Waterfowl Protection Plan

cc: Henry Elsen, Esq., EPA (email copy)
Allie Archer, EPA (email copy)
Joe Vranka, EPA (email copy)
Jonathan Morgan, Esq., DEQ (email copy)
Jenny Chambers, DEQ (email copy)
Carolina Balliew, DEQ (email copy)
Tom Stoops, DEQ (email copy)
John Sither, DOJ-EES (email copy)
Karen Nelson, USFWS (email copy)
Mona Ianelli, USFWS (email copy)
Chapin Storrar, CDM (email copy)
Rebecca Summerville, MR (email copy)
Jeremy Fleege, MR (email copy)
Dave Griffis, Atlantic Richfield (email copy)
Josh Bryson, Atlantic Richfield (email copy)

Loren Burmeister, Atlantic Richfield (email copy)
Irene Montero, Atlantic Richfield (email copy)
Jean Martin, Atlantic Richfield (email copy)
Jenni Harris, Atlantic Richfield (email copy)
Cord Harris, Atlantic Richfield (email copy)
John Davis, Esq., Poore, Roth and Robinson P.C. (email copy)
Bill Duffy Esq., Davis Graham and Stubbs, LLP (email copy)
Matt Vincent, Rampart Solutions (email copy)
Mark Mariano, Rampart Solutions (email copy)
Don Booth, Booth Consulting (email copy)
Jim Jonas, Copper Environmental (email copy)
Rich Keeland, Pioneer Technical (email copy)
Ted Decker, Pioneer Technical (email copy)
Ted Duaine, MBMG (email copy)
Gary Icipine, MBMG (email copy)
Stella Capoccia, Montana Tech/Waterfowl Mitigation Advisory Board (email copy)
Jon Sesso, BSB (email copy)
Julia Crain, BSB (email copy)

Parties' Responses to EPA's Comment Letter from May 20, 2019 for the Butte Mine Flooding Operable Unit (BMFOU) – Draft Final 2019 Waterfowl Protection Plan (March 2019)

General Comments:

1. **Agency Comment:** *The document submitted included the Summary Report Evaluation of Water Samples and Bird Tissues Collected at the Berkeley Pit, Butte, Montana In December 2016 and Oral toxicity of Berkeley Pit (Butte, Montana) Water to Snow Geese reports in the front of the PDF. If applicable, in the final version of the document it is recommended these two documents be included, and identified, as attachments to the overall waterfowl protection plan.*

Parties' Response: The aforementioned documents were included as Attachment A to the Parties' March 13, 2019 Response to EPA's Comment Letter from September 24, 2018 for Butte Mine Flooding Operable Unit (BMFOU) – Draft Final 2019 Berkeley Pit Waterfowl Protection Plan. The Parties did not intend for these documents to be supplements to or otherwise part of (e.g. appendices) the Plan and therefore do not feel their inclusion is applicable.

Agency Comment: *The USFWS requests that all birds taken from the pit for rehabilitation be taken to a permitted rehabilitator. A local veterinarian can accept sick birds, but would need to transfer the sick birds to a permitted rehabilitator once the bird is stable. The release of a recovered bird should only be done by a permitted rehabilitator. The USFWS is attaching a permit application in the event the veterinarian currently treating birds would like to become a permitted rehabilitator.*

Parties' Response: The Parties would like to have further discussion with the USFWS on this issue as requested below in the response to Specific Comment 7. Specifically, the Parties appear to have a different definition of "rehabilitation" than USFWS and believe that a meeting with the Agencies (including USFWS) on this topic may be able to clarify the definition and intention of rehabilitation in the Plan.

2. **Agency Comment:** *In the next revision of the document, please include the response to comments that are contained in this version of the document.*

Parties' Response: The Parties' responses herein refer to the Agencies' comments contained in the May 20, 2019 comment letter. Each revision is discussed in this Response to Comments under the specific comment from the Agencies; all revisions are reflected as a preface to the attached Plan (Attachment A).

3. **Agency Comments:** *Many of the responses to comments in the document refer to “...an updated version in the next submittal of this Plan.” Is the intent to submit this plan on a regular (e.g., yearly) basis? It is recommended that this plan be submitted yearly with necessary changes included – similar to yearly updated to quality assurance project plan (QAPP) for sampling activities. It is understood that in some years there will be no changes, and as such only the date of the document be revised.*

Parties’ Response: The Parties’ intention is to review the Plan and SOPs annually as part of the adaptive management approach and submit updates to the Plan when changes are deemed necessary by the Parties and/or Agencies, not necessarily on a yearly basis. If updates and/or changes are required following annual review, then an updated Plan, SOP(s) and/or pertinent replacement pages will be submitted to the Agencies.

Specific Comments:

1. **Section 2.1: November – December 2016 Event:** *This section states that the review of aerial photographs collected during the mortality event captured more than 2,900 waterfowl that did not respond to hazing. This number seems low, as 2,609 were counted as dead, 651 were still alive, and 372 had been collected dead on or before the day of the flight. The flight did not cover the entire pit, so birds were likely missed. Please review and revise as necessary. This total is 3,532 birds, which is more than 2,900 but not very accurate.*

Parties’ Response: The Parties reviewed the information outlined in the Agencies’ comment here, as well as the numbers previously referred to in the March 13, 2019 response to comments (EPA’s Comment Letter from September 24, 2018 for the Butte Mine Flooding Operable Unit (BMFOU) – Draft Final Waterfowl Protection Plan (August 2018)). The statement that referred to greater than 2,900 unresponsive waterfowl in the previous version of the Plan did include the deceased birds that were already collected prior to aerial photography. In an attempt to better define this in response to the Agencies’ comment, the Parties have made the following revision to the Plan: “A review of aerial photographs collected by drone and manned aircraft flights, **including the cumulative number of dead birds collected prior to the imagery flights** show that more than 2,900 waterfowl did not respond to hazing, remained in the Pit, and ultimately died as detailed in the Berkeley Mine Pit Snow Goose Assessment (USFWS, 2016) and **Berkeley Pit – November 28, 2016 Event, Waterfowl Count Technical Memo**_(Arcadis, 2017b).”

2. **Section 3.2.1, Observation Locations and Schedule:** *Suggest adding the following clarification sentence after the first sentence in this section. The entire pit cannot be viewed from the Bird Shack so alternative viewing locations were established on the east and north rims so that the blind spot (see Figure 1) can be checked for birds. Please include which viewing locations need to be used to see the blind spot. Can one alternate location be used or do you need to go to two different sites to view the blind spot?*

Parties' Response: The Parties have revised the first paragraph in Section 3.2.1, Observation Locations and Schedule to read as follows:

The primary observation station, referred to as the “Bird Shack,” is located on the south rim of the Pit. The Bird Shack was improved in 2017 and 2018 to include new roof/siding, observation windows, permanent electricity, and climate control. **However, the entire Pit cannot be viewed from the Bird Shack, therefore, alternate viewing locations were established so that the blind spot from the Bird Shack can be checked for birds from these alternate locations. The entire blind spot from the Bird Shack, can be viewed from any/all of the alternate observation locations (Figure 1).**

3. *Section 3.2.4, Observation Training: What are the specific details of the planned waterfowl identification, waterfowl counts, and use of optics training? Please provide additional detail.*

Parties' Response: The Parties have revised Section 3.2.4, Observation Training to read as follows:

Personnel involved in waterfowl observation will be trained **annually** on **the following topics:**

- **Waterfowl identification.**
 - **How to detect the distinguishing characteristics for each species.**
 - **How to utilize the “Bird Guide to the Berkeley Pit” (Appendix C) and associated poster.**
- **Waterfowl counts**
 - **How to accurately count and record waterfowl present on the Pit.**
- **Use of optics**
 - **How to properly use and care for binoculars and spotting scopes.**
 - **How to use the digiscope to document unknown species.**

4. *Section 3.3, Hazing Efforts, Observation Training: Second full sentence at the top of the page – Please define what “short-term” waterfowl exposure to pit water is specifically. Are there specific time periods that would be defined as “short-term” exposure for each species or each group using or potentially using the Berkeley Pit?*

Parties' Response: The definition of “short-term” used in the Plan is in reference to the findings concluded in Stubblefield and Lohr, 2018. However, the Parties feel it is technically impracticable to define specific exposure times for each species or group of waterfowl potentially using the Berkeley Pit due to the variability not only from species to species and group to group of waterfowl, but also from the variability of individuals within each species and/or group.

5. 3.3.3 Capture, Transport, Release and/or Removal of Waterfowl: Suggest adding the word temporary before variance in the following sentence. “In 2013, the Parties were granted a temporary variance regarding manned on-the-water operations due to the instability of the Pit walls.” Also, in this section, a permitted rehabilitator should be identified, or the local veterinarian currently being used should obtain a necessary permit to rehabilitate birds captured in the Berkeley Pit. This information can be included in the WPP-SOP-13.

Parties’ Response: The Parties have revised the first sentence of Section 3.3.3 Capture, Transport, Release, and/or Removal of Waterfowl to read as follows:

In 2013, the Parties were granted a **temporary** variance regarding manned on-the-water operations due to the instability of the Pit walls.

However, the Parties request to have further discussion with the Agencies on this variance. Specifically, the Parties believe that the unsafe conditions that led to granting the temporary variance in 2013 have persisted, and that the variance should become permanent in order to adequately protect human health and personnel safety.

6. WPP-SOP-03; Hazing Strategy:

- a. *Species (4-Letter Alpha Code) column – Please define the 4-Letter Alpha Codes somewhere near this table.*

Parties’ Response: The Parties have revised WPP-SOP-03; Hazing Strategy, Tasks 2,3,4, and 5 to include the species full name along with the 4-Letter alpha code.

- b. *It appears “RGBU” should be “RBGU”. Please review and revise as necessary.*

Parties’ Response: The Parties have revised WPP-SOP-03; Hazing Strategies, Task 5 by replacing RGBU with **RBGU**.

7. WPP-SOP-13; CAPTURE, TRANSPORT, RELEASE, AND/OR REMOVAL OF WATERFOWL. Please change licensed to permitted in the following sentence “Any treatment should be performed by a licensed rehabilitator and/or veterinarian. Specific treatment will vary depending on species, age, and condition of the bird.” Sick birds may be taken to the local veterinarian, but unless the veterinarian obtains a permit to rehabilitate birds, the veterinarian will need to transport the bird to a permitted rehabilitator (once the bird is stabilized) for any continued care and release. The local veterinarian can euthanize sick birds without a permit, the USFWS requests that all birds be euthanized by the local veterinarian. The Service would like to work with MR and AR to include

more details in the SOP such as information regarding capture, transport and euthanasia and any future necropsy. The USFWS requests that any future necropsies to determine cause of death be conducted by the U.S. Geological Survey's National Wildlife Health Center.

Parties' Response: The Parties propose setting up a date to have a working meeting(s) with the USFWS, as well as the EPA and DEQ, to develop a more detailed WPP-SOP-13, and to discuss future necropsy requirements and the requested role of a permitted wildlife rehabilitator in the care and release of captured waterfowl. As previously described in the cover letter to this Plan, the Parties request the Agencies' approval of the Plan accompanying this document (Attachment A), as additional changes/revisions may be made to the Plan under the flexibility granted in Section 6.0 Adaptive Management.

8. *Appendix C: Table of Contents – Should all the waterfowl and waterbirds listed in the Table of Contents for the “Bird Guide to the Berkeley Pit”, also be listed on the table in WPP-SOP-03? Species listed in the Table of Contents that are missing from the SOP include wood duck, Bonaparte’s gull, black-necked stilt, marbled godwit, Wilson’s phalarope, and red-necked phalarope. Please review and revise as necessary.*

Parties' Response: The Parties have revised the tables in Tasks 2, 3, 4 and 5 within WPP-SOP-03 to include these additional species.

Additional Revisions:

In addition to the responses to Agencies' comments and resulting revisions, the Parties also made the following revisions to the Plan:

- In the Introduction and throughout the remainder of the Protection Plan, the EPA and DEQ are clarified as being collectively referred to as “the Agencies,” as follows:

“...the United States Environmental Protection Agency (EPA) and Montana Department of Environmental Quality (DEQ), collectively herein referred to as ‘the Agencies.’”
- Both *Section 3.3.2, Active/On-the-Water Deterrents* and *Table 2. Deterrents Evaluated for use at Berkeley Pit (1996 - 2018)* were updated to remove the Vortex Ring Avian Deterrent (VRAD) as a deterrent being implemented at the Pit. While the VRAD was in fact evaluated for use at the Pit during 2017-18, its use at the site by the Parties was discontinued in 2019 due to personnel safety considerations, as well as limitations with the product/technology vendor. In the event the vendor is able to address certain safety issues and other limitations with the VRAD, the Parties may reserve its right to reconsider/reevaluate the technology's use in the future. However, until such time, the VRAD is no longer being used or considered as an active or passive deterrent at the Pit. The aforementioned sections of the Plan have been revised accordingly.

- The first sentence in Section 3.2 Observation Program has been revised to read as follows:

This section provides a description of how waterfowl are observed **and documented** on the Pit as well as the available resources.

- In Section 3.2.1 Observation Locations and Schedules, Migration Period Observation Schedules has been revised to read as follows:

March 1 to May 31 and August 15 to December 31

Personnel shall observe the Pit hourly from the Bird Shack and once daily from an alternate observation location throughout daylight hours. Personnel shall observe the Pit, **using a searchlight**, every 4 hours from the Bird Shack throughout the night.

- The first sentence in Section 3.3.2 Active/On-the-Water Deterrents has been revised as follows:

Active hazing targets ~~specific to~~ waterfowl that have landed on the Pit **and** shall be done using the methods below.



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March 13, 2019

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**Re: Submittal of Draft Final 2019 Berkeley Pit Waterfowl Protection Plan; and
Response to EPA's Comment Letter from September 24, 2018 for Butte Mine
Flooding Operable Unit (BMFOU) – Draft Final Berkeley Pit Waterfowl Protection
Plan (August 2018)**

Dear Nikia and Daryl:

Montana Resources, LLP and Atlantic Richfield Company (collectively ‘the Parties’) submit the following attachments (described further herein) in response to the comments provided by the U.S. Environmental Protection Agency (EPA), in consultation with the Montana Department of Environmental Quality (DEQ) and U.S. Fish and Wildlife Service (USFWS) on the *BMFOU – Draft Final Berkeley Pit Waterfowl Protection Plan* (Plan) (the Parties, 2018), received by the parties on September 24, 2018.

The September 24, 2018 letter from EPA states in the first paragraph, “*Please incorporate or otherwise address the comments and submit revised documents for review and approval.*” The Parties present this submittal in two separate parts: Attachment A. Parties’ Responses to EPA’s Comment Letter from September 24, 2018 for the Butte Mine Flooding Operable Unit (BMFOU) – Draft Final Waterfowl Protection Plan dated August 10, 2018; and Attachment B. Draft Final 2019 Berkeley Pit Waterfowl Protection Plan dated March 13, 2019 (Draft Final 2019 Plan). Response to EPA’s Comment Letter from September 24, 2018, provides a basis for incorporating and/or addressing each comment submitted by the Agencies in the September 24, 2018 letter.

The attached Draft Final 2019 Plan includes all figures, tables and appendices and incorporates and/or addresses many of the comments included in the Agencies’ September 24, 2018 letter, as well as input received from the Berkeley Pit Waterfowl Mitigation Advisory Board (Waterfowl Advisory Board).

In addition to the Draft Final 2019 Plan, the Parties prepared Attachment A in an effort to provide a clear basis for incorporating and/or addressing each of the comments provided by the

Agencies in the September 24, 2018 letter. The format of the Response to Comments includes the full, original comments from the Agencies (General Comments, 1; Specific Comments, 1-15;) in italicized font, followed by the Parties' responses. As a supplement to Attachment A, the Parties have included the following documents for the Agencies: Attachment A(i) "Evaluation of water samples and bird tissues collected at the Berkeley Pit, Butte, Montana in December 2016" (Stubblefield and Löhr, 2018); and Attachment A (ii) "Oral Toxicity of Berkeley Pit (Butte, Montana) Water to Snow Geese (*Chen caeulescens*)" Document Number 0486-375 (ENSR, 1996). These two documents are provided to the Agencies as additional information regarding Specific Comments 3 a) and 9, respectively, as they appeared in the September 24, 2018 letter. These documents are not intended to be supplements or otherwise (e.g., appendices) to the Draft Final 2019 Plan.

Please contact either one of us once you have had an opportunity to review the attachments and we would be happy to schedule a time to discuss them further.

On behalf of the Settling Defendants,



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Parties' Responses to EPA's Comment Letter from September 24, 2018 for the Butte Mine Flooding Operable Unit (BMFOU) – Draft Final Waterfowl Protection Plan (August 2018)

General Comments:

1. **Agency Comment:** Paragraph 2 of EPA's Comment Letter from September 24, 2018 states:

“The document as submitted did not include Appendix A or all portions of Appendix B, which are noted as still under development. Those appendices, Appendix B in particular, are important components related to implementation of waterfowl hazing techniques at the Berkeley Pit. The comments below apply to the document as it was submitted. However further comments, on the appendices and the full document, may be provided after the missing appendices have been submitted.”

Parties' Response: Appendix A and Appendix B are provided with this submittal of the Plan and will continue to be updated as necessary.

Specific Comments:

1. **Section 1.0:** Item b) – *It is suggested to add that the implementation of the observation and hazing program is safe for birds as well as the people responsible for their implementation.*

Parties' Response: The Parties have revised Section 1.0: Item b) to read as follows:

b) Employ observation and hazing programs that are appropriate for this unique site, and in a manner that is protective of waterfowl and safe for the people responsible for their implementation.

2. **Section 1.0:** second paragraph – *The paragraph should also reference the BMFOU Explanation of Significant Differences in describing the decision documents relating to this operable unit. The 2002 Consent Decree for the Mine Flooding Site should also be described, and the paragraph should note that the actions described in the Plan are required pursuant to the Consent Decree. This paragraph should also note that the obligations and requirements of the Plan are the responsibility of the existing Settling Defendants named in the Consent Decree.*

Parties' Response: The Parties have revised Section 1.0: second paragraph as follows:

Waterfowl mitigation, henceforth referred to as waterfowl protection, is still adequately defined as the particular activities conducted to minimize (insofar as is practical) the contact of waterfowl with waters of the Pit. For the purpose of this Plan, "waterfowl" includes waterfowl, shorebirds and water birds that may use the Pit. Mitigating the risks and protecting migratory and other waterfowl from hazards associated with contacting Pit water via a written plan is a component of the EPA Superfund Record of Decision: Butte Mine Flooding Operable Unit, Silver Bow Creek/Butte Area NPL Site, Butte, Montana, (EPA ID: MTD980502777, OU 03) (EPA, 1994) (BMFOU Record of Decision [ROD]), the BMFOU Explanation of Significant Differences (ESD) (EPA, 2002), and the Consent Decree for the Butte Mine Flooding Site (CD) (EPA, 2002). The obligations and requirements of this Plan are the responsibility of the existing Settling Defendants¹ named in the CD and the actions described in the Plan are required pursuant to the CD. All activities conducted by the Parties under this Plan shall comply with all Applicable or Relevant and Appropriate Requirements (ARARs) as outlined in the BMFOU ROD. The ARARs that are specifically applicable to this Plan are detailed in **Error! Reference source not found.**

3. Section 1.1:

- a. *Site Description, footnote 1 – It is stated that the pH has increased to 4.15 as of March 2018. It is also stated that "concentrations of certain metals/ions have changed significantly as well." Is it correct to assume that concentrations of certain metals have decreased along with the increase of pH? Please clarify.*

Parties' Response: The Parties have revised Section 1.1: Site Description, footnote 1 to read as follows:

²According to the water quality sampling data from the Pit performed by the Montana Bureau of Mines and Geology on March 27, 2018, field pH has increased to approximately 4.15 standard units (S.U.) and concentrations of certain metals/ions have changed (GWIC, 2018).

- b. *Related to the comment above; Please consider safe ecological risk thresholds for pH levels and metals concentrations of waters in the Pit and/or clarify why or why not that might not be feasible.*

Parties' Response: Deriving risk thresholds for pH and metals concentrations that will continue to change over time in the Pit, is not feasible due to the various species of waterfowl that have potential to frequent the Pit. A key objective of the Plan remains to re-evaluate the effectiveness of the protection program on an ongoing basis and modify the program to accommodate changing conditions over time at the site.

- c. *The first paragraph of Section 1.1 should reference the definition of the Mine Flooding Site contained in the 2002 Consent Decree for the Mine*

Flooding Site.

Parties' Response: The Parties will revise the definition of the site provided in Section 1.1 to be consistent with, and to reference the CD Section 1.1. Paragraphs 1 and 2 have been revised as follows:

The BMFOU is part of the Silver Bow Creek/Butte Area National Priorities List (NPL) site and is located adjacent to the eastern boundaries of Butte and Walkerville, Montana. The Mine Flooding Site as defined in the CD, shall mean the Butte Mine Flooding Operable Unit, the surface boundaries of which are depicted on Figure 1 of the BMFOU ROD and which are further defined in the Response Decision Document, and which consists of: (a) the waters within Berkeley Pit; (b) the underground mine workings hydraulically connected to the Berkeley Pit; (c) the alluvial aquifer near the Berkeley Pit that drains into the Berkeley Pit; (d) the bedrock aquifers including the bedrock aquifer in and near the Continental Pit shown in the BMFOU ROD and Response Decision Document; (e) other contributing sources of inflow to Berkeley Pit/East Camp system including surface runoff, leach pad, storm water that enters Berkeley Pit from BPSOU, tailings slurry circuit overflows and Horseshoe Bend surface water flows; (f) the Travona/West Camp groundwater system; and (g) surface area designated for potential development of a sludge repository (CD) (EPA, 2002).

The feature relevant to this Plan is the Pit. The Pit is in the west-central portion of the BMFOU. The Pit has a water depth of approximately 1,000 feet, an approximate surface area encompassing over 430 acres and an estimated volume of over 50 billion gallons of contaminated water (May 2018 estimates) (site features are shown on Figure 1).

4. Section 2.0: Waterfowl Protection Background, paragraph 2, bullet 2 - Which species of "diver ducks" incurred mortality prior to 2002? Please add this information to the background information.

Parties' Response: The Parties have reviewed Observation Logs prior to 2002 and species-specific data were not recorded. Focused training and refinement of species-specific data collection were implemented in fall of 2017.

5. Section 2.1:

- a. *This section states that the review of the aerial photographs collected during the mortality event captured more than 2,900 waterfowl that did not respond to hazing. This number seems low, as 2,609 were counted as dead, 651 were still alive, and 372 had been collected dead on or before the day of the flight. Please review and revise as necessary.*

Parties' Response: Section 2.1, paragraph 3, last sentence states: A review of aerial photographs collected by drone and manned aircraft flights show that more than 2,900 waterfowl did not respond to hazing, remained in the Pit, and ultimately died as detailed in the Berkeley Pit Snow Goose Assessment (USFWS, 2016) and (Arcadis, 2017b).

According to the *Berkeley Pit Waterfowl Assessment* (Arcadis, 2017b) the maximum number counted as dead is 2,963 which reflects the “more than 2,900” as stated in Section 2.1.

- b. Section 2.1: November-December 2016 Event, paragraph 2, sentence 3 - *It is stated that, "A flock of that size landing on the Pit was unprecedented during the previous 20 years when the Parties conducted extensive observation and hazing activities at the Pit (1996 to the present)." For reference, please consider mentioning the size of a typical flock observed in the Pit over the last 20 years of monitoring. This could help explain the atypical size of the flock in 2016.*

Parties' Response: The Parties have revised Section 2.1 November-December 2016 Event, paragraph 2 as follows:

On the evening of November 28, 2016, flocks totaling approximately 60,000 (Arcadis, 2017a) (the Parties, 2017a) waterfowl landed on the Pit. The flock was composed predominantly of lesser snow geese (*Chen caerulescens*) and Ross's geese (*Chen rossii*), hereafter referred to as “light geese.” A flock of that size landing on the Pit was unprecedented during the previous 20 years when the Parties conducted extensive observation and hazing activities at the Pit (1996 to the present). The Parties have typically observed flocks of 68 or fewer birds, as determined over the course of 13 years of record keeping with 1,058 days of observed waterfowl on the Berkeley Pit. The November 28 event occurred during a large-scale, late fall migration of waterfowl from southern Canada through western and central Montana. Historical data for light geese migration through western Montana indicate that fall migration typically occurs between the end of September and early November. During this migration event, large flocks of co-mingled light geese species on the West-Central Flyways crossed the Continental Divide north of Butte and landed on the Pit in response to adverse weather conditions during the evening of November 28.

6. Section 3: *Please add a sub-section on euthanizing birds, removing dead birds to reduce risk to avian and mammalian scavenger, particularly now that we know bald eagles could be taking birds off the pit.*

Parties' Response: The Parties will rely on veterinarians to treat and/or euthanize captured birds as determined necessary through their professional evaluation. Removing dead waterfowl from the access ramp areas will be accomplished when and where safely accessible.

7. Section 3.1: *Appendix B is listed as still under development, as such the referenced standard operating procedure (SOP) WPP-SOP-01 Migration Monitoring & Communication is not yet included in the document. From past documents and correspondence, it is understood that the Cornell Lab of Ornithology's eBird site is utilized for migration monitoring, however it is not mentioned in the document anywhere. Will that information be contained in the aforementioned SOP? Please clarify.*

Parties' Response: The Parties will include reference to Cornell Lab of Ornithology's eBird site (eBird) in appropriate SOPs. The general text of this Plan excludes specific reference to eBird to allow for adaptive management. The SOPs are intended to include specific details such as using eBird to adhere to this Plan.

8. *Section 3.2.1: Please Add a figure to show the named polygons defined in the Berkeley Pit, and add a polygon to show the blind spot from the Bird Shack viewing area. Then describe how that "blind spot" can be viewed from alternate viewing locations. The current statement about enhanced surface visibility sounds different than using different vantage points to see an area not viewable from the bird shack. Please review and revise.*

Parties' Response: The Parties have revised Figure 1: Berkeley Pit Site Location Map to show the sectors (polygons) of the Pit. The Parties have revised Section 3.2.1: Observation Locations and Schedule to read as follows:

The primary observation station, referred to as the "Bird Shack," is located on the south rim of the Pit. The Bird Shack was improved in 2017 and 2018 to include new roof/siding, observation windows, permanent electricity, and climate control. This Plan uses additional observation locations, located on the east and north rims, respectively, to increase the areas of the Pit that are viewable. Observations may also be made from the North and South Ramps and other locations, when necessary (see Figure 1).

If the Pit surface is frozen, with no open water, observations are to occur daily to confirm the presence of ice/open water. Once open water is confirmed, applicable observation procedures will resume as described below.

9. *Section 3.3:*
 - a. *Hazing Efforts, paragraph 2, sentence 4 – Please provide specifics from the Stubblefield & Löhr Report that substantiate "Short-term exposure to Pit water is likely tolerable to waterfowl in good physical condition." In addition, please include a copy of this report as an appendix to this plan.*

Parties' Response: The Parties have included the following as appendices to this Response to Comments letter: "Evaluation of water samples and bird tissues collected at the Berkeley Pit, Butte, Montana in December 2016" (Stubblefield & Löhr, 2018) and "Oral Toxicity of Berkeley Pit (Butte, Montana) Water to Snow Geese (*Chen caerulescens*)" Document Number 0480-375 (ENSR, 1996).

- b. *Hazing Efforts, paragraph 3, sentence 1 – It is stated that "active hazing is generally ineffective for waterfowl whose main defense is diving." Please include further information about what methods are employed or are being considered to disperse diving birds that land on the waters of the Pit.*

Parties' Response: The Parties have revised Section 3.3, paragraph 3 to read as follows:

Active hazing is generally ineffective for fatigued waterfowl whose main defense is diving (i.e., grebes, loons, coots, diving ducks). Over-hazing these species may increase and/or prolong exposure to Pit water and increase negative biological effects. Diving waterfowl will be initially hazed, depending on other factors and variables; otherwise, waterfowl are left to rest until midday or dusk (whichever comes first). An important component to this Plan is training observation and hazing personnel to enable accurate identification of the different species and apply the species-specific hazing approach, known as precision hazing. Details on this strategy is further explained in WPP-SOP-03 Hazing Strategy provided in Appendix B.

10. Section 3.3.2: Firearms, sentence 3 - *It is mentioned that the use of firearms as an active hazing technique is dependent upon what species is present on the water. Please add further information about the species that this method is effective on (e.g., non-diving birds). In addition, if not already planned to be included in the forthcoming WPP SOP-03 Hazing Strategy, please consider adding a table that identifies commonly seen waterfowl on the Pit with hazing techniques that are appropriate for that species. This could be a useful quick reference for the waterfowl hazing crews.*

Parties' Response: The Parties have included a table in WPP-SOP-03 Hazing Strategy that outlines appropriate methods to be used on specific species. As more data are gathered during hazing efforts, the table will be updated to better define appropriate methods to be deployed.

11. Section 3.3.3: *The section states that pit water is likely tolerable to waterfowl in good physical condition. Because of the stress of migration, and the lack of studies on migration results after pit water ingestion, the United States Fish and Wildlife Service (USFWS) does not think that the scientific data exists to support this statement. Also, in this section, please include a description of obtaining the necessary permits for transport, treatment, and release of birds collected from the pit to off-site locations.*

Parties' Response: Studies reported in "Oral Toxicity of Berkeley Pit (Butte, Montana) Water to Snow Geese (*Chen caerulescens*)" Document Number 0480-375 (ENSR, 1996) indicate that waterfowl that were not in a stressed condition as a result of migration were less sensitive to the effects of exposure to Pit water.

No transport, treatment, and release of birds will be performed outside of the Clark Fork Basin Sites without appropriate permits.

12. Sections 2.0, 3.0 and 4.0: *Throughout these sections, the word "will" should be replaced with "shall" when describing affirmative obligations described in these sections. The WPP-SOP-01 SOP includes such language, which is also necessary, and the other SOPs being developed should also include use of the term "shall" in describing affirmative obligations and requirements.*

Parties' Response: The Parties have revised the Plan and associated SOPs to replace the word "will" with "shall" when describing affirmative obligations.

13. Section 6.3: *Data Management and Analysis - Does the data management and analysis include incorporating Pit water chemistry and pH data collected by Montana Bureau of Mines and Geology? Could this data be useful in determining future possible toxicity to waterfowl in the Pit if the chemistry changes?*

Parties' Response: The Parties believe that Pit water chemistry and pH data collected by MBMG is not directly related to hazing protocols and procedures. The Parties have and will continue to include MBMG data in the Settling Defendants Butte Mine Flooding Operable Unit (BMFOU) Quarterly Reports provided to the Agencies.

14. Appendix C: *Bird Guide to the Berkeley Pit, Table of Contents - "White-winged scoter - WWSC" should be marked as "(Unlikely)" to match the species account that appears later in Appendix C.*

Parties' Response: The Parties have revised and updated Appendix C: Bird Guide to the Berkeley Pit and will provide the Agencies with an updated version in the next submittal of this Plan.

15. Appendix C: *Bird Guide to the Berkeley Pit, species accounts - Several birds are listed as "Unlikely". These include greater white-front goose, cackling goose, surf scoter, white-winged scoter, red-breasted merganser, and horned grebe. Have these species been observed on Pit waters?*

Parties' Response: The Parties have revised Appendix C: Bird Guide to the Berkeley Pit and will provide the Agencies with an updated version in the next submittal of this Plan. The "Unlikely" category will be reviewed and updated as new data are obtained and as necessary. Surf scoter, white-winged scoter, and horned grebe species have been observed on the Pit water.

Summary Report

Evaluation of water samples and bird tissues
collected at the Berkeley Pit, Butte, Montana in December 2016

Prepared by:

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and
Christiane V. Löhr, Dr. med. vet., PhD, Diplomate ACVP

9 February 2018

Introduction

The Berkeley Pit is a former "open pit" copper mine located in Butte, Montana, that was mined from 1953 until 1982. Since discontinuing mining operations, surface and subsurface water sources have partially filled the pit creating an approximately 400-acre lake. The pit water is acidic and contains elevated concentrations of a variety of alkaline earth and transition metals, and metalloids, e.g., arsenic, cadmium, chromium, copper, nickel, vanadium, and zinc.

On 28 November 2016, a large number of snow geese (*Chen caerulescenes*) and Ross' geese (*Chen rossii*), estimated to number in the tens of thousands, landed on the Berkeley Pit. Over a period of several days, most of those birds left the Pit; however, between 2-12 December, a number of mortalities were observed in the Pit.

Sixteen snow geese, one Northern Shoveler, and one Mallard were collected from the north ramp of the Berkeley Pit and shipped to the USGS-National Wildlife Health Center (NWHC) for the determination of cause of death. Complete necropsies and postmortem examinations were conducted on 4 of the snow geese, the Northern Shoveler, and the Mallard (USGS 2017). The necropsy report concluded that:

"Death of snow geese 001-003, snow goose 007, and Northern Shoveler 013 is attributed to acute damage to oral, gastrointestinal, or respiratory mucosa. The findings in the examined snow geese and Northern shoveler are very similar to those described in the pathology reports from [a] snow goose mortality event at Berkley Pit investigated in 1995 and are suspected to be due to contact with contaminated water."

The necropsy report refers a 1995 mortality event, in which, 342 snow geese were found dead in the area of the Berkeley Pit. In response to that event, and to inform selection of potential mitigation strategies, a variety of on-site investigations and several laboratory-based toxicity studies were conducted in 1996 by Dr W. Stubblefield (ENSR 1996) to evaluate the toxicity of the water in Berkeley Pit. All toxicity tests were conducted using the snow goose (*Chen caerulescenes*), and included the following:

- Toxic effects when dosed with pit water by oral gavage at 1% body weight after fasting for 48 hours (USEPA Standard Method)
- Toxic effects when allowed *ad libitum* exposure to pit water for 31 hours after fasting for 48 hours
- Toxic effects when allowed *ad libitum* exposure to pit water for 3 days after fasting for 48 hours
- Toxic effects when allowed *ad libitum* exposure to pit water for 24 hours with no fasting

The methods and results for each of these four toxicity studies are outlined in the ENSR (1996) report that is attached hereto as Appendix [A], and referred to hereafter as "ENSR 1996."

In December 2016, we were asked to examine a sample of geese that died in the 2016 mortality event, and to compare the results of that examination to information developed in the 1996 Toxicity Studies. To conduct that evaluation, an additional 25 snow geese carcasses from the 2016 incident were collected and sent to the Oregon State University Veterinary Diagnostic Laboratory (OVDL) where gastrointestinal contents and select body tissues were excised and subsequently sent for metals and cyanide tissue residue analyses. All samples were sent to the ALS Environmental (Kelso, Washington; formerly Columbia Analytical Laboratories) where

analyses were conducted according to the laboratory's ISO and NELAP-approved methods and quality assurance program.

This report presents a summary of the results of our examination. Section One describes water sample compositional data collected from the Berkeley Pit at the time of the 2016 incident and shortly thereafter in May 2017. These recent samples are compared to water samples collected in 1995, at the time of the previous bird mortality event.

Section Two of this report contains our observations regarding the condition of the geese that we examined, as well as the laboratory residue analyses conducted on the tissues taken from the 25 geese received by the OSU-VDL. The report concludes that exposed geese are not likely to present a risk to people or wildlife that consume them.

Finally, Section Three summarizes published research and metal toxicity studies involving wild and domestic birds, including chickens, turkeys, ducks and geese. We compare the results of those studies to water chemistry results for the Berkeley Pit, and find that no single metal concentration in the pit exceeded the reported toxicity threshold for any of these species.

Because there is little research on the effects of the combination of metals and ionic compounds found in Pit water, we conclude the report with a discussion of issues that may warrant further evaluation.

1. Berkeley Pit water analysis (1995 - 2017)

On 19 February 1996, two "grab" samples of Berkeley Pit water, one collected 17 November 1995 and the other collected 13 February 1996, were submitted to Columbia Analytical Services (Kelso, Washington, now ALS Environmental) for determination of several water chemistry characteristics including a suite of metals. The resulting data was used to inform an evaluation of the pit water constituents and the potential toxicity of pit water to migrating ducks and geese.

During the mortality event that began late in 2016, on 7 December 2016, two additional samples of water were collected from the Berkeley Pit by representatives of the Montana Bureau of Mines and Geology (MBMG). These surface grab samples were collected near the pit edge and analyzed for a range of parameters including total and dissolved metals concentrations. The complete results of these analyses are presented in a Groundwater Information Center Water Quality Report dated 16 December 2016.¹ (attached as Appendix 1).

On 9 May 2017, two more samples of water were collected from the Berkeley Pit for analysis by MBMG. One surface grab sample was collected near the north edge of the pit, and a second sample was collected three feet below the surface in the same area. These samples were also analyzed for a range of parameters, including total and dissolved metal concentrations. The results of these analyses are presented in a Groundwater Information Center Water Quality Report dated 30 May 2017² (attached as Appendix 1).

¹ Ground-Water Information Center Water Quality Report, 16 December 2016; Sample ID 222284, 222285, 222286, 222287; Site ID 120678 ;Collected 7 Dec 2016

² Ground-Water Information Center Water Quality Report, 30 May 2017; Sample ID 222563, 222565, 222562, 222564; Site ID 120678 ;Collected 9 May 2017

We were asked to compare the 1995-96 water samples to the 2016-17 water samples, and to look for similarities as well as potentially significant differences. The results of our comparison are summarized in Table 1, and discussed below.

There are substantial differences in the concentrations of a number of metals in the 1995-96 samples, and in the 2016-17 samples, as shown in the graph in Figure 1. In some cases, metals concentrations are lower in the recent samples (e.g., Cu, Fe, Pb, Ar), while in other cases metals' concentrations are higher in the recent samples (e.g., Be, Co, Ti, Zn) (Figure 2). Concentrations of several "ionic" constituents such as Ca, Mg, Mn, K, and Na are also higher in recent samples (12-80%).

The observed differences in constituent concentrations warrant further study to determine whether the pit chemistry is likely to continue to change in the future, and if so, what the metal and ionic concentrations are likely to be in the future. As explained in Section Two of this report, a reduction in the concentration of some metals can reduce toxicity, while an increase in the concentration of other metals or ionic compounds may eventually increase toxicity, if those concentrations continue to increase over time.

Table 1. Berkeley pit water metals concentrations (µg/L)

ID		Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Bromide	Cadmium	Calcium	Cerium
1995											
Nov 1995	Total	342,000		57	8	64	216		2,400	457,000	
Feb 1996	Total	260,000		484	12	51	178		1,850	393,000	
Mean		301,000		271	10	58	197		2,125	425,000	
2016											
222284	Dissolved	317,300	<1.00	5.55	4.52	71.1	47.8	<50	2,152	484,340	1,037
222285	Total	335,325	<1.00	9.09	5.73	81.1	63.3	NR	2,415	476,730	1,131
222286	Dissolved	319,175	<1.00	6.42	4.93	61.8	51.8	<50	2,289	484,090	1,118
222287	Total	332,775	<1.00	9.20	6.01	79.7	62.7	NR	2,409	475,210	1,131
Total Mean		334,050		9.15	5.87	80.4	63.0		2,412	475,970	1,131
Total SD		1,803		0.08	0.20	1.0	0.4		4	1,075	0
2017											
222563	Dissolved	312,050	<1.00	4.7	6.96	61.9	29.1	<50.00	2,007	433,900	764
222565	Total	314,873	<1.00	7.23	7.24	60.9	23.8	NR	1,941	482,080	741
222562	Dissolved	311,091	<1.00	3.72	8.17	60.1	35.4	<50.00	1,924	418,700	734
222564	Total	312,153	<1.00	4.84	7.55	56.6	21.9	NR	1,892	479,730	695
Total Mean		312,542		5.12	7.48	59.9	27.5		1,941	453,603	734
Total SD		1,626		1.49	0.52	2.3	6.1		48.39	32,145	28

NR = no reading

Table 1 cont. Berkeley pit water metals concentrations (µg/L)

ID		Cesium	Chromium	Cobalt	Copper	Gallium	Lanthanum	Iron	Lead	Magnesium	Manganese
1995											
Nov 1995	Total		59	1,650	176,000			388,000	64	522,000	242,000
Feb 1996	Total		44	1,350	177,000			408,000	56	426,000	204,000
Mean			52	1,500	176,500			398,000	60	474,000	223,000
2016											
222284	Dissolved	<1.00	26.0	1,755	63,595	<1.00	251	10,674	26.8	627,570	284,600
222285	Total	<1.00	30.4	1,934	62,835	2.1	280	12,402	29.9	614,650	281,350
222286	Dissolved	<1.00	26.9	1,815	66,205	<1.00	276	11,687	27.9	625,900	280,300
222287	Total	<1.00	29.8	1,876	62,393	1.06	279	11,973	30.5	614,340	303,438
Total Mean			30.1	1,905	62,614		279	12,188	30.2	614,495	292,394
Total SD			0.4	41	312		1	303	0.5	219	15,619
2017											
222563	Dissolved	<1.00	26.43	1,644	59,070	<1.00	261	8,146	30.2	557,800	267,700
222565	Total	<1.00	27.11	1,762	59,077	<1.00	246	9,123	32.1	613,580	267,581
222562	Dissolved	<1.00	25.86	1,547	57,720	<1.00	252	8,421	42	538,600	258,000
222564	Total	<1.00	25.46	1,739	58,436	<1.00	187	9,969	42	615,330	263,443
Total Mean			26.22	1,673	58,575		236	8,915	37	581,328	264,181
Total SD			0.72	98.32	644		34	814	6	39,054	4,571

Table 1 cont. Berkeley pit water metals concentrations (µg/L)

ID		Lithium	Mercury	Molybdenum	Nickel	Niobium	Neodymium	Palladium	Praseodymium	Rubidium	Potassium
1995											
Nov 1995	Total		ND	ND	1,370						6,960
Feb 1996	Total		ND	ND	1,030						4,340
Mean					1,200						5,650
2016											
222284	Dissolved	326.4	NR	1.9	1,289.3	<1.00	442.4	27.50	100.8	52.27	9,470
222285	Total	337.5	NR	18.9	1,421.9	<1.00	489.8	31.64	111.3	60.01	10,020
222286	Dissolved	333.1	NR	2.8	1,355.2	<1.00	474.9	28.73	109.2	52.95	10,500
222287	Total	331.4	NR	17.8	1,423.2	<1.00	491.2	30.52	111.9	60.01	10,700
Total Mean		334		18.4	1,423		491	31.1	112	60.0	10,360
Total SD		4		0.7	1		1	0.8	0	0.0	481
2017											
222563	Dissolved	264.2	NR	1.82	1,217	<1.00	432.04	25.47	77.92	53.23	11,080
222565	Total	320.4	NR	5	1,387	<1.00	329.44	24.64	78.07	5416	11,150
222562	Dissolved	241.9	NR	3.79	1,169	<1.00	323.72	25.35	76.84	47.18	9,570
222564	Total	309.9	NR	6.43	1,366	<1.00	305.81	25.88	72.99	54.54	10,830
Total Mean		284		4.26	1,285		348	25	76	1393	10,658
Total SD		37		1.95	107		57	1	2	2682	738

Table 1 cont. Berkeley pit water metals concentrations (µg/L)

ID		Selenium	Silver	Sodium	Strontium	Thallium	Thorium	Tin	Titanium	Tungsten	Uranium
1995											
Nov 1995	Total		ND	69,600	1,450				10		
Feb 1996	Total		ND	54,000	1,160				13		
Mean				61,800	1,305				12		
2016											
222284	Dissolved	18.46	<1.00	74,120	1,275	<1.00	59.39	<1.00	64.18	<1.00	790
222285	Total	28.02	NR	73,250	1,344	4.24	60.93	<1.00	74.29	<1.00	889
222286	Dissolved	18.67	<1.00	75,020	1,300	<1.00	66.20	<1.00	68.67	<1.00	860
222287	Total	27.10	NR	73,930	1,324	<1.00	61.54	<1.00	79.13	<1.00	890
Total Mean		27.56		73,590	1335	4.24	61.2		76.7		890
Total SD		0.65		481	14		0.4		3.4		1
2017											
222563	Dissolved	18.77	<1.00	71,140	1,133	<1.00	57.33	<1.00	88.33	<1.00	731
222565	Total	20.53	NR	70,330	1,178	<1.00	54.57	<1.00	69.65	<1.00	718
222562	Dissolved	18.84	<1.00	66,830	1,068	<1.00	57.93	<1.00	100.96	<1.00	753
222564	Total	20.88	NR	71,450	1,177	<1.00	54.09	<1.00	68.95	<1.00	707
Total Mean		20		69,938	1,139	#DIV/0!	56		81.97		728
Total SD		1		2,125	52	#DIV/0!	2		15.52		20

Table 1 cont. Berkeley pit water metals concentrations (µg/L)

ID		Vanadium	Zinc
1995			
Nov 1995	Total	ND	533,000
Feb 1996	Total	29	428,000
Mean		29	480,500
2016			
222284	Dissolved	<1.00	615,450
222285	Total	<1.00	630,300
222286	Dissolved	<1.00	617,000
222287	Total	<1.00	623,300
Total Mean		<1.00	626,800
Total SD			4,950
2017			
222563	Dissolved	<1.00	581,800
222565	Total	<1.00	599,499
222562	Dissolved	<1.00	5677,00
222564	Total	<1.00	596,681
Total Mean			586,420
Total SD			14,698

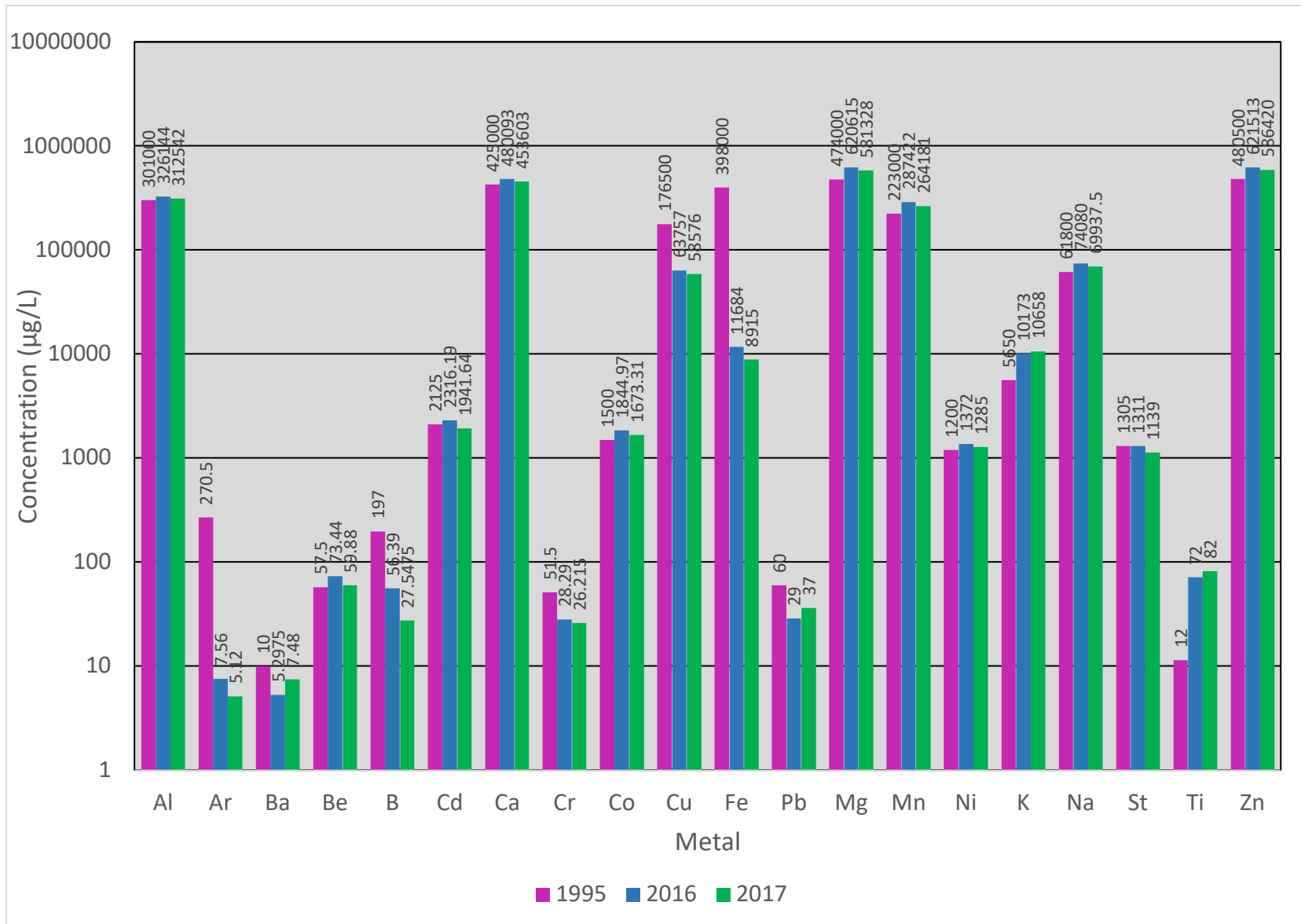


Figure 1. Metals concentrations measured in Berkeley Pit water (1995 - 2017).

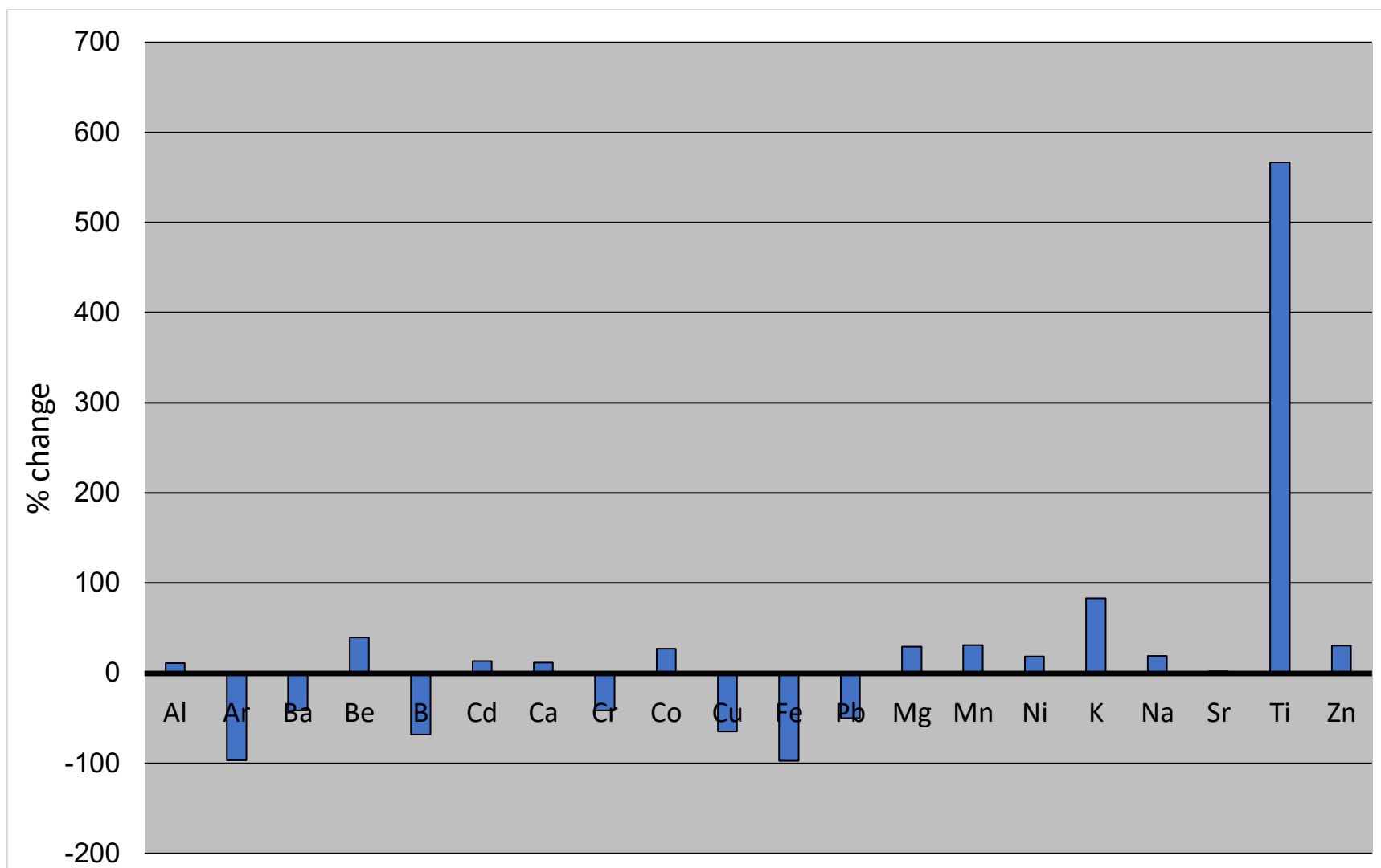


Figure 2. Berkeley Pit water constituents (% change 1995 to 2016)

2. Examination and metals analyses obtained from birds that died in the 2016 incident

On 20 December 2016 the OVDL received a total of 25 snow geese carcasses that had been collected from the Berkeley Pit. Collection, transport, and handling of all birds was covered under Montana Fish Wildlife and Parks Scientific Collector's Permit #2016-113-W and USFWS Scientific Collection Permit MB14733C-0. Conditions of the USFWS permit limited OVDL to only collect tissues for the purpose of determination of metals tissues residues, specifically the permit limitations stated:

"... Oregon State University College of Veterinary Medicine Pathology Laboratory are not authorized to conduct necropsies or postmortem evaluations for the purpose of determining cause of death, or any postmortem carcass analysis for purposes other than collecting and preparing tissue/organ samples to be shipped to ALS laboratory for assessment of risks to human health, safety, and evaluate potential risks to pets and wildlife."

Additional conditions of the permit required the analysis of metals/analytes designated in the superfund contract laboratory program list³, and the tissues for analysis were limited to breast, thigh, leg and organs (including liver and kidney).

Table 2 provides the unique bird identification designations as well as the weight, sex and body condition of each of the snow geese received by OVDL. Tissues collected by OVDL and sent to ALS laboratories for analysis of the required analytes are reflected in Table 3 (raw data in Appenidix B). Birds were observed and standard scores made regarding the general "body condition" of the birds at the time dissection was done to remove the tissues for metal analyses. In general, the birds were judged to be in "moderate" condition; however, a few were judged to be in "fair" body condition (Table 2). In contrast, all of the birds submitted to NWHC for necropsy were judged to be in "good" or "excellent" body condition with adequate to abundant adipose tissue (USGS 2017).

Although the terms of the Scientific Collection Permit did not allow OVDL staff to conduct post-mortem examinations of the collected bird carcasses, Dr. Christiane Löhr, of the OVDL, was permitted to go to the NWHC (Madison, WI) to review the necropsy documentation and the prepared slides to verify the findings described in the NWHC pathology report. In general, Dr Löhr's findings were consistent with the observations and interpretation contained in the NWHC report. Dr Löhr's report is attached as Appendix A.

Metals tissue concentrations in each of the designated tissues of the birds sent to OVDL are presented in Tables 4-10. Mercury and cyanide concentrations are reported separately in Tables 11 and 12, respectively. ALS Environmental reports are contained in Appendix B. As expected, owing to their high blood perfusion and metabolic role, the highest metals concentrations were generally observed in liver and kidney tissues. Muscle tissues (breast and thigh) and gastrointestinal (G.I.) tract tissues were, for the most part, substantially lower. Cyanide concentrations were low and unremarkable across all tissues examined (Table 12).

³ Aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, vanadium, zinc, mercury, and cyanide.

Table 2. Bird Identification, weight, sex and body condition of snow geese received by Oregon State Veterinary Pathology Laboratory from Berkeley Pit on 20 December 2016.

ID	Weight (g)	Sex (m/f)	Body condition	Body condition score ¹
16-1	1772	m	Thin	1
16-2	2475	m	well-muscled	3
16-3	1964	m	well-muscled	3
16-4	2419	m	well-muscled	3
16-5	2887	m	moderate	2
16-6	1893	m	moderate	2
16-7	2317	f	moderate	2
16-8	2518	m	moderate	2
16-9	2274	f	Fair	2
16-10	2521	m	Fair	2
16-11	2152	m	moderate	2
16-12	1864	f	moderate	2
16-13	2170	f	moderate	2
16-14	1941	f	moderate	2
16-15	1973	m	moderate	2
16-16	2532	f	moderate	2
16-17	2624	m	Fair	2
16-18	2445	m	moderate	2
16-19	2418	f	moderate	2
16-20	2197	m	moderate	2
16-21	1537	f	moderate	2
16-22	1741	m	Fair	2
16-23	1853	f	Fair	2
16-24	1795	m	moderate	2
16-25	1838	m	Thin	1

¹ Body condition score breakdown:

Score = 1 Severely emaciated. Minimal palpable muscle mass over keel. Likely in critical condition.

Score = 2 Adequate condition to slightly thin. Moderate muscle mass with keel easily palpated. Often seen in normal conditions.

Score = 3 Excellent body condition. Convex curvature. Keel apex palpable.

Table 3. Tissues collected and sent to ALS Laboratories on 28 December 2016 for analysis of metals and cyanide tissue concentrations.

ID	Liver	Kidney	GI tract	GI contents	Breast muscle	Thigh muscle	Bone (including marrow)
16-1	x	x	x	x	X	X	x
16-2	x	x	x	x	X	X	x
16-3	x	x	x	x	X	X	x
16-4	x	x	x	x	X	X	x
16-5	x	x	x	x	X	X	x
16-6	x	x	x	x	X	X	x
16-7	x	x	x	x	X	X	x
16-8	x	x	x	x	X	X	x
16-9	x	x	x	x	X	X	x
16-10	x	x	x	x	X	X	x
16-11	x	x	x	x	X	X	x
16-12	x	x	x	x	X	X	x
16-13	x	x	x	x	X	X	x
16-14	x	x	x	x	X	X	x
16-15	x	x	x	x	X	X	x
16-16	x	x	x	x	X	X	x
16-17	x	x	x	x	X	X	x
16-18	x	x	x	x	X	X	x
16-19	x	x	x	x	X	X	x
16-20	x	x	x	x	X	X	x
16-21	x	x	x	x	X	X	x
16-22	x	x	x	x	X	X	x
16-23	x	x	x	x	X	X	x
16-24	x	x	x	x	X	X	x
16-25	x	x	x	x	X	X	x

Table 4. Liver tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit

ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
16-1	7.90	0.434	0.03 J	0.086	0.003 J	4.01	566	0.970	0.996	129	3450
16-2	13.90	0.163	0.05 J	0.127	0.005 J	3.95	451	0.480	1.090	165	1470
16-3	3.40	0.151	0.03 J	0.901	0.003 U	7.80	418	0.230	0.273	138	3350
16-4	11.60	0.112	0.04 J	0.128	0.003 J	2.99	658	0.210	1.510	94	1510
16-5	6.90	0.035 J	0.02 J	0.072	0.003 J	5.82	604	0.170 J	1.240	153	1720
16-6	2.60	0.040 J	0.02 J	0.247	0.003 U	4.59	312	0.200	0.319	120	2570
16-7	6.50	0.043 J	0.02 J	0.153	0.003 U	3.74	572	0.120 J	1.200	67	1490
16-8	6.40	0.023 J	0.37 J	0.087	0.003 U	5.18	615	0.170 J	1.520	112	1620
16-9	10.70	0.069	0.04 J	0.091	0.005 J	3.65	531	0.200	1.620	160	1440
16-10	4.50	0.075	0.02 U	0.112	0.003 U	9.95	395	0.290	0.504	281	2180
16-11	16.20	0.046 J	0.03 J	0.088	0.005 J	10.70	388	0.110 J	0.672	277	4200
16-12	3.90	0.019 J	0.03 J	0.158	0.003 U	8.86	284	0.100 J	0.471	236	2340
16-13	8.70	0.062	0.03 J	0.102	0.003 U	4.83	338	0.140 J	0.625	125	2630
16-14	27.80	0.045 J	0.03 J	0.103	0.012 J	10.60	476	0.320	1.390	201	4700
16-15	2.80	0.020 J	0.04 J	0.094	0.003	11.60	252	0.120 J	0.352	197	4380
16-16	15.50	0.024 J	0.08 J	0.178	0.004 J	4.52	447	0.090 J	1.300	135	2220
16-17	12.90	0.023 J	0.02 U	0.036 J	0.003 U	3.53	356	0.080 J	1.070	93	1670
16-18	12.70	0.084	0.03 J	0.073	0.009 J	4.11	410	0.200	1.170	75	1900
16-19	4.60	0.041 J	0.03 J	0.123	0.003 U	4.37	316	0.160 J	0.653	104	1680
16-20	17.00	0.135	0.03 J	0.101	0.008 J	7.54	644	0.170 J	1.430	230	2540
16-21	3.90	0.200	0.03 J	0.073	0.003 U	13.70	283 N	0.240	0.425	431	2700
16-22	3.50	0.096	0.03 J	0.160	0.003 U	7.07	228 N	0.100 J	0.262	158	2340
16-23	3.40	0.076	0.02 U	0.149	0.003 U	7.02	296 N	0.110 J	0.233	103	3040
16-24	2.50	0.065	0.02 U	0.151	0.003 U	6.46	291 N	0.100 J	0.211	145	2170
16-25	7.30	0.087	0.03 J	0.166	0.003 U	8.32	361 N	0.150 J	0.184	54	4820
Mean	8.68	0.087	0.045	0.150	0.004	6.60	420	0.209	0.829	159	2565
SD	6.12	0.087	0.069	0.163	0.002	2.95	131	0.181	0.492	83	1044

U = The analyte was not detected ("non-detect") at or above the MRL/MDL. Reported as the MDL.

J = The result is an estimated value.

N = The Matrix Spike sample recovery is not within control limits. See case narrative.

* = The result is an outlier. See case narrative.

Table 4 cont. Liver tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit

ID	Lead	Magnesium	Manganese	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
16-1	0.041	1010	122.0	1.10	11000	4.30	0.042	3790	0.001 J	0.042 J	1270
16-2	0.034	861	88.1	0.78	9740	3.10	0.061	2370	0.002 J	0.036 J	465
16-3	0.150	790	22.9	0.14 J	11000	5.80	0.019	3680	0.001 U	0.040 J	1410
16-4	0.083	1120	184.0	1.09	9240	5.50	0.025	1910	0.014 J	0.065 J	552
16-5	0.053	1070	139.0	0.90	9160	6.60	0.014 J	2670	0.002 J	0.039 J	1050
16-6	0.073	848	32.9	0.20	10800	5.30	0.011 J	2780	0.001 J	0.033 J	931
16-7	0.113	975	144.0	0.73	9890	4.10	0.005 U	2360	0.001 U	0.024 J	460
16-8	0.092	1030	153.0	1.01	8520	4.70	0.037	2090	0.001 U	0.103 J	601
16-9	0.038	1100	170.0	1.12	10100	6.00	0.042	1970	0.003 J	0.024 J	548
16-10	0.165	859	61.2	0.40	10500	6.00	0.026	3040	0.003 J	0.036 J	975
16-11	0.103	859	78.1	0.40	10300	5.80	0.027	3510	0.001 U	0.061 J	1690
16-12	0.042	702	74.8	0.23	9230	5.10	0.042	3470	0.003 J	0.045 J	781
16-13	0.094	758	70.2	0.42	9280	5.30	0.022	2860	0.001 U	0.041 J	555
16-14	0.192	1070	171.0	1.06	10100	5.50	0.023	3630	0.010 J	0.081 J	2000
16-15	0.191	758	18.7	0.12 J	10600	5.70	0.016 J	3330	0.001 U	0.181 J	1470
16-16	0.181	1060	164.0	0.81	10700	5.30	0.049	2550	0.001 U	0.050 J	561
16-17	0.070	930	133.0	0.69	9320	5.90	0.02	2320	0.001 U	0.019 J	487
16-18	0.104	867	126.0	0.85	8400	4.60	0.023	1790	0.002 J	0.048 J	503
16-19	0.091	843	97.0	0.44	10700	4.90	0.033	2260	0.001 U	0.075 J	355
16-20	0.056	1000	186.0	1.03	8210	3.50	0.021	2780	0.004 J	0.049 J	1150
16-21	0.030	755	42.6	0.23	10900	5.70	0.059	3740	0.001 U	0.101 J	1160
16-22	0.066	812	18.6	0.10 J	11400	5.30	0.023	2960	0.003 J	0.061 J	1140
16-23	0.095	772	15.2	0.06 J	11500	4.60	0.016 J	3560	0.001 U	0.067 J	1360
16-24	0.563	662	41.6	0.12 J	9390	5.30	0.016 J	3230	0.001 U	0.042 J	526
16-25	0.266	744	11.0	0.10 J	9830	4.90	0.007 J	3350	0.001 U	0.119 J	1390
Mean	0.119	890	94.6	0.57	9992	5.15	0.027	2880	0.002	0.059	936
SD	0.110	136	59.7	0.39	928	0.81	0.015	630	0.003	0.036	453

U = The analyte was not detected ("non-detect") at or above the MRL/MDL. Reported as the MDL.

J = The result is an estimated value.

N = The Matrix Spike sample recovery is not within control limits. See case narrative.

* = The result is an outlier. See case narrative.

Table 5. Kidney tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit

ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
16-1	43.8	0.180	0.02 J,N	1.35	0.009 J	6.58	1090	0.59	0.74	49.5	364
16-2	19.2	0.037 J	0.02 J,N	0.28	0.004 J	2.38	533	0.29	0.89	29.0	582
16-3	11.8	0.059	0.02 U,N	2.28	0.007 J	9.22	2060	0.27	0.39	41.6	482
16-4	27.5	0.124	0.02 U,N	0.45	0.007 J	1.89	1080	0.31	0.48	20.4	510
16-5	16.9	0.030 J	0.02 U,N	0.58	0.005 J	12.10	608	0.82	0.79	55.3	381
16-6	6.0	0.053	0.02 U,N	0.42	0.003 U	5.32	748	0.30	0.71	44.1	434
16-7	8.4	0.056	0.02 J,N	0.80	0.003 J	3.99	1210	0.43	0.78	26.1	837
16-8	32.0	0.019 J	0.03 J,N	1.70	0.007 J	2.73	1730	1.39	1.20	19.9	428
16-9	14.3	0.045 J	0.03 J,N	1.80	0.003 U	3.83	2260	0.35	0.97	34.6	710
16-10	13.5	0.019 J	0.02 U,N	0.39	0.003 U	3.73	565	0.26	0.31	16.7	293
16-11	34.9	0.011 J	0.02 J,N	0.54	0.012 J	11.00	871	0.35	0.97	42.4	353
16-12	6.6	0.050	0.02 U,N	1.17	0.003 J	7.85	853	0.16 J	0.54	45.1	391
16-13	20.4	0.085	0.04 J,N	1.34	0.006 J	3.76	2230	0.35	0.74	18.3	543
16-14	29.1	0.048 J	0.02 J,N	0.69	0.008 J	6.62	580	0.29	0.29	47.8	140
16-15	11.0	0.015 J	0.02 J,N	2.49	0.011 J	12.60	1880	0.16 J	0.59	64.6	370
16-16	17.1	0.054	0.08 J,N	1.12	0.003 U	3.35	1350	0.15 J	0.55	27.4	620
16-17	11.8	0.021 J	0.02 U,N	1.31	0.004 J	5.42	1980	0.29	0.53	22.8	779
16-18	21.1	0.036 J	0.02 U,N	1.79	0.003 U	3.06	2560	0.45	0.51	15.1	510
16-19	8.0	0.073	0.02 U,N	0.76	0.003 U	5.88	1610	0.19	0.74	16.1	704
16-20	26.0	0.057	0.02 U,N	1.21	0.009 J	5.90	1660	0.32	1.05	58.7	932
16-21	5.4	0.041 J	0.02 J	0.77	0.003 U	11.20	884 N	0.21	0.48	34.0	301
16-22	8.2	0.009 J	0.02 U	0.68	0.003 U	5.44	537 N	0.17 J	0.24	30.3	405
16-23	7.8	0.021 J	0.02 J	0.61	0.003 U	8.47	502 N	0.24	0.20	23.1	401
16-24	4.0	0.055	0.02 U	0.82	0.003 U	7.36	729 N	0.23	0.31	35.1	565
16-25	8.5	0.091	0.02 U	0.54	0.003 U	9.68	567 N	0.43	0.26	31.2	889
Mean	16.5	0.052	0.024	1.04	0.005	6.37	1227	0.36	0.61	34.0	517
SD	10.5	0.038	0.013	0.60	0.003	3.17	652	0.26	0.28	14.1	200

U = The analyte was not detected ("non-detect") at or above the MRL/MDL. Reported as the MDL.

J = The result is an estimated value.

N = The Matrix Spike sample recovery is not within control limits. See case narrative.

* = The result is an outlier. See case narrative.

Table 5 cont. Kidney tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit

ID	Lead	Magnesium	Manganese	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
16-1	0.092	785	77.6	0.65	10300	6.3 N	0.016 J	4830	0.006 J	0.090 J	2670
16-2	0.058	584	81.5	0.77	6830	1.8 N	0.006 U	2150	0.001 U	0.010 J	255
16-3	0.108	895	62.1	0.16 J	10200	5.4 N	0.006 U	5140	0.002 J	0.050 J	1290
16-4	0.114	657	142.0	0.53	6770	2.5 N	0.006 U	1970	0.017 J	0.032 J	235
16-5	0.160	715	73.9	0.97	9090	4.9 N	0.006 U	4040	0.005 J	0.048 J	688
16-6	0.106	744	72.3	0.66	8140	3.6 N	0.006 U	3490	0.001 J	0.024 J	491
16-7	0.237	875	259.0	0.97	8380	3.1 N	0.006 U	2830	0.001 J	0.024 J	241
16-8	0.154	907	401.0	1.23	7030	2.9 N	0.006 U	2020	0.001 U	0.056 J	292
16-9	0.107	1090	424.0	0.97	9850	4.2 N	0.006 U	3000	0.002 J	0.031 J	332
16-10	0.157	374	69.6	0.27	4460	2.6 N	0.006 U	1920	0.001 J	0.019 J	378
16-11	0.176	823	106.0	0.56	8120	5.4 N	0.010 J	4640	0.005 J	0.071 J	1200
16-12	0.064	735	144.0	0.39	7590	4.2 N	0.006 U	3750	0.012 J	0.037 J	633
16-13	0.142	1010	259.0	0.72	8440	3.4 N	0.006 U	3620	0.004 J	0.051 J	375
16-14	0.225	486	39.1	0.25	5710	3.0 N	0.006 U	2370	0.016 J	0.035 J	909
16-15	0.249	942	154.0	0.26	10000	4.2 N	0.006 U	4580	0.005 J	0.092 J	722
16-16	0.255	825	236.0	0.53	7450	2.9 N	0.006 U	2380	0.004 J	0.061 J	245
16-17	0.170	910	326.0	0.57	9110	4.2 N	0.006 U	3130	0.001 U	0.019 J	348
16-18	0.177	841	288.0	0.53	7430	3.3 N	0.006 U	2740	0.004 J	0.059 J	207
16-19	0.177	1040	327.0	0.64	9600	3.3 N	0.006 U	3670	0.002 J	0.038 J	283
16-20	0.083	928	202.0	0.88	8440	3.2 N	0.006 U	3270	0.003 J	0.032 J	766
16-21	0.041	659	105.0	0.30	7720	5.0	0.006 U	3480	0.009 J	0.033 J	1130
16-22	0.104	468	44.0	0.17 J	6540	2.6	0.006 U	2960	0.007 J	0.033 J	380
16-23	0.131	489	29.7	0.15 J	7030	3.0	0.006 U	3520	0.002 J	0.044 J	432
16-24	0.737	558	65.1	0.21	7290	3.8	0.006 U	3730	0.002 J	0.032 J	450
16-25	0.409	728	15.5	0.24	9580	4.1	0.006 U	4220	0.005 J	0.127 J	724
Mean	0.177	763	160.1	0.543	8044	3.72	0.007	3338	0.005	0.046	627
SD	0.141	192	121.5	0.304	1466	1.07	0.002	921	0.005	0.027	530

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J = The result is an estimated value.

N = The Matrix Spike sample recovery is not within control limits. See case narrative.

* = The result is an outlier. See case narrative.

Table 6. Gastrointestinal tract tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit

ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
16-1	464 N	0.049	0.18 J	3.8 *	0.085	2.40	591	48.1	1.82	57	534
16-2	387 N	0.253	0.22 J	9.0 *	0.084	2.16	505	31.9	1.53	81	503
16-3	208 N	0.467	0.12 J	2.6 *	0.047	1.55	343	49.2	1.04	33	654
16-4	819 N	0.002 U	0.26 J	5.2 *	0.168	2.75	614	28.3	1.87	154	539
16-5	999 N	0.002 U	0.17 J	2.9 *	0.233	3.79	846	21.6	2.09	135	519
16-6	678 N	0.002 U	0.16 J	4.1 *	0.174	3.77	942	22.8	1.63	130	547
16-7	775 N	0.002 U	0.13 J	2.3 *	0.165	2.91	515	36.8	1.89	124	510
16-8	582 N	0.006 J	0.43 J	13.0 *	0.105	1.86	560	66.7	2.01	82	876
16-9	752 N	0.002 J	0.18 J	2.8 *	0.145	2.95	516	37.0	1.96	119	488
16-10	667 N	0.002 U	0.12 J	2.5 *	0.151	3.34	435	23.7	1.14	65	468
16-11	715 N	0.008 J	0.23 J	7.5 *	0.159	4.66	660	90.2	2.60	133	794
16-12	1770 N	0.003 J	0.30 J	3.3 *	0.448	6.13	699	51.6	2.81	225	624
16-13	837 N	0.011 J	0.16 J	4.1 *	0.194	2.91	595	45.2	2.20	116	547
16-14	269 N	0.012 J	0.62	6.4 *	0.047	1.00	350	34.6	0.89	40	697
16-15	871 N	0.010 J	0.47 J	12.1 *	0.268	3.71	547	123.0	2.38	97	1230
16-16	914 N	0.007 J	0.51	2.2 *	0.201	3.11	541	26.9	1.84	149	496
16-17	968 N	0.030 J	0.59	12.0 *	0.192	2.93	689	96.3	2.90	136	921
16-18	1140 N	0.019 J	0.29 J	4.3 *	0.261	5.01	841	77.0	3.30	155	837
16-19	850 N	0.003 J	0.16 J	15.7 *	0.182	2.57	477	50.4	1.92	135	604
16-20	642 N	0.002 J	0.24 J	5.9 *	0.171	3.38	686	62.7	1.95	109	712
16-21	1940	0.026 J	0.26 J	5.1	0.471	5.68	790 N	45.9	2.26	196	584
16-22	346	0.007 J	0.26 J	5.0	0.057	1.27	549 N	55.9	1.05	34	1030
16-23	1170	0.008 J	0.35 J	13.8	0.268	2.60	567 N	126.0	1.81	118	1090
16-24	1060	0.007 J	0.28 J	14.2	0.180	1.91	399 N	119.0	1.83	108	1080
16-25	2310	0.013 J	0.36 J	14.3	0.054	0.76	1030 N	209.0	2.43	39	1360
Mean	885	0.038	0.282	7.0	0.180	3.00	611	63.2	1.97	111	730
SD	499	0.102	0.143	4.6	0.107	1.35	174	43.8	0.59	49	257

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N = The Matrix Spike sample recovery is not within control limits. See case narrative.

* = The result is an outlier. See case narrative.

Table 6 cont. Gastrointestinal tract tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit

ID	Lead	Magnesium	Manganese	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
16-1	0.160	861	133	22.0	8310	1.6	0.016 J	2540	0.001 U	0.65	644
16-2	0.188	814	143	14.1	8920	1.3	0.007 J	2410	0.001 J	0.48	618
16-3	0.503	481	35	25.3	6880	2.0	0.006 U	2800	0.001 U	0.57	416
16-4	0.381	887	210	13.0	8070	1.8	0.006 J	1760	0.010 J	0.55	791
16-5	0.409	969	287	10.3	7710	1.9	0.006 U	2640	0.001 J	0.47	1080
16-6	1.790	667	245	10.4	5970	1.7	0.012 J	2050	0.001 U	0.25	903
16-7	0.281	853	210	16.1	8210	1.2	0.006 U	2630	0.001 U	0.39	756
16-8	0.306	964	174	29.1	6790	1.5	0.013 J	1880	0.002 J	1.64	554
16-9	0.734	891	217	16.6	8200	1.8	0.008 J	2010	0.001 U	0.42	750
16-10	0.295	630	147	10.4	6850	1.8	0.006 U	2410	0.001 U	0.51	762
16-11	0.288	727	242	38.6	5350	1.7	0.006 U	2950	0.004 J	1.12	954
16-12	0.407	933	354	22.8	6070	2.0	0.006 U	2620	0.003 J	0.63	1760
16-13	0.284	1010	267	20.3	7290	1.5	0.010 J	2560	0.001 J	0.69	906
16-14	0.379	476	69	14.7	4680	1.2	0.017 J	1360	0.003 J	1.64	277
16-15	0.818	575	160	51.5	5460	1.6	0.012 J	2100	0.003 J	1.70	1010
16-16	0.447	887	233	12.4	7180	1.5	0.008 J	1860	0.002 J	0.51	860
16-17	1.560	1130	257	41.6	7430	1.8	0.018 J	1800	0.002 J	1.74	787
16-18	0.629	1050	355	33.7	7890	1.5	0.006 J	2360	0.003 J	1.15	1280
16-19	0.342	853	183	22.0	8800	1.9	0.006 U	2190	0.002 J	0.54	747
16-20	0.289	875	215	27.3	7330	1.1	0.006 U	2340	0.003 J	0.89	1040
16-21	0.539	843	335	20.0	7940	1.6	0.007 J	2960	0.002 J	0.50	1620
16-22	0.663	556	85	23.5	5980	1.2	0.006 U	1880	0.004 J	0.94	376
16-23	0.448	432	76	53.0	5360	1.3	0.006 U	2420	0.003 J	1.24	714
16-24	0.309	581	101	49.3	6250	1.9	0.008 J	2610	0.001 U	1.22	595
16-25	0.296	426	30	87.9	4960	1.4	0.360	2630	0.003 J	2.17	291
Mean	0.510	775	190	27.4	6955	1.59	0.023	2311	0.002	0.90	820
SD	0.388	205	93	18.1	1228	0.27	0.070	407	0.002	0.53	358

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J = The result is an estimated value.

N = The Matrix Spike sample recovery is not within control limits. See case narrative.

* = The result is an outlier. See case narrative.

Table 7. Gastrointestinal tract contents tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit

ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
16-1	944	0.095 N	22.1	23.6 *	0.154	1.68 N	668	54.0 N,*	2.33 *	73	3200 *
16-2	831	0.002 U,N	0.5	28.0 *	0.076	0.29 N	675	0.6 N,*	0.70 *	87	1390 *
16-3	797	0.007 J,N	1.2	18.4 *	0.096	1.17 N	465	45.7 N,*	0.91 *	59	1090 *
16-4	533	0.006 J,N	1.0	24.5 *	0.065	0.35 N	193	1.0 N,*	0.59	40	2110 *
16-5	3450	0.005 J,N	0.7	13.2 *	0.668	4.38 N	1110	12.7 N,*	3.15 *	304	1280 *
16-6	1970	0.012 J,N	1.1	23.4 *	0.430	4.31 N	1260	131 N,*	2.77 *	256	1280 *
16-7	922	0.007 J,N	0.8	20.6 *	0.123	1.18 N	384	158 N,*	2.70 *	88	1920 *
16-8	1000	0.007 J,N	1.8	44.0 *	0.106	0.71 N	457	55.5 N,*	1.67 *	54	2370 *
16-9	2170	0.006 J,N	1.1	18.8 *	0.350	2.31 N	551	46.9 N,*	1.91 *	181	1440 *
16-10	1320	0.007 J,N	1.2	23.4 *	0.231	1.31 N	224	21.9 N,*	0.87 *	60	1050 *
16-11	2520	0.003 J,N	0.5	14.6 *	0.389	3.12 N	2380	1.0 N,*	2.14 *	283	764 *
16-12	5290	0.007 J,N	2.6	13.6 *	1.040	4.81 N	812	105 N,*	4.05 *	508	1530 *
16-13	2460	0.047 J,N	1.5	13.1 *	0.324	3.07 N	876	1.5 N,*	3.15 *	253	1610 *
16-14	324	0.002 J,N	1.1	11.4 *	0.031	0.52 N	2680	0.8 N,*	0.50 *	28	811 *
16-15	4690	0.023 J,N	2.1	29.5 *	0.747	3.97 N	1080	123 N,*	3.32 *	513	2000 *
16-16	1120	0.004 J,N	1.4	17.0 *	0.097	0.47 N	377	1.6 N,*	1.01 *	72	1100 *
16-17	1280	0.005 J,N	0.8	23.5 *	0.192	1.70 N	599	36.1 N,*	2.79 *	105	813 *
16-18	1350	0.005 J,N	1.1	17.3 *	0.168	1.20 N	387	44.0 N,*	1.49 *	85	2460 *
16-19	1230	0.004 J,N	1.0	20.0 *	0.171	0.98 N	589	11.1 N,*	1.11 *	122	943 *
16-20	1540	0.004 J,N	1.0	10.0 *	0.323	5.85 N	1540	1.3 N,*	2.47 *	232	1220 *
16-21	13600	0.015 J	2.5	8.4	2.220	13.80	1930	19.3	5.50	654	1220
16-22	1440	0.006 J	1.0	9.8	0.118	1.25	1150	4.7	1.13	34	2250
16-23	4660	0.026 J	1.4	21.1	0.814	5.29	2810	32.0	1.83	387	1050
16-24	4950	0.004 J	1.1	21.1	0.745	4.08	1150	46.0	2.32	249	1170
16-25	4360	0.003 J	1.2	39.3	0.075	0.51	1120	57.5	0.89	42	1120
Mean	2590	0.012	2.1	20.3	0.390	2.73	1019	40.5	2.05	191	1488
SD	2755	0.020	4.2	8.6	0.472	2.88	738	44.9	1.22	173	612

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J = The result is an estimated value.

N = The Matrix Spike sample recovery is not within control limits. See case narrative.

* = The result is an outlier. See case narrative.

Table 7 cont. Gastrointestinal tract contents tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit

ID	Lead	Magnesium	Manganese	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
16-1	1.70	549	139	24.2 *	3090	1.0	0.021	917	0.006 J	1.75	478
16-2	0.76	538	41	1.0 *	924	0.2 J	0.022	208	0.010 J	2.23	101
16-3	1.01	283	46	20.0 *	1970	0.5 J	0.013 J	636	0.007 J	1.94	207
16-4	0.55	197	76	1.1 *	1050	0.4 J	0.011 J	181	0.011 J	1.72	90
16-5	1.14	1820 *	467	5.5 *	4570	1.5	0.018 J	1430	0.008 J	1.74	1610
16-6	6.34	498	322	57.8 *	3290	1.0	0.042	1000	0.009 J	1.78	1180
16-7	0.64	375	137	68.3 *	2810	0.5 J	0.009 J	716	0.009 J	2.01	366
16-8	0.92	401	77	25.5 *	1380	0.3 J	0.033	325	0.011 J	4.71	210
16-9	1.83	564	208	20.6 *	3340	0.9 J	0.015 J	734	0.008 J	2.10	842
16-10	1.18	224	74	9.9 *	983	0.5 J	0.007 J	270	0.006 J	1.99	387
16-11	0.56	1120 *	336	1.9 *	4260	1.2	0.013 J	1520	0.010 J	1.36	968
16-12	1.71	791 *	358	46.0 *	2950	1.7	0.019 J	1590	0.014 J	2.17	1690
16-13	1.34	1240 *	322	2.4 *	3150	0.8 J	0.042	923	0.010 J	3.57	864
16-14	0.74	605	69	0.6 *	2520	0.5 J	0.045	633	0.012 J	1.64	170
16-15	6.44	810 *	223	53.6 *	3160	1.4	0.070	2640	0.011 J	3.34	1040
16-16	1.24	463	85	1.3 *	2180	0.3 J	0.012 J	455	0.011 J	2.47	158
16-17	1.46	1010 *	263	17.2 *	2810	0.5 J	0.013 J	583	0.005 J	1.31	586
16-18	1.52	477	142	19.9 *	1580	0.6 J	0.010 J	368	0.008 J	4.06	412
16-19	0.57	293	66	5.3 *	1680	0.5 J	0.009 J	483	0.006 J	2.25	262
16-20	0.78	801 *	375	2.5 *	4500	1.0 J	0.011 J	1260	0.008 J	1.94	1100
16-21	2.94	1620	989	11.1	7710	3.4 N	0.062	6130	0.007 J	1.01	4090
16-22	2.47	824	108	2.2	1680	0.3 J,N	0.015 J	417	0.009 J	4.47	301
16-23	1.90	975	278	14.4	7230	2.0 N	0.022	3590	0.009 J	2.24	1330
16-24	1.47	944	323	20.6	6090	1.3 N	0.091	4370	0.006 J	1.64	1470
16-25	0.78	327	25	25.0	1870	0.3 J,N	0.006 J	782	0.005 J	2.33	112
Mean	1.68	710	222	18.3	3071	0.90	0.025	1286	0.009	2.31	801
SD	1.54	419	205	19.3	1822	0.71	0.022	1445	0.002	0.97	854

U = The analyte was not detected ("non-detect") at or above the MRL/MDL. Reported as the MDL.

J = The result is an estimated value.

N = The Matrix Spike sample recovery is not within control limits. See case narrative.

* = The result is an outlier. See case narrative.

Table 8. Breast muscle tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit

ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
16-1	1.7 J	0.002 U	0.02 U	0.038 J	0.003 U	0.064	192	0.68	0.082	26.7	234
16-2	11.8	0.002 U	0.04 J	0.099	0.003 U	0.145	224	0.49	0.307	24.9	215
16-3	2.7	0.002 U	0.02 U	0.060	0.003 U	0.086	185	0.74	0.099	27.4	307
16-4	6.6	0.002 U	0.02 J	0.149	0.003 U	0.061	275	0.55	0.235	23.1	249
16-5	2.4	0.002 U	0.02 U	0.313	0.003 U	0.064	237	0.50	0.101	27.3	271
16-6	1.2	0.002 U	0.02 U	0.255	0.003 U	0.123	177	0.60	0.147	24.2	310
16-7	3.0	0.002 U	0.02 U	0.205	0.003 U	0.056	241	0.16 J	0.214	21.0	246
16-8	5.9	0.002 U	0.05 J	0.201	0.003 U	0.157	338	0.33	0.551	19.1	223
16-9	3.9	0.002 U	0.02 J	0.332	0.003 U	0.070	249	0.44	0.257	24.5	260
16-10	40.0	0.002 U	0.02 J	0.876	0.003 U	0.089	225	0.34	0.118	23.3	287
16-11	2.5	0.002 U	0.02 U	0.058	0.003 U	0.101	141	0.33	0.051	25.1	244
16-12	5.4	0.002 U	0.02 U	0.094	0.003 U	0.103	114	0.47	0.074	27.1	264
16-13	2.9	0.018 J	0.02 U	0.123	0.007 J	0.065	137	0.21	0.081	19.8	253
16-14	9.6	0.002 U	0.02 J	0.086	0.003 U	0.060	143	0.35	0.096	23.0	247
16-15	1.9 J	0.002 U	0.02 U	0.110	0.003 U	0.111	140	0.22	0.071	23.4	307
16-16	7.4	0.002 U	0.05 J	0.093	0.003 U	0.051	116	0.30	0.119	23.2	251
16-17	15.4	0.002 U	0.04 J	0.112	0.003 U	0.066	148	0.30	0.147	17.8	241
16-18	5.1	0.002 U	0.03 J	0.146	0.003 U	0.230	219	0.67	0.354	25.1	257
16-19	8.4	0.002 U	0.10 J	0.099	0.003 U	0.066	113	0.30	0.086	23.8	280
16-20	2.7	0.002 U	0.02 U	0.052	0.003 U	0.123	235	0.30	0.160	28.5	224
16-21	3.2	0.002 U	0.02 U	0.076	0.003 U	0.098	174	0.43	0.081	29.2	262
16-22	1.5 J	0.002 U	0.02 U	0.148	0.003 U	0.047	131	0.33	0.037	31.7	278
16-23	2.3	0.002 U	0.02 U	0.208	0.003 U	0.114	148	0.22	0.047	25.4	280
16-24	1.5 J	0.002 U	0.02 U	0.149	0.003 U	0.071	198	0.26	0.053	31.3	308
16-25	1.8 J	0.002 U	0.02 J	0.152	0.003 U	0.150	187	0.28	0.062	28.4	292
Mean	6.0	0.003	0.028	0.169	0.003	0.095	187	0.392	0.145	25.0	264
SD	7.9	0.003	0.018	0.166	0.001	0.043	57	0.159	0.119	3.5	28

U = The analyte was not detected ("non-detect") at or above the MRL/MDL. Reported as the MDL.

J = The result is an estimated value.

N = The Matrix Spike sample recovery is not within control limits. See case narrative.

* = The result is an outlier. See case narrative.

Table 8 cont. Breast muscle tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit

ID	Lead	Magnesium	Manganese	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
16-1	0.005 J	988	9.73	0.36	11600	2.20 N	0.013 J	1510	0.001 J	0.007 U	143
16-2	0.090	1080	28.80	0.42	9570	1.30 N	0.009 J	1080	0.001 J	0.010 J	109
16-3	0.013 J	1010	5.84	0.37	11100	2.80 N	0.006 U	1750	0.001 U	0.024 J	126
16-4	0.049	1190	25.90	0.51	11100	2.30 N	0.006 U	1150	0.013 J	0.012 J	80
16-5	0.028	1050	8.70	0.27	11400	2.80 N	0.012 J	1660	0.002 J	0.007 U	116
16-6	0.008 J	951	10.20	0.35	9230	3.20 N	0.006 U	1200	0.002 J	0.046 J	95
16-7	0.017	1090	25.40	0.23	9860	1.90 N	0.006 U	1050	0.002 J	0.011 J	70
16-8	0.031	1110	47.80	0.60	8340	2.00 N	0.006 U	1180	0.001 J	0.011 J	97
16-9	0.022	1180	25.70	0.42	9860	2.20 N	0.006 U	1100	0.001 J	0.018 J	73
16-10	0.054	896	12.50	0.25	7820	2.10 N	0.006 U	1480	0.003 J	0.148 J	83
16-11	0.008 J	919	4.94	0.17 J	10700	2.90 N	0.006 U	1130	0.001 U	0.007 U	110
16-12	0.009 J	909	6.52	0.26	9940	1.60 N	0.006 U	1040	0.003 J	0.011 J	91
16-13	0.022	934	6.28	0.14 J	9730	1.90 N	0.006 U	1100	0.008 J	0.014 J	69
16-14	0.022	965	8.72	0.20	10700	2.10 N	0.006 U	1060	0.007 J	0.081 J	111
16-15	0.014 J	958	2.79	0.12 J	11600	3.00 N	0.006 U	1250	0.002 J	0.012 J	124
16-16	0.073	952	10.20	0.21	9730	2.20 N	0.006 U	804	0.002 J	0.055 J	76
16-17	0.092	943	19.10	0.24	8880	2.70 N	0.006 U	882	0.001 U	0.032 J	72
16-18	0.154	1070	35.90	0.56	9330	2.40 N	0.065 U	1030	0.002 J	0.015 J	123
16-19	0.074	1010	9.92	0.21	11400	2.20 N	0.006 U	845	0.001 J	0.050 J	73
16-20	0.019 J	947	17.30	0.24	10300	1.70 N	0.009 J	1040	0.002 J	0.007 U	116
16-21	0.039	950	7.21	0.21	10500	2.50 N	0.006 U	1550	0.001 J	0.007 J	127
16-22	0.013 J	938	3.01	0.16 J	11100	1.90 N	0.006 U	1380	0.003 J	0.007 U	97
16-23	0.022	881	2.66	0.12 J	10800	2.00 N	0.006 U	1290	0.001 J	0.018 J	111
16-24	0.059	925	4.91	0.14 J	11300	2.80 N	0.006 U	1510	0.002 J	0.007 U	96
16-25	0.020	892	2.47	0.14 J	10500	2.00 N	0.020 J	1380	0.002 J	0.021 J	119
Mean	0.038	990	13.70	0.276	10256	2.27	0.010	1218	0.003	0.026	100
SD	0.036	87	11.74	0.138	1023	0.47	0.012	252	0.003	0.032	22

U = The analyte was not detected ("non-detect") at or above the MRL/MDL. Reported as the MDL.

J = The result is an estimated value.

N = The Matrix Spike sample recovery is not within control limits. See case narrative.

* = The result is an outlier. See case narrative.

Table 9. Thigh muscle tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit

ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
16-1	15.0	0.002 U	0.02 U,N	0.188	0.003 U	0.089	256	2.51 *	0.156	8.38	199
16-2	7.5	0.002 U	0.03 J,N	0.207	0.003 U	0.150	313	2.35 *	0.430	12.30	172
16-3	3.4	0.002 U	0.02 U,N	0.112	0.003 U	0.104	262	0.98 *	0.089	7.21	235
16-4	6.0	0.004 J	0.04 J,N	0.269	0.004 J	0.192	320	1.31 *	0.531	7.70	156
16-5	5.3	0.002 U	0.02 U,N	0.542	0.003 U	0.070	313	2.60 *	0.111	9.90	216
16-6	4.0	0.002 U	0.02 J,N	0.132	0.003 U	0.145	316	4.04 *	0.499	7.12	218
16-7	2.8	0.002 U	0.02 U,N	0.117	0.003 U	0.224	208	3.71 *	0.401	10.40	262
16-8	8.4	0.002 J	0.02 J,N	0.401	0.003 U	0.138	261	1.31 *	0.283	7.15	167
16-9	2.9	0.002 U	0.02 U,N	0.245	0.003 U	0.395	383	2.67 *	0.871	10.90	236
16-10	9.9	0.003 J	0.02 U,N	0.341	0.005 J	0.107	295	2.00 *	0.152	9.24	192
16-11	2.9	0.002 U	0.02 U,N	0.096	0.003 U	0.069	152	2.10 *	0.070	4.90	126
16-12	6.2	0.002 U	0.02 U,N	0.260	0.003 U	0.112	165	1.26 *	0.121	7.83	229
16-13	6.9	0.002 U	0.02 U,N	0.113	0.003 U	0.094	188	2.35 *	0.204	5.11	214
16-14	4.4	0.002 U	0.02 U,N	0.064	0.003 U	0.052	125	1.32 *	0.071	4.35	103
16-15	2.8	0.002 U	0.02 U,N	0.091	0.003 U	0.107	139	2.35 *	0.076	4.87	169
16-16	10.3	0.002 U	0.06 J,N	0.106	0.003 U	0.101	191	0.91 *	0.315	5.01	221
16-17	3.9	0.002 U	0.02 J,N	0.087	0.003 U	0.065	229	0.61 *	0.260	4.62	198
16-18	16.1	0.002 U	0.05 J,N	0.188	0.003 U	0.161	299	4.18 *	0.536	6.21	159
16-19	6.1	0.002 U	0.03 J,N	0.122	0.003 U	0.112	181	0.65 *	0.161	6.33	272
16-20	4.5	0.002 U	0.02 U,N	0.195	0.003 U	0.131	232	1.60 *	0.174	5.77	102
16-21	5.0	0.002 U	0.02 U	0.148	0.003 U	0.098	202	1.74	0.083	7.99	140
16-22	5.6	0.002 U	0.02 U	0.150	0.003 U	0.066	152	2.34	0.062	9.43	214
16-23	1.6 J	0.002 U	0.02 U	0.145	0.003 U	0.148	151	1.18	0.052	7.52	165
16-24	7.9	0.002 U	0.02 U	0.122	0.003 U	0.079	225	1.68	0.053	4.63	141
16-25	4.4	0.002 U	0.02 U	0.197	0.003 U	0.175	350	1.08	0.082	6.55	222
Mean	6.2	0.002	0.024	0.186	0.003	0.127	236	1.95	0.234	7.26	189
SD	3.6	0.000	0.010	0.110	0.000	0.070	73	0.98	0.206	2.18	46

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N = The Matrix Spike sample recovery is not within control limits. See case narrative.

* = The result is an outlier. See case narrative.

Table 9 cont. Thigh muscle tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit

ID	Lead	Magnesium	Manganese	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
16-1	0.014 J	875 N	13.5	1.25	10700	1.9 N	0.013 J	2260	0.001 J	0.025 J	198
16-2	0.038	890 N	41.4	1.34	9270	1.0 J,N	0.006 U	1940	0.001 J	0.014 J	159
16-3	0.011 J	714 N	6.6	0.48	8570	2.0 N	0.006 U	2280	0.001 U	0.007 J	188
16-4	0.073	720 N	55.2	1.02	6210	1.3 N	0.006 U	1140	0.011 J	0.014 J	132
16-5	0.071	873 N	9.7	1.27	10700	2.3 N	0.006 U	2430	0.001 J	0.034 J	164
16-6	0.018 J	667 N	42.4	2.22	6780	2.0 N	0.006 U	1830	0.002 J	0.027 J	145
16-7	0.016 J	703 N	31.0	2.03	7730	1.2 N	0.006 U	1980	0.001 U	0.028 J	135
16-8	0.016 J	731 N	35.4	0.85	6520	1.4 N	0.006 U	1390	0.001 J	0.030 J	107
16-9	0.012 J	888 N	66.7	1.83	8660	1.9 N	0.006 U	1820	0.001 U	0.015 J	185
16-10	0.245	713 N	16.0	1.05	8160	1.6 N	0.006 U	2030	0.003 J	0.023 J	135
16-11	0.010 J	518 N	5.4	1.02	7380	1.4 N	0.006 U	1320	0.001 J	0.013 J	119
16-12	0.014 J	790 N	6.9	0.61	9480	1.3 N	0.012 J	1800	0.003 J	0.016 J	145
16-13	0.017 J	669 N	16.1	1.22	7790	1.1 N	0.006 U	1450	0.002 J	0.018 J	101
16-14	0.020	551 N	4.9	0.66	7090	1.2 N	0.006 U	1190	0.006 J	0.011 J	113
16-15	0.008 J	632 N	2.2	1.11	8220	1.5 N	0.006 U	1380	0.002 J	0.015 J	139
16-16	0.083	671 N	31.6	0.64	7160	1.2 N	0.006 U	1110	0.002 J	0.029 J	121
16-17	0.028	740 N	27.7	0.50	7910	1.6 N	0.006 U	1350	0.001 U	0.012 J	102
16-18	0.153	643 N	48.7	2.29	5980	1.2 N	0.006 U	1220	0.001 J	0.035 J	127
16-19	0.061	810 N	22.9	0.43	10400	1.4 N	0.006 U	1310	0.001 J	0.017 J	124
16-20	0.020	472 N	13.8	0.90	5670	0.8 J,N	0.006 U	1340	0.001 U	0.008 J	103
16-21	0.034	741	7.5	0.86	9850	1.7 N	0.006 U	1910	0.002 J	0.010 J	162
16-22	0.012 J	616	3.2	1.13	8590	1.2 N	0.006 U	1660	0.004 J	0.016 J	137
16-23	0.007 J	602	1.6	0.55	8680	1.1 N	0.006 U	1620	0.001 J	0.010 J	130
16-24	0.058	493	4.8	0.79	6540	1.2 N	0.019 J	1300	0.001 U	0.010 J	96
16-25	0.062	659	1.9	0.51	8830	1.2 N	0.006 U	1850	0.002 J	0.018 J	147
Mean	0.044	695	20.7	1.06	8115	1.43	0.007	1636	0.002	0.018	137
SD	0.054	118	18.7	0.54	1445	0.36	0.003	385	0.002	0.008	28

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J = The result is an estimated value.

N = The Matrix Spike sample recovery is not within control limits. See case narrative.

* = The result is an outlier. See case narrative.

Table 10. Bone (with marrow) tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit

ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
16-1	5.7	0.002 U	0.02 U,N	68.3 *	0.004J	0.048	164000 *	1.91 *	0.051	1.26 *	124
16-2	26.4	0.002 U	0.04 J,N	59.7 *	0.008J	0.111	150000 *	1.33 *	0.174	5.04 *	133
16-3	12.3	0.002 U	0.02 J,N	19.5 *	0.006J	0.100	65500 *	3.09 *	0.130	4.36 *	226
16-4	10.4	0.002 U	0.03 J,N	35.5 *	0.004J	0.147	94900 *	1.85 *	0.508	5.90 *	184
16-5	6.5	0.003 J	0.03 J,N	106.0 *	0.015J	0.044	177000 *	1.48 *	0.142	1.79 *	83
16-6	4.7	0.002 U	0.02 U,N	41.0 *	0.004	0.063	96500 *	2.63 *	0.113	3.86 *	153
16-7	5.6	0.003 J	0.02 U,N	57.4 *	0.009	0.047	118000 *	2.46 *	0.157	2.33 *	131
16-8	8.5	0.002 U	0.08 J,N	34.6 *	0.004 J	0.236	82900 *	3.26 *	0.451	4.49 *	187
16-9	4.1	0.002 U	0.03 J,N	56.5 *	0.005 J	0.070	144000 *	2.19 *	0.213	1.90 *	119
16-10	5.3	0.002 U	0.02 U,N	27.3 *	0.006 J	0.106	99900 *	2.26 *	0.139	4.16 *	129
16-11	4.2	0.002 U	0.02 J,N	46.6 *	0.005 J	0.075	136000 *	2.31 *	0.111	2.21 *	111
16-12	4.5	0.002 U	0.02 U,N	25.9 *	0.010 J	0.071	72400 *	3.05 *	0.122	3.27 *	146
16-13	7.8	0.012 J	0.02 J,N	41.7 *	0.014 J	0.047	143000 *	2.53 *	0.190	2.06 *	91
16-14	4.9	0.002 U	0.02 U,N	40.2 *	0.007 J	0.052	95800 *	2.04 *	0.071	1.87 *	84
16-15	4.8	0.002 U	0.02 U,N	41.1 *	0.009 J	0.063	131000 *	1.82 *	0.084	1.63 *	105
16-16	3.8	0.002 U	0.02 J,N	51.7 *	0.005 J	0.043	138000 *	1.61 *	0.070	1.40 *	111
16-17	3.8	0.002 U	0.02 U,N	48.0 *	0.008 J	0.038	120000 *	5.86 *	0.112	1.51 *	156
16-18	8.3	0.002 U	0.03 J,N	22.7 *	0.004 J	0.061	67500 *	6.43 *	0.217	3.32 *	181
16-19	4.3	0.002 U	0.02 J,N	46.7 *	0.008 J	0.041	143000 *	1.60 *	0.114	2.34 *	125
16-20	5.9	0.002 U	0.03 J,N	27.8 *	0.003 U	0.116	92500 *	2.73 *	0.110	2.99 *	158
16-21	3.9	0.002 J	0.02 J	38.6	0.003 U	0.079	112000	1.64	0.062	2.28	81
16-22	4.8	0.003 J	0.02 U	60.8	0.007 J	0.049	127000	2.16	0.060	2.60	110
16-23	3.6	0.002 U	0.02 J	45.1	0.008 J	0.114	109000	1.69	0.086	2.44	126
16-24	5.7	0.002 U	0.02 U	43.5	0.007 J	0.064	118000	1.93	0.080	2.30	154
16-25	3.3	0.002 U	0.02 J	46.9	0.015 J	0.040	160000	2.02	0.100	1.19	80
Mean	6.5	0.003	0.025	45.3	0.007	0.077	118316	2.48	0.147	2.74	132
SD	4.7	0.002	0.013	17.7	0.003	0.044	30610	1.22	0.110	1.26	37

U = The analyte was not detected ("non-detect") at or above the MRL/MDL. Reported as the MDL.

J = The result is an estimated value.

N = The Matrix Spike sample recovery is not within control limits. See case narrative.

* = The result is an outlier. See case narrative.

Table 10 cont. Bone (with marrow) tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit

ID	Lead	Magnesium	Manganese	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
16-1	0.17 *	2850 *	68.4 *	0.80	2440	0.40 J,N	0.012 J	3210 *	0.002 J	0.030 J	267
16-2	0.23 *	2600 *	65.9 *	0.63	3290	0.20 J,N	0.007 J	3150 *	0.002 J	0.057 J	184
16-3	0.23 *	1130 *	22.6 *	1.36	3940	0.80 J,N	0.006 U	2460 *	0.001 J	0.161 J	156
16-4	0.29 *	1830 *	59.4 *	1.18	5300	1.00 N	0.006 U	2710 *	0.013 J	0.267	192
16-5	8.80 *	2420 *	51.0 *	0.69	2120	0.50 J,N	0.006 U	3960 *	0.003 J	0.627	186
16-6	1.14 *	1760 *	30.4 *	1.14	4590	1.00 N	0.006 U	2880 *	0.001 J	0.168 J	171
16-7	8.86 *	1810 *	36.5 *	1.11	3130	0.50 J,N	0.006 U	3030 *	0.002 J	0.382	140
16-8	0.84 *	1590 *	76.4 *	1.63	3270	0.60 J,N	0.006 U	2330 *	0.001 J	0.181 J	207
16-9	0.61 *	2130 *	46.2 *	1.03	2520	0.40 J,N	0.049	3060 *	0.002 J	0.249	162
16-10	12.00 *	1540 *	34.8 *	0.99	4070	0.90 J,N	0.006 U	2970 *	0.002 J	0.259	173
16-11	1.03 *	1880 *	42.8 *	1.00	3060	0.70 J,N	0.012 J	3400 *	0.001 J	0.310	172
16-12	1.85 *	1100 *	27.2 *	1.29	3530	0.70 J,N	0.006 U	2390 *	0.002 J	0.354	139
16-13	20.70 *	1880 *	32.6 *	1.10	2230	0.30 J,N	0.006 U	3460 *	0.007 J	0.497	160
16-14	3.19 *	1460 *	25.6 *	0.92	3240	0.50 J,N	0.006 U	2500 *	0.004 J	0.175 J	153
16-15	7.27 *	1830 *	28.8 *	0.78	2720	0.40 J,N	0.006 U	3230 *	0.002 J	0.917	185
16-16	5.28 *	2070 *	22.1 *	0.69	2670	0.50 J,N	0.006 U	3190 *	0.002 J	0.324	146
16-17	1.56 *	1740 *	29.0 *	2.53	2690	0.50 J,N	0.006 U	2890 *	0.001 U	0.185 J	138
16-18	2.59 *	1160 *	28.2	2.79	3980	0.70 J,N	0.006 U	2200 *	0.001 J	0.207	119
16-19	6.80 *	1830 *	29.7 *	0.75	2880	0.40 J,N	0.006 U	3410 *	0.001 J	0.846	152
16-20	0.62 *	1660 *	51.2	1.22	4080	0.60 J,N	0.006 U	2480 *	0.002 J	0.093 J	179
16-21	0.23	2020	67.8	0.75	3190	0.60 J,N	0.006 U	2730	0.001 J	0.049 J	175
16-22	1.61	2070	32.1	0.92	3380	0.40 J,N	0.006 U	3230	0.003 J	0.085 J	166
16-23	8.14	1430	21.1	0.71	2690	0.50 J,N	0.006 U	2970	0.001 J	0.329	156
16-24	14.10	1610	24.5	0.81	3570	0.70 J,N	0.006 U	3200	0.002 J	0.401	153
16-25	14.10	1850	21.9	0.82	1850	0.40 J,N	0.006 U	4060	0.001 J	0.743	190
Mean	4.89	1810	39.0	1.11	3217	0.57	0.008	3004	0.002	0.316	169
SD	5.59	419	16.9	0.53	802	0.21	0.009	470	0.003	0.243	29

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N = The Matrix Spike sample recovery is not within control limits. See case narrative.

* = The result is an outlier. See case narrative.

Table 11. Tissue mercury concentrations (ng/g dry wt) in snow geese received by OVDL from the Berkeley pit.

ID	Liver	Kidney	GI tract	GI tract contents	Breast muscle	Thigh muscle	Bone (with marrow)
16-1	24.80	24.40	3.80	3.73	5.84	6.99	1.36
16-2	58.90	23.10	8.08	4.10	5.81	5.04	3.36
16-3	12.10	10.70	2.03	1.04	2.94	2.20	1.69
16-4	22.60	12.60	4.18	0.84	3.10	2.40	2.43
16-5	23.70	11.00	4.25	3.28	2.75	4.16	1.17
16-6	13.20	9.25	3.24	1.73	3.29	2.40	2.07
16-7	14.60	11.60	3.07	0.72	3.63	1.76	0.90
16-8	16.20	7.33	2.98	0.99	3.72	3.36	1.48
16-9	13.80	16.70	2.27	1.07	2.44	2.55	0.89
16-10	14.70	7.03	2.10	0.97	2.22	2.65	1.87
16-11	20.20	24.90	3.07	2.09	4.29	3.44	0.90
16-12	19.60	9.73	2.25	1.45	1.97	1.94	0.85
16-13	13.20	6.69	1.91	3.36	2.10	2.10	0.57
16-14	17.50	10.60	2.01	1.37	2.78	2.07	0.85
16-15	19.80	13.00	1.86	3.06	3.30	2.12	1.03
16-16	28.10	21.80	3.27	1.51	3.35	2.84	0.99
16-17	9.41	10.00	2.47	0.90	2.11	1.95	0.62
16-18	12.50	9.51	2.75	0.98	2.52	2.25	1.26
16-19	11.90	8.06	2.02	0.50	2.16	2.69	0.77
16-20	16.40	12.10	2.96	2.85	2.34	2.00	1.29
16-21	14.70	7.92	2.38	2.20	1.73	2.46	1.26
16-22	29.80	18.60	3.41	2.16	4.49	4.68	1.56
16-23	9.27	10.10	1.97	3.71	1.81	1.18	0.72
16-24	8.02	6.17	1.72	0.86	1.84	1.63	0.95
16-25	8.61	8.08	2.47	1.81	2.17	2.08	0.36
Mean	18.14	12.44	2.90	1.89	2.99	2.76	1.25
SD	10.34	5.73	1.30	1.10	1.14	1.27	0.66

Table 12. Tissue cyanide concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit

ID	Liver	Kidney	GI tract	GI tract contents	Breast muscle	Thigh muscle	Bone (with marrow)
16-1	3.35	0.59	1.85	0.13	2.27	1.18	1.27
16-2	1.58	2.09	2.49	ND	3.40	1.66	2.87
16-3	1.66	0.82	0.91	ND	2.70	1.17	2.07
16-4	1.69	2.25	2.41	ND	3.55	1.12	2.76
16-5	2.28	1.23	2.13	0.16	2.32	1.07	2.01
16-6	1.92	2.25	1.59	0.20	3.42	0.90	1.79
16-7	1.99	3.00	2.76	0.17	2.76	4.22	2.27
16-8	1.96	3.48	1.87	ND	3.83	1.28	2.47
16-9	1.49	2.64	1.94	0.17	4.20	2.83	1.94
16-10	2.08	1.22	1.84	ND	3.86	0.74	1.87
16-11	1.55	0.73	1.97	0.15	2.79	0.43	1.52
16-12	1.86	1.43	1.97	0.29	3.58	1.57	1.90
16-13	2.11	1.49	1.78	0.12	3.28	1.03	1.32
16-14	1.54	0.50	1.00	ND	1.62	0.50	1.64
16-15	1.27	1.21	1.94	0.27	1.61	0.70	1.03
16-16	1.92	1.94	1.96	ND	1.94	1.47	1.82
16-17	1.71	2.40	1.85	ND	2.06	1.82	1.53
16-18	1.68	2.40	2.58	0.12	2.11	0.59	2.54
16-19	1.87	2.88	1.94	ND	1.72	1.25	1.91
16-20	0.76	2.46	1.79	0.26	2.04	0.51	2.13
16-21	1.56	0.95	1.27	2.31	2.64	0.86	0.91
16-22	1.88	1.33	1.05	0.45	3.14	1.14	1.60
16-23	2.04	1.29	1.79	0.31	2.97	0.74	0.99
16-24	2.70	2.34	1.70	0.99	2.58	1.53	1.47
16-25	2.59	1.56	1.53	0.18	2.13	0.97	0.65
Mean	1.88	1.78	1.84	0.39	2.74	1.25	1.77
SD	0.50	0.81	0.46	0.55	0.76	0.81	0.57

We compared the tissue metals concentrations in the samples provided to ALS in 2016 with the concentrations in samples collected by the USEPA in 2016, and those reported in the tissues of birds collected during the 1995 incident. The results are summarized in Table 13 below.

In a number of cases there were substantial differences noted between the 2016 tissue residue data reported in this report and values reported by EPA, and in most cases, EPA found substantially higher values, e.g., nickel liver, vanadium liver. It is interesting to note however, in some of these instances the metal concentration in Berkeley Pit water was very low or non-detectable, e.g., Sb, Ag, and V. Figures 3-6 present comparisons of USEPA reported residue values and those provided in this report. In addition, data for liver and kidney tissues collected from birds in the 1995 incident are provided in Figures 3 and 4.

This investigation focused on the determination of metal residues in the tissues of birds that were found dead on and in the vicinity of the Berkeley Pit, Montana in December 2016. The intent of gathering these data was, in part, to evaluate potential risks to humans, wildlife, and pets that might unintentionally consume tissues from birds that consumed Berkeley Pit water. Results of the individual tissue concentrations are provided in Tables 4-12 and summarized in Table 13. Based on an evaluation of acceptable ingestion concentrations, these residues do not represent a significant risk to humans, wildlife, or pets that may have incidentally consumed muscle or organs from these birds. This conclusion was confirmed by the USEPA in a memo from Susan Griffin to Nikia Greene (USEPA 6 February 2017 that concluded:

“These results suggest that ingestion of tissue or organs from these waterfowl for both short term and chronic exposure periods would be unlikely to result in adverse health effects from inorganics.” (USEPA)

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Table 13. Mean tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit. Data presented from 1995 incident and 2016 USGS and AR analyses.

Tissue		Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
Liver	1995 AR	—	—	1.64	—	—	0.82	—	—	—	282.8	—
	2016 EPA	—	4.03	2.03	20.05	2.03	3.78	—	4.03	2.08	113.7	—
	2016 AR	8.68	0.09	0.04	0.15	0.00	6.60	420	0.21	0.83	159.3	2565
Kidney	1995 AR	—	—	1.66	—	—	1.37	—	—	—	88.2	—
	2016 EPA	—	5.50	2.73	27.50	2.73	12.17	—	5.50	2.73	106.0	—
	2016 AR	16.53	0.05	0.02	1.04	0.01	6.37	1227	0.36	0.61	34.0	517
Breast muscle	2016 EPA	—	3.35	1.70	16.80	1.70	1.70	—	3.35	1.70	23.8	—
	2016 AR	6.03	0.00	0.03	0.17	0.00	0.09	187	0.39	0.15	25.0	264
Thigh muscle	2016 EPA	—	3.75	1.90	18.83	1.90	1.90	—	3.75	1.90	9.8	—
	2016 AR	6.15	0.00	0.02	0.19	0.00	0.13	236	1.95	0.23	7.3	189

— = no data available

Table 13 cont. Mean tissue metals concentrations (mg/kg dry wt) in snow geese received by OVDL from the Berkeley pit. Data presented from 1995 incident and 2016 USGS and AR analyses.

Tissue		Lead	Magnesium	Manganese	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
Liver	1995 AR	—	—	160	—	—	3.65	—	—	—	—	551
	2016 EPA	2.03	—	117	2.03	—	10.03	2.03	—	2.03	10.03	736
	2016 AR	0.12	890	95	0.57	9992	5.15	0.03	2880	0.00	0.06	936
Kidney	1995 AR	—	—	226	—	—	3.19	—	—	—	—	491
	2016 EPA	2.73	—	212	2.73	—	13.77	2.73	—	2.73	13.77	1706
	2016 AR	0.18	763	160	0.54	8044	3.72	0.01	3338	0.00	0.05	627
Breast muscle	2016 EPA	1.70	—	10	1.70	—	8.42	1.70	—	1.70	8.42	80
	2016 AR	0.04	990	14	0.28	10256	2.27	0.010	1218	0.00	0.03	100
Thigh muscle	2016 EPA	1.90	—	59	1.90	—	9.42	1.9	—	1.90	9.42	190
	2016 AR	0.04	695	21	1.06	8115	1.43	0.007	1636	0.00	0.02	137

— = no data available

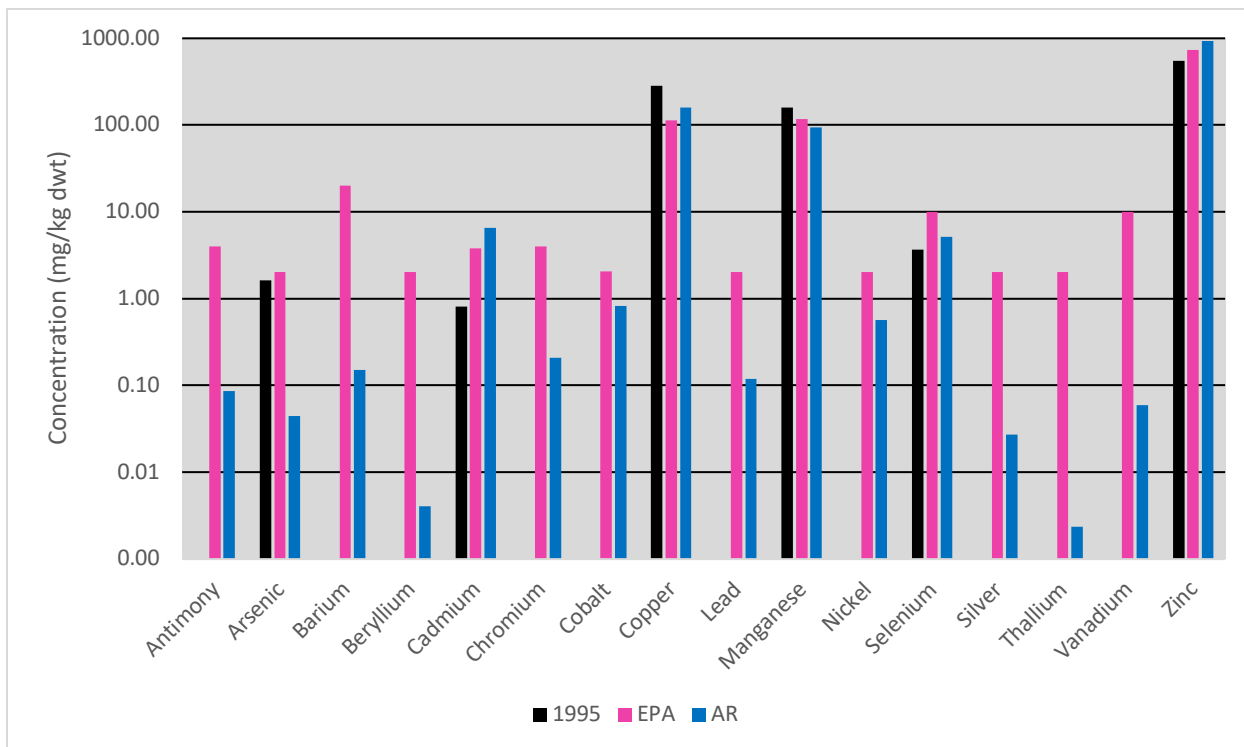


Figure 3. Comparison of liver tissue metals concentrations between evaluations conducted in 2016 (USEPA and Atlantic Richfield [AR]) and 1995 incident data.

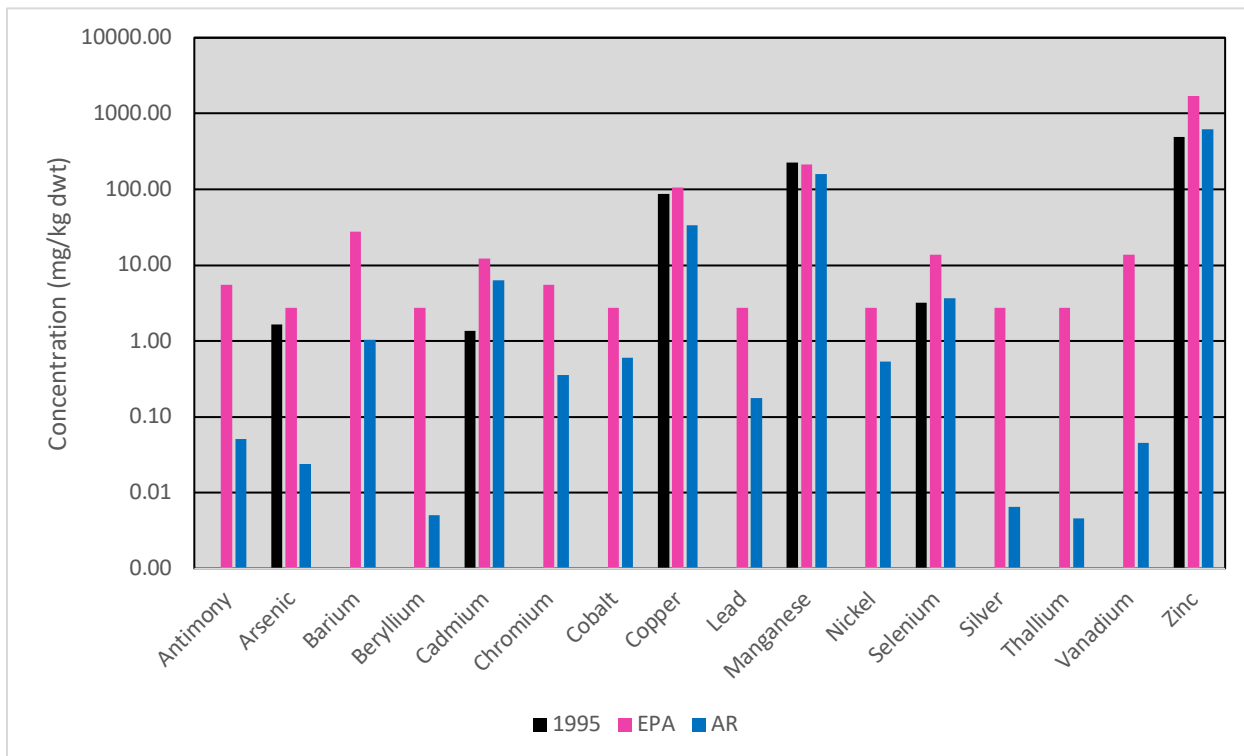


Figure 4. Comparison of kidney tissue metals concentrations between evaluations conducted in 2016 (USEPA and Atlantic Richfield [AR]) and 1995 incident data.

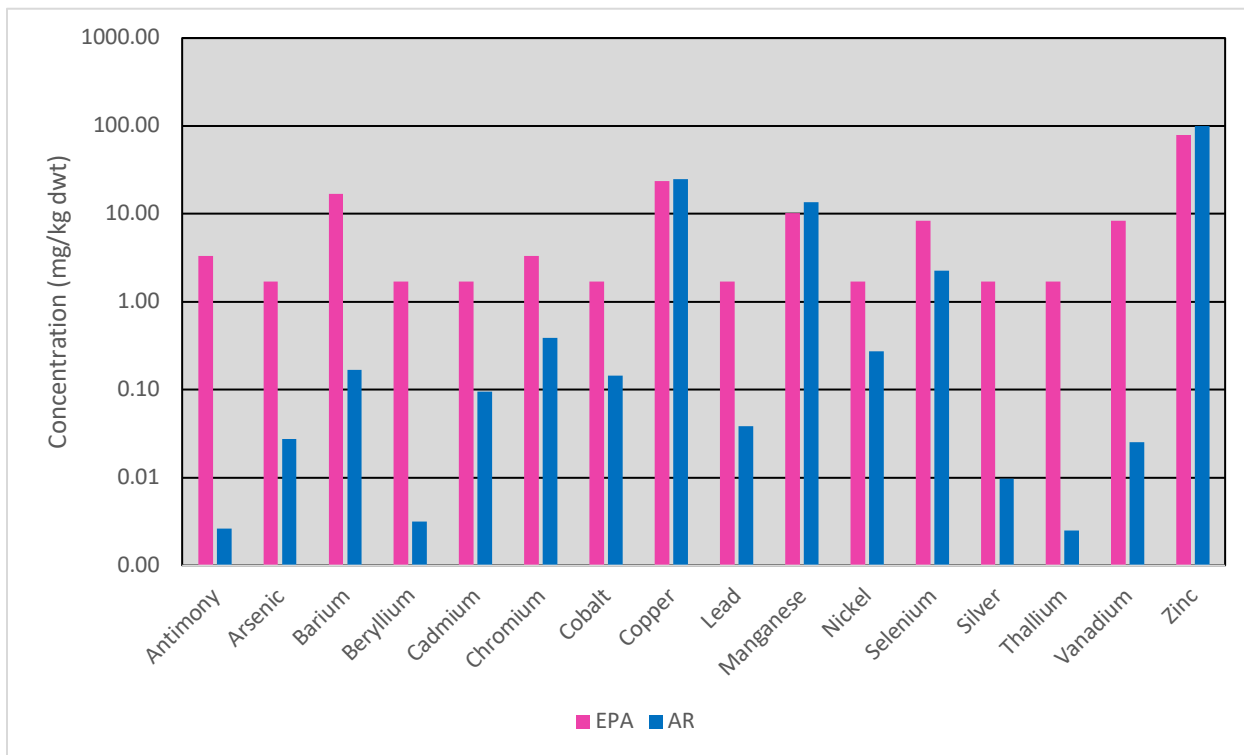


Figure 5. Comparison of breast muscle tissue metals concentrations between USEPA and Atlantic Richfield [AR] evaluations conducted in 2016.

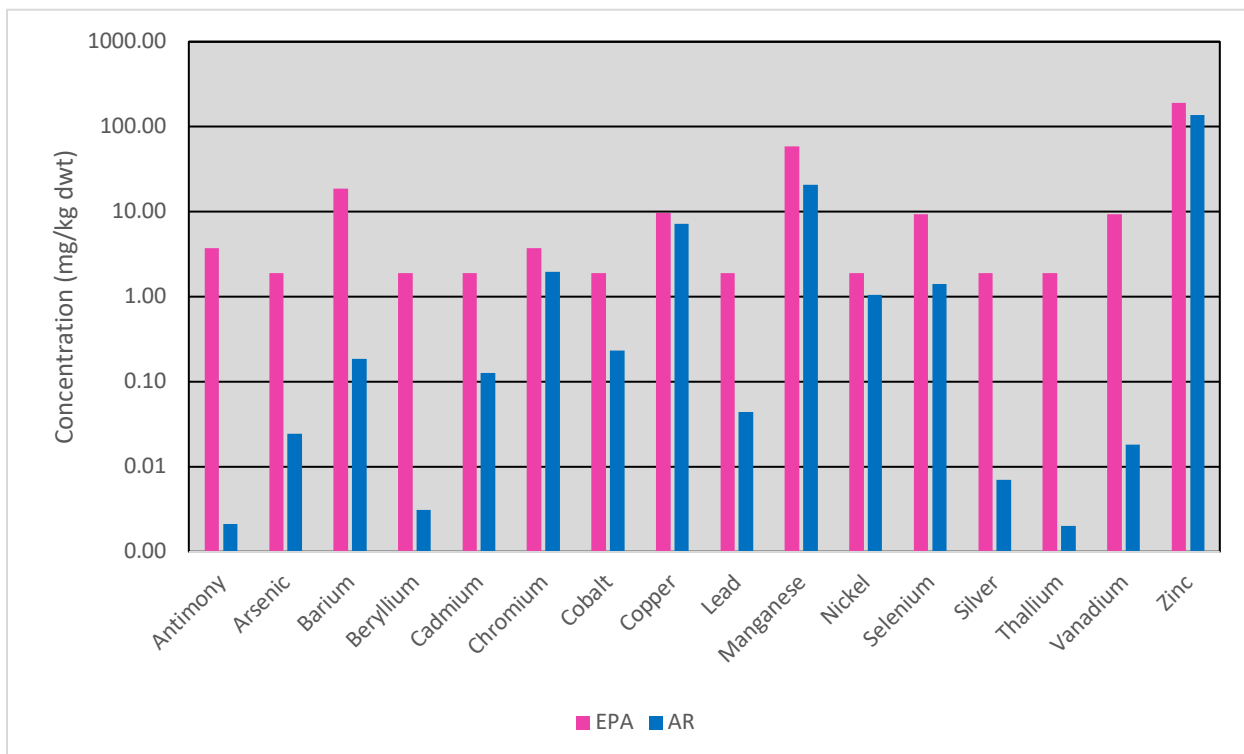


Figure 6. Comparison of thigh muscle tissue metals concentrations between USEPA and Atlantic Richfield [AR] evaluations conducted in 2016.

3. Discussion

Potential Causes of Toxicity in Berkeley Pit water (BPW)

Following the 1995 incident, a series of laboratory investigations were conducted in an effort to determine probable toxicological mechanisms and chemical causes underlying the death of the snow geese on the Berkeley Pit. Pit water contained elevated metals concentrations and high acidity; however, no single chemical component of the water was measured at levels consistent with those observed to cause avian toxicity in studies previously reported in the literature. Although necropsy examination and clinical testing of collected dead birds found several consistent physiological observations among the geese evaluated, results were not sufficiently conclusive to definitively ascribe the cause of the death of the birds to a single or multiple characteristics of Pit water. It was thus hypothesized that a complex combination of factors, including metals concentrations, ionic composition, acidity, the duration of exposure of the birds to Pit water, and the pre-exposure physiological status of the birds, may have interacted in causing the observed mortalities. The laboratory tests that were conducted were intended to determine: 1) the acute toxicity of BPW to snow geese, 2) the effect of induced stress (i.e., food and water fasting) as a potential modifying factor of BPW toxicity, and 3) the toxicological profile of symptoms associated with BPW acute toxicity.

Comparison of the limited avian toxicity thresholds reported in the literature to metals concentrations determined in the BPW samples taken either in 1995 or 2016 showed all to be below those purported to be acutely toxic to avian species.

Copper: For example, drinking water containing copper sulfate concentrations of 666 and 1,000 mg/L (265 and 398 mg/L as Cu, respectively) did not adversely affect the survival or growth of chicks over 18 d of exposure (Underwood et al. 1956). Rowe and Prince (1983) conducted mallard drinking water avoidance studies with copper sulfate at concentrations up to 100 mg/L—no signs of toxicity or avoidance were observed. Henderson and Winterfield (1974) reported acute toxicity among Canada geese ingesting water from a farm pond that had been dosed with copper sulfate at an estimated dose of 600 mg/kg of copper sulfate (240 mg/kg as Cu). Finally, no effect on the survival of mallard ducklings was noted in a study where birds were provided drinking water containing copper concentrations of up to 252 mg/L over 14 d—although significant mortalities (63%) resulted in a subsequent test where ducklings were provided drinking water containing 605 mg Cu/L (Foster 1999). Therefore, from the extant literature, it would appear unlikely that BPW containing approximately 177 mg Cu/L would illicit a response of the magnitude noted, i.e., the acute death of large numbers of geese.

Zinc: French et al. (1987) fed mallard ducks single oral doses of zinc, in the form of metal shot in gelatin capsules. No mortalities or untoward effects were observed at absorbed doses of up to 665 mg. Chickens consumed diets containing zinc concentrations of up to 1,000 mg/kg for ten weeks with no apparent adverse effects (Johnson et al. 1961). Ducks fed diets containing 3,000 mg Zn/kg for 60 d exhibited reduced survival after 30 d (Gasaway and Buss 1972). The zinc concentration measured in BPW at the time of the snow geese kill was 523 mg/L (in 1995) and 627 mg/L (in 2016), well below reported acutely lethal concentrations.

Manganese: The manganese concentration in the November 1995 BPW sample was 242 mg/L and 292 in 2016. No drinking water toxicity tests with avian species were identified from the literature; however, the minimum toxic dietary concentration of manganese for turkey poults was 4,800 mg Mn/kg diet (Vohra and Kratzer 1968). These data suggest that the manganese concentrations in BPW would not likely be acutely toxic to avian species.

Acidity and pH: Pit water is acidic, with a pH that has varied over time from ~ 2.5 to 3.5); however, the measure of pH alone provides limited meaningful information regarding potential physiological effects attributable to the acidity of the water. The acidic strength of a material and the type of acid present (e.g., sulfuric as opposed to, e.g., acetic acid) can be more important in determining the material's acid-related toxicity than will its pH. A review of the available literature regarding the acute toxicity of acid mine drainage or acidic solutions in general to avian species did not reveal any reported studies; therefore, no conclusions could be reached regarding the toxicity of Pit water based on its acidic properties. Further, no information about the potential interactive acute toxic effects of metals and acidic solutions in avian species was identified.

BPW Acute Toxicity tests (1995)

As indicated earlier, following the 1995 exposure incident, a series of toxicity tests were conducted with water collected from the Berkeley pit. The results of those tests were as follows:

- An oral toxicity study conducted showed that ingestion of single oral doses of Pit water equal to one percent of the bird's body weight, a volume typical of the amount consumed during a single drinking occasion, caused no mortalities and no grossly or pathologically observable toxic effects. Birds were basically symptom free following exposure; thus Berkeley Pit water would be considered "essentially non-toxic" by standard evaluation criteria (USEPA 1985). Metals concentrations were not sufficiently elevated, and water pH was not sufficiently depressed, to elicit adverse effects among birds provided with a single dose of Pit water.
- In contrast, prolonged exposure to greater quantities of Pit water than would normally be consumed during a single drinking episode was required to cause toxicity. Subsequent studies that provided unrestricted access of test birds to Pit water provided very different results from the single-dose test. Exposed birds drank substantially elevated quantities of water compared to control birds, became lethargic, decreased their food intake, exhibited respiratory irritation, and in some cases, exhibited labored breathing. Pit water was acutely toxic in these tests, and birds in an experimentally-induced dehydrated condition were more sensitive to the toxic effects of the water than well hydrated individuals. In all of the studies where Pit water was freely available to the test birds, time to death was typically on the order of 10-18 hours. However, those birds surviving the initial unrestricted exposure to Pit water were observed to recover physiologically once the Pit water was replaced with laboratory drinking water.
- The postmortem lesions of the birds that died during the laboratory studies appeared generally consistent with that of the birds found dead on the Berkeley Pit following the 1995 exposure incident. Common lesions were characterized by yellow discoloration and sloughing of the upper epithelial layers of the oral and upper gastrointestinal tract, and necrosis of the renal tubules. Although observed in the field collected birds, no signs of pulmonary edema were noted in the laboratory studies birds. On the other hand, evidence of pancreatic atrophy and necrosis was noted in laboratory exposed birds, but was not evident from field-collected birds.
- Clinical signs observed in intoxicated geese included behavioral changes consisting of lethargy, sneezing, and consumption of copious amounts of water. Clinical chemistry results obtained *in extremis* were characterized by substantial increases in uric acid, creatine, creatine kinase, aspartate aminotransferase,

phosphorous, and potassium. These findings are typically indicative of renal failure.

- Reversal of all clinical manifestations occurred rapidly when Pit water-exposed birds resumed drinking uncontaminated drinking water.
 - o Whereas tissue metals residues among birds killed as a result of Pit water exposure were highly elevated relative to control birds, animals that survived the initial exposure and then recovered on laboratory water showed tissue metals residues consistent with unexposed control birds.
 - o Similarly, clinical chemistry parameters were affected among birds that died, but were comparable to control and pre-test results among recovered birds.
 - o The post-exposure behavior of recovered birds was also consistent with the behavior of unexposed birds.
 - o Histopathological examinations of the recovered birds showed few residual lesions; those that were observed were in the process of healing.

Tissue Metals Residues

Liver and kidney metals residues were elevated and indicative of acute metals exposure, but were not necessarily indicative of metals toxicity. Interpretation of tissue residues is made difficult by the fact that an established relationship between tissue metals concentrations and adverse effects in exposed organisms is generally lacking. Frequently causality in wildlife kills is ascribed to metals toxicity when tissue metals concentrations are determined to be in excess of commonly accepted “background” tissue concentrations. However, “background” tissue concentrations are most likely a function of homeostatic processes, in the case of “essential” metals, and are a function of environmental exposure in the case of non-essential metals. Further, because metabolic detoxification processes are effective in removing metals from tissues, the time between exposure and the taking of tissues for analysis can be very important and will affect measured tissue concentrations.

As indicated, few data exist that relate measured tissue residue concentrations and observed toxic response, especially under controlled laboratory conditions. The tissue residue data in birds from the Berkeley Pit incidents (1995, 2016), in addition to the tissue concentrations obtained from birds in controlled toxicity tests (1996), provided a unique opportunity to evaluate the relationship between measured tissue concentrations and observed biological response.

A clear relationship was noted between liver tissue zinc concentrations and mortality in snow geese that consumed Pit water (Figure 7). Control birds (no exposure) and birds that consumed sublethal quantities of Pit water and survived had liver zinc concentrations <135 mg Zn/kg dwt, while all birds that had liver zinc concentrations >146 mg Zn/kg dwt died. However, the relationship between liver copper concentrations and bird mortality was not as clear cut. Liver concentrations as low as 53 mg Cu/kg dwt were found in dead birds collected from the Berkeley Pit, while concentrations as high as 178 mg Cu/kg dwt were found in surviving birds from the controlled laboratory studies (Figure 8).

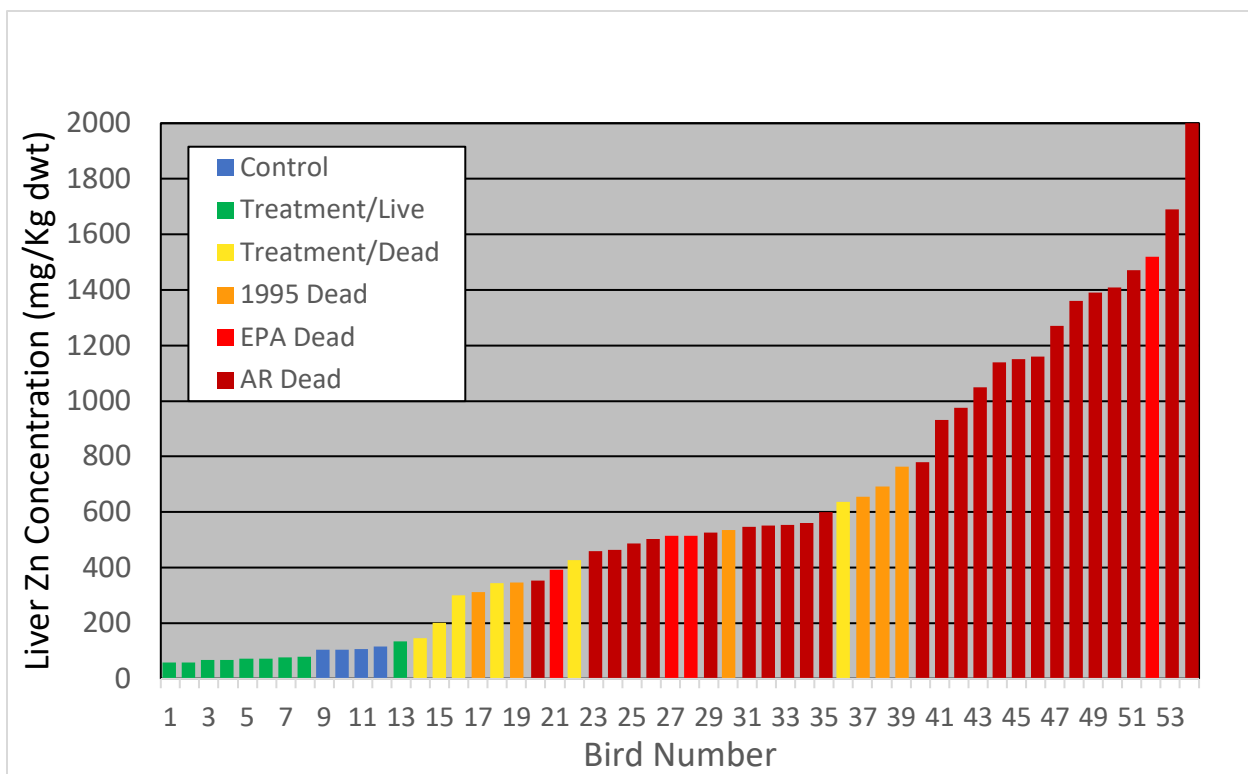


Figure 7. Concentrations of Zn found in the livers of dead snow geese collected from the Berkeley Pit in 1995, 2016 (analyzed by EPA or Atlantic Richfield), or that were treated and lived or died in 1996 toxicity tests. A clear concentration mortality relationship exists; birds with Zn liver concentrations >145 mg Zn/kg dwt all died.

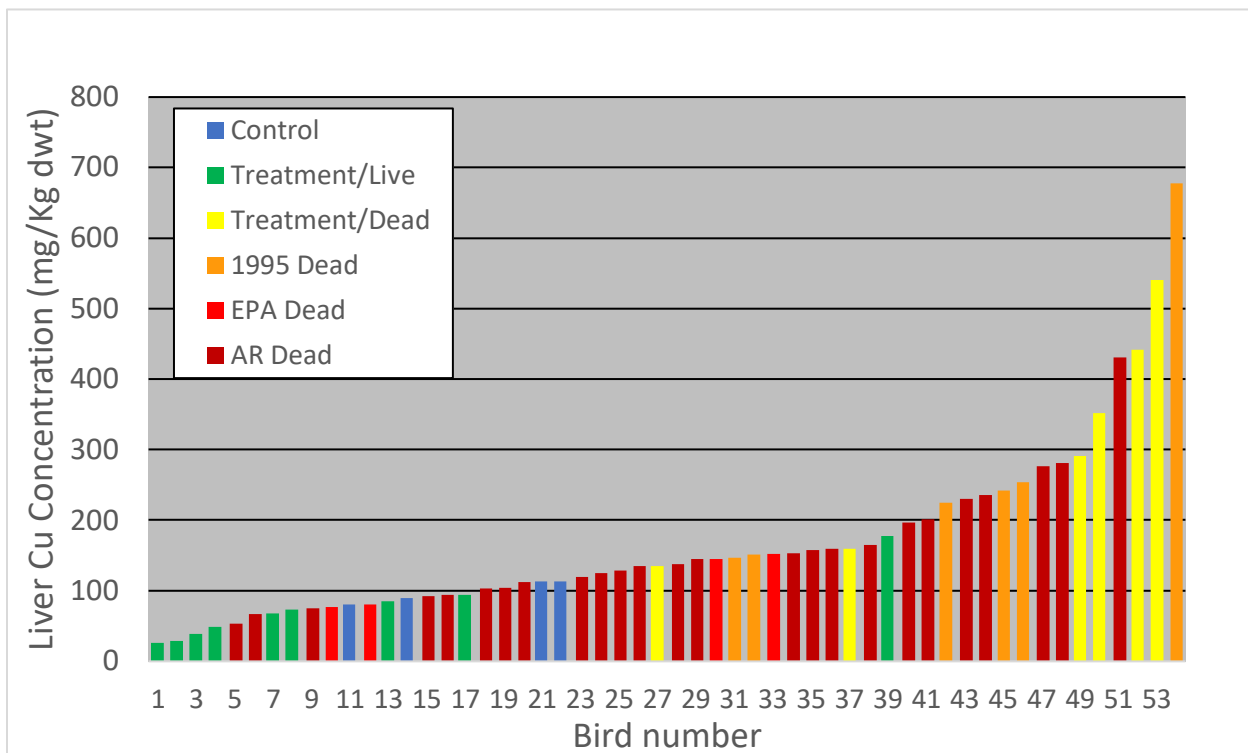


Figure 8. Concentrations of Cu found in the livers of dead snow geese collected from the Berkeley Pit in 1995, 2016 (analyzed by EPA or Atlantic Richfield), or that were treated and lived or died in 1996 toxicity tests. No clear concentration mortality relationship exists between birds that died and their liver Cu concentration.

The consistency between the liver zinc measurements for Berkeley Pit and experimental birds does not necessarily mean that toxicity among the birds occurred as a direct result of elevated tissue metals concentrations (i.e., it does not mean that metals in the bird's tissues caused the toxicity). Rather, it is an indication that field and laboratory birds consumed similar volumes of Pit water and that those volumes could be sufficient to cause the observed toxicity. It remains unclear from the studies reported here whether metals concentrations, other Pit water chemical components, or some combination of factors was the actual source of the observed toxicity.

It is likely that the snow geese mortalities that occurred in November of 1995 and 2016 resulted from ingestion of large volumes of Pit water. These deaths may have resulted from a number of specific circumstances that led to the prolonged exposure of the geese to Pit water and an increase in sensitivity among the birds due to migratory stress. The specific agent(s) responsible for the death of the geese in either the laboratory studies or those found at the Berkeley Pit cannot be determined from the available data because the different components of the water have not been examined separately; this can only be done by taking a reductionist approach. While liver and kidney tissue metals residues were elevated in exposed birds above those in unexposed birds, this observation is indicative of Pit water exposure, and does not confirm that metal exposure caused the observed mortalities.

4. References

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Appendix A

Review of postmortem work-up of birds
collected at the Berkley Pit, Butte, Montana in December 2016

Summary Report

Review of postmortem work-up of birds
collected at the Berkley Pit, Butte, Montana in December 2016

Review performed and report prepared by:

Dr. Christiane V. Löhr, Dr. med. vet., PhD, Diplomate ACVP

Site visit conducted at the
National Wildlife Health Center in
Madison, Wisconsin
March 27-28, 2017

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04/07/17

Date

Summary statement:

On 27-28 March 2017, Dr. Christiane Löhr (Oregon State University Veterinary Diagnostic Laboratory, OVDL) reviewed the detailed findings and archived tissue sections obtained from birds that had been found dead on the Berkeley Pit (Butte Montana) in early December 2016 and had been examined at the National Wildlife Health Center (Madison, Wisconsin). The findings from the postmortem examinations of the 2016 birds by the NWHC are nearly identical to those described in previous reports, which detailed the morbidity and mortality of water fowl (geese and ducks) after consumption of water from the Berkeley pit, Butte, Montana (spontaneous exposure, Lipton and Galbraith 1996; subsequent experimental study in snow geese, Stubblefield 1997; experimental study in mallard ducks, Isanhart 2008 and 2011). The presentation of the observed gross and microscopic lesions in four lesser snow geese and one Northern shoveler examined at the NWHC, in conjunction with temporal and spatial characteristics of the incident in December 2016, make ingestion of Berkeley pit water (acidic metalliferous water) the most probable cause of the lesions observed in this cohort of birds.

The primary lesions identified are a combination of extensive degeneration and necrosis of mucosal surfaces (severe destruction of the lining) of the digestive tract and, to a lesser extent, the respiratory tract, as well as renal tubular necrosis (kidney damage). Systemic alterations such as metabolic acidosis (inappropriate pH of the blood), electrolyte imbalances and dehydration are expected to result from these types of gross and microscopic lesions and can explain the acute death of the affected birds (Stubblefield 1997; Isanhart 2008 and 2011). Residue analysis for potentially toxic elements performed on tissue samples collected at NWHC as part of the 2016 case workup identified consistently high levels of manganese, zinc and copper in the digestive tract contents and elevated levels of manganese and zinc in examined tissues (liver and kidney). In addition, copper, iron and cadmium were elevated in some of the samples. High concentrations detected for some metals, e.g., copper, can lead to oxidative damage, interference with metabolism of other trace minerals/metals, and contribute to systemic alterations listed above (Henderson 1975).

No other probable cause of morbidity or mortality were identified in the birds examined at NWHC with exceptions of two birds. The primary lesion in a snow goose obtained at a nearby location was massive hemorrhage and cause of death was determined as exsanguination (bleeding out) from gunshot wounds. A mallard duck was in too advanced postmortem autolysis to establish a definitive cause of death. This bird had marked parasitic infection of the upper gastrointestinal tract and this body site may have had significant damage from that, rather than ingestion of acidic metalliferous water.

Given the similarity of the tissue damage caused by the ingestion of Berkeley pit water by snow geese in 1995 and 2016, it appears that any changes in water quality that have occurred between the two time points were insufficient to eliminate negative health outcomes in lesser snow geese and potentially other water fowl that may consume Berkeley Pit water. Although

changes in toxic potency may be suggested given the increased time-to-death and reduced percentage of affected birds between the 1995 and 2016 incidents, one would have to make additional improvements in Pit water quality to ensure an elimination of wildlife hazard, and we do not know whether this is feasible.

The most recent investigation does not provide any additional clues as to the precise toxic mechanism ultimately responsible for the observed lesions. A combinatory effect of low pH and high levels of electrolytes and metals remains the most probable cause of the Berkeley Pit bird mortalities. Although copper has been suggested as a probable cause/contributor to the observed mortalities, liver lesions, often seen with acute copper toxicity, were not identified in the 2016 birds or consistently in birds of prior studies. Morbidity and mortality has been observed in neonatal birds exposed to acidic water or in adult birds ingesting high levels of sulfate or nitrate (Adams 1969; Krista 1961; Jensen 1991). Metals, may play a role alone or in combination with low pH (acidic water). Studies systematically delineating the effects of various combinations of metals, heavy metals, low pH, sulfate and nitrate on the health of water fowl have not been published. Therefore, there are currently not enough data available to pinpoint the specific type of tissue damage present in the 2016 birds and previously examined birds to any one particular component of the Berkeley pit water quality. It has been shown repeatedly that dehydration is a critical predisposing factor for consumption of acidic metalliferous water by birds (Stubblefield 1997; Isanhart 2008 and 2011). Analysis of blood chemistry and determination of metal concentrations in blood, liver, kidney, and content of the digestive tract have been found to be the most reliable in diagnosing metals toxicity in water fowl (Stubblefield 1997; Isanhart 2008 and 2011).

Additional studies in primarily affected species may be required to identify specific target(s) for intervention and prevention strategies. In an experimental study conducted in mallard ducks, treatment of water with lime limited mortalities (deaths) and reduced but did not eliminate morbidity (disease; Isanhart 2008). However, mallard ducks appear to be less sensitive than snow geese to the detrimental effects of acid metalliferous water ingestion.

Abbreviations

APHIS - VS	Animal and Plant Health Inspection Services - Veterinary Services
AI	Avian influenza
NWHC	United States Geological Survey - National Wildlife Health Center

Materials and Methods

Summary Report – Review of Postmortem Workup of Snow Geese at NWHC, WI

Christiane V. Löhr, Dr. med. vet., PhD, Diplomate ACVP

Full access was provided by the United States Geological Survey - National Wildlife Health Center (NWHCS) to all archived case materials including:

- Written necropsy reports for each individual bird
- Summary report
- CDs with gross images
- Microscopic slides

A review was performed of all materials provided and the main findings from the review are briefly summarized below.

Eighteen birds were submitted to NWHC. Complete necropsies with microscopic examination were performed on 7 birds:

- Birds collected on site
 - 001, 002, 003, 007 – Snow geese
 - 013 – Northern shoveler duck
 - 014 – Mallard duck
- Bird collected from nearby site
 - 018 – Snow goose

Remaining bodies are being held frozen.

The chain of custody paperwork including copies of sample tags were present and appeared to be complete. According to the paperwork, some birds were routed through other agencies including the National Fish and Wildlife Forensics Laboratory (NFWFL) in Ashland, OR and United States Fish and Wildlife Services (MONA USFWS).

Findings

Overview of case work-up

18 birds were submitted to the NWHC. Full postmortem examination including radiographic imaging, gross necropsy, and histopathology was performed on 7 of 18 birds. Samples of all necropsied birds were tested for avian influenza (AI) by PCR; virus isolation was also performed. Tissue samples and digestive tract content from a subset of birds were tested for toxic elements and toxic organic compounds. Samples from a single bird with grossly apparent enteritis were submitted for virus isolation and bacteriology to test for enteric pathogens common in ducks.

Summary of Performed Testing

- Radiographic imaging – 7 birds total

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- Gross necropsy – 7 birds total
- Histopathology – 7 birds total
 - Birds collected on site
 - 001, 002, 003, 007 – snow geese
 - 013 – Northern shoveler duck
 - 014 – Mallard duck
 - from nearby site
 - 018 – snow goose

Testing for viral pathogens performed on samples from 7 birds receiving full necropsies:

- Influenza virus
 - PCR on samples from 7 birds (all birds receiving full postmortem) = negative
- Virus isolation
 - Samples from 6 birds (except 018) = negative

Additional testing was performed on samples of 4 birds:

- Bacteriology
 - Liver from 1 bird (007) with bacterial enteritis submitted for routine aerobic culture = negative (including salmonella)
- Clostridium botulinum toxicity assays
 - Samples from 3 birds (001, 002, 003) = negative
- Virus isolation
 - Colon from 1 bird (007) = negative
- Cholinesterase activity
 - Brain samples of 3 birds (001, 002, 003) = within normal limits
- GC/MS testing for inorganic compounds screen
 - Gastric contents of 1 bird (003) = negative
- Toxic elements panel
 - Esophagus and gastric wash of 2 birds (002, 003) =
 - Manganese, zinc, copper – present; also detected aluminum, barium, calcium, chromium, iron, magnesium, sodium, phosphorus, lead, sulfur
 - Liver and kidney of 3 birds (001, 002, 003) =
 - Manganese, zinc, copper, cadmium – above reference range for domestic geese
- Toxic elements panel ICP-MS (mercury, cyanide, other metals and metalloids)
 - 6 birds (001, 002, 003, 007, 013, 014) - leg and breast muscle
 - 4 birds (003, 007, 0013, 0014) – liver
 - 3 birds (007, 0013, 0014) - kidney

Detailed findings from radiographic, gross and histopathological examination of each bird were recorded in individual necropsy reports and were consistent with those observed in radiographic images, images of representative gross lesions and microscopic tissues sections reviewed. The original results of assays performed elsewhere were included in the case package and accurately presented in the summary report.

Discussion

The summary report provided by NWHC (Appendix 1 and 2) is an accurate presentation of the findings from postmortem examination of the examined birds, as recorded in the individual necropsy reports for each bird. Of note, all birds submitted to NWHC were in good or excellent body condition with adequate to abundant adipose tissue. In contrast, some of the geese submitted to Oregon Veterinary Diagnostic Laboratory, Corvallis, OR (OVDL; 2016) for sample collection were in moderate and a few in fair body condition (Appendix 3).

Based on gross images provided, birds examined at NWHC had yellow discoloration of feathers as observed in the previous incident (1995) and in snow geese submitted to the OVDL (2016). Most of the NWHC birds had multifocal red-blue discolorations of the unfeathered skin and often deep defects of the skin on the dorsal or cranial (up or front) surface of feet and legs with tendons, joints, and bones visible. Such lesions were seen in only a few birds submitted to the OVDL.

Epithelial damage in the oral cavity, esophagus, proventriculus was present to varying degree or suspected in all birds except 018, and was similar to that described previously (1995). This ranged from hyperkeratosis and epithelial cell swelling and degeneration (grossly white material) on mucosal surfaces of tongue, oropharynx and larynx, esophagus and ventriculus to epithelial sloughing and blistering in the oral cavity to laminar or deep necrosis (extensive cell death) and hemorrhage in the proventriculus and duodenum. In birds submitted to the OVDL, only proventriculus and ventriculus were opened as per permits and the only gross lesion observed was intense reddening of the proventriculus in rare birds. The stomach contents of most birds examined at NWHC comprised grit only. This was also identified in some of the birds submitted to the OVDL.

The severe damage of mucosal lining (epithelial degeneration and necrosis with hemorrhage and vascular thrombosis) was also presented in the respiratory tract, more specifically the larynx, trachea and occasionally the airsacs. Foreign material (debris, bacteria) was present in parabronchi (airways) of the lungs of some birds and interpreted as agonal change. Renal tubular degeneration (kidney damage) was a common finding.

Additional gross and histopathological findings limited to specific birds were as follows.

007 – snow goose: External examination showed fecal stains and gross and histopathology identified colitis with intralesional bacteria. This case was appropriately worked up for diarrhea.

Additional testing did not yield viruses and bacteria. This bird also had necrotizing to ulcerative tracheitis with bacteria, likely associated with or secondary to the colitis.

013 and 014 – ducks: Both had esophageal parasites consistent with *Capillaria* sp., a common parasite (worm) in the esophagus of birds. One bird also had parasites in the small intestine consistent with acanthocephalans, a known parasite of the intestine of many species including birds.

018 – snow goose (from nearby site): This bird had gunshot wounds with extensive hemorrhage identified as cause of death. There was no evidence of acidic metalliferous water ingestion in this bird at the gross or microscopic level.

The postmortem examinations on birds collected in December 2016 at the Berkeley pit site, Butte, MT were conducted to industry (diagnostic veterinary pathology) standards with respect to breadth and depth of the examinations. There are no concerns about procedural details.

References

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Summary Report – Review of Postmortem Workup of Snow Geese at NWHC, WI

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Appendix 1



NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road
Madison, Wisconsin 53711-6223
608-270-2400 (FAX 608-270-2415)

DIAGNOSTIC SERVICES CASE REPORT

CASE: 27653
EPIZOO: 2016-184
Legal ☒ INV#: 2016605539
Declassified ☐

Final Report

3/15/2016

Submitter:

Mona Iannelli
USFWS Law Enforcement/Missoula MT
P.O. BOX 7488
200 East Broadway, RM 236
Missoula, MT 59807-7488

Date Submitted: 12/8/2016

Specimen description/identification/Location:

ACC	SPECIES	SPECIMEN TYPE	BAND NUMBER	SUBMITTER'S ID	COUNTY	STATE
001	Goose, Snow	CARCASS	625307 1	SG-6	Silver Bow	MT
002	Goose, Snow	CARCASS	625307 2	SG-2	Silver Bow	MT
003	Goose, Snow	CARCASS	625307 3	SG-4	Silver Bow	MT
004	Goose, Snow	CARCASS	625307 4	SG-5	Silver Bow	MT
005	Goose, Snow	CARCASS	625307 5	SG-1	Silver Bow	MT
006	Goose, Snow	CARCASS	625307 6	SG-3	Silver Bow	MT
007	Goose, Snow	CARCASS	625356 1		Silver Bow	MT
008	Goose, Snow	CARCASS	625355 1		Silver Bow	MT
009	Goose, Snow	CARCASS	625355 2		Silver Bow	MT
010	Goose, Snow	CARCASS	625355 3		Silver Bow	MT
011	Goose, Snow	CARCASS	625355 4		Silver Bow	MT
012	Goose, Snow	CARCASS	625355 5		Silver Bow	MT
013	Duck, Shoveler Northern	CARCASS	625355 6		Silver Bow	MT
014	Duck, Mallard	CARCASS	625355 7		Silver Bow	MT
015	Goose, Snow	CARCASS	625355 8		Silver Bow	MT
016	Goose, Snow	CARCASS	625355 9		Silver Bow	MT
017	Goose, Snow	CARCASS	625355 10		Silver Bow	MT
018	Goose, Snow	CARCASS	62536501	88976	Beaverhead	MT

Diagnosis:

Upper gastrointestinal tract mucosal necrosis (Acc. 001-003, 007, 013)
Upper gastrointestinal tract mucosal necrosis suspect (Acc. 014)
Duodenal mucosal necrosis (Acc. 001, 003)
Duodenal mucosal necrosis suspect (Acc. 002)
Upper respiratory tract mucosal necrosis (Acc. 001-003, 013)
Tracheal mucosal necrosis suspect (Acc. 007)
Necrotizing bacterial tracheitis (Acc. 007)
Renal tubular necrosis (Acc. 001-003, 007, 013, 014)
Necrotizing bacterial colitis (Acc. 007)
Gunshot trauma (Acc. 018)
Not examined (Acc. 004-006, 008-012, 015-017)

Event History:

In Butte, Montana, large flocks of mainly snow geese have been landing on the Berkeley Pit, a large flooded open-pit copper mine. This is a Silverbow/Butte Area Superfund Site. This mine is currently filled with low pH groundwater contaminated with various trace elements. Snow goose migration is ongoing and due to cold temperatures, stopover habitats have frozen over and forced birds to use the pit. Mortality onset date is estimated as 11/29 and significant mortality has been reported (estimated dead is 1,000 at the time of this submission). A hazing program is in effect but has not significantly deterred birds. A similar mortality event at this site occurred in November 1995 and was due to acute metal toxicosis and sulfuric acid exposure.

Comment:

CASE: 27653
EPIZOO: 2016-184
Legal ☒ INV#: 2016605539
Declassified ☐

Final Report

3/15/2017

Comment:

Sixteen snow geese (accessions 001 to 012 and 015 to 018), one Northern shoveler duck (accession 013) and one mallard duck (accession 014) were received at the USGS-National Wildlife Health Center for determination of cause of death. Complete postmortem investigation was carried out on 4 snow geese (001-003 and 007), the Northern shoveler duck (013) and the mallard duck (014). Radiographic, gross and microscopic examination was carried out on one additional snow goose submitted later from a nearby site (018). The remaining eleven carcasses (004-006, 008-012 and 015 to 017) were kept frozen in case they are needed for further testing. All dissected accessions were in thawed condition, having been previously frozen. Accession 001 to 003, 007 and 018 were in a good postmortem preservation state while accessions 013 and 014 were in a fair postmortem preservation state. Gross images were taken of all dissected carcasses (001-003, 007, 013, 014 and 018).

Death of snow geese 001-003, snow goose 007, and Northern shoveler 013 is attributed to acute damage to oral, gastrointestinal, or respiratory mucosa. Common findings among these birds included acute upper gastrointestinal tract mucosal necrosis (001-003, 007 and 013), duodenal mucosal necrosis (001, 003), upper respiratory tract mucosal necrosis (001-003, 007, 013), peracute cutaneous erosions and ulcerations (001-003, 013), and acute renal tubular necrosis (001-003, 007, 013).

Mallard duck 014 also presented with upper gastrointestinal tract mucosal necrosis and acute renal tubular necrosis. However, autolysis and concurrent capillariid infection of the esophageal mucosa prevented reliable assessment of the intensity and extension of the mucosal damage and its contribution to the death of this bird.

Death of snow goose 018 is attributed to trauma (see below); histologically, in kidneys, renal tubules multifocally contained intraluminal uric acid crystals and urates topi that rarely caused necrosis of renal tubular epithelium. This lesion was interpreted as incipient renal gout most likely secondary to dehydration; other tissues, including oral, gastrointestinal, and respiratory mucous membranes, were grossly and microscopically unremarkable with exception of a focal area of chronic lymphocytic inflammation of the ventricular lamina propria, most likely unrelated with the death of the animal.

The findings in the examined snow geese and Northern shoveler duck are very similar to those described in the pathology reports from the previous snow goose mortality event at Berkley pit investigated in 1995 and are suspected to be due to contact with contaminated water (**Galbraith and Lipton 1996; Isanhart MS 2008**).

The necrotizing lesions in the upper gastrointestinal tract, duodenum and upper respiratory tract are acute (minutes to 24 hours) and suggestive of chemical tissue damage induced by corrosive substances (**Arunachalam and Rammohan 2016; Contini and Scarpignato 2013**). Extensive damage of the upper gastrointestinal tract and duodenal mucosa may cause electrolytic imbalance, water loss, acute hypovolemia, shock and death.

The presence of bacteria and more florid inflammation in the necrotizing lesions of the upper respiratory tract of accession 007 suggests that a longer time elapsed between the mucosal insult and the death of this goose. This is consistent with the history of being captured and treated in rehabilitation. Secondary bacterial invasion of the damaged mucosa within the following 24-36 hours after removal from the site would explain this presentation. This bird also presented with acute bacterial colitis which may have contributed to death by exacerbating water loss and electrolytic imbalance.

A tissue toxic elements panel carried out at Michigan State University's Diagnostic Center for Population and Animal Health on liver and kidney of three snow geese (001-003) demonstrated elevated levels of manganese and zinc in both organs compared to the in-house reference for geese (**Puls 1994**). In addition, copper, iron, and cadmium were inconsistently elevated in these organs (table with these toxicology results has been submitted in a supplemental PDF document). Manganese, zinc and copper were detected in pooled upper gastrointestinal tract mucosa wash from two accessions (001 and 002) (see toxicology results below), confirming oral intake of these elements. Microbiological investigation (virological and bacteriological) did not reveal any significant infectious agents (see virology and bacteriology results below).

Based on chemistry data provided on water from the site and the detection of elevated metals in the stomach, the examined birds were presumably exposed to acidic water and soluble heavy metals and metalloids (acid metalliferous water). In acidic environments, dissolved metals, particularly copper and zinc, may potentiate the corrosive effect of acidic water (**Galbraith and Lipton 2016; Isanhart MS 2008**). In addition, copper alone has been documented to produce lesions similar to those described in this case in the upper gastrointestinal tract of Canada geese (**Henderson and Winterfield 1974**).

The erosions and ulcerations in the featherless skin of the legs and feet, noted both grossly and histologically, are characteristic of a peracute chemical burn; however, based on the absence of other conspicuous tissue changes in the skin, it is considered possible that damage to the skin could have occurred after death.

Gross examination of accession 018 revealed presence of a shotgun pellet in the subcutis of the left side of the caudal vertebrae with a corresponding 2-mm diameter wound involving skin and subcutis of the right side of the caudal vertebrae (suspect entry wound). The underlying soft tissues (subcutis and skeletal muscle) and bone (caudal edge of the right ischium) were hemorrhagic, confirming that this trauma occurred before death. Two additional small lacerations of the skin of the right metacarpus and left ulna suggestive of shotgun pellet wounds were also present. The right caudal coelomic cavity contained a 3x2x1-cm blood clot adjacent to the presumptive shotgun pellet entry wound (hemocoelum). There were no other abnormal findings, and shotgun trauma is the suspected cause of death. A full list of significant gross and microscopic findings and laboratory results from each accession are listed below.

CASE: 27653
EPIZOO: 2016-184
Legal ☒ INV#: 2016605539
Declassified ☐

Final Report

3/15/2017

Significant gross and microscopic findings:

1. Good or excellent body condition with adequate to abundant body fat (001-003, 007, 013, 014, 018)
2. Plumage covered by a small to moderate amount of pale-yellow sandy material (001-003, 013, 014)
3. Pericloacal feathers stained with feces and urates (007)
4. Oral mucosa and tongue: Mucosal degeneration or necrosis, acute, mild to moderate (001-003, 007, 013)
5. Esophagus: Mucosal degeneration or necrosis, acute, mild to moderate (001-003, 007, 013, 014)
6. Esophagus: Esophagitis, lymphoplasmacytic, multifocal, chronic, moderate, with intralesional nematodes (013, 014)
7. Proventriculus: Mucosal degeneration, necrosis, or ulceration, acute, mild (001,002)
8. Proventriculus: Mucosal degeneration or ulceration, suspect, acute, mild to moderate (003, 007, 013, 014)
9. Ventriculus: Mucosal necrosis and hemorrhage, acute, moderate to severe (001-003)
10. Ventriculus: Lymphocytic ventriculitis, focal, chronic, moderate (018)
11. Duodenum: Mucosal necrosis, diffuse, acute, severe (001, 003)
12. Duodenum: Mucosal necrosis, diffuse, acute, severe, suspect based on gross examination (002)
13. Larynx, trachea: Mucosal necrosis, multifocal, acute, moderate to severe (001, 002, 013)
14. Trachea: Necrotizing-ulcerative tracheitis, diffuse, acute, severe, with intralesional bacteria (007)
15. Kidney: Renal tubular degeneration and necrosis, multifocal, acute, mild to moderate (001-003, 007, 013, 014)
16. Kidney: Intraluminal tubular presence of uric acid crystals and urates tophi, multifocal, subacute, moderate, with rare obliteration of the lumen and necrosis of renal tubular epithelium (018)
17. Featherless skin (mostly affecting the unfeathered legs and feet and the bill): Epidermal necrosis with erosion and ulceration, peracute, and with no associated inflammatory changes (possible postmortem tissue damage) (001-003, 013)
18. Colon: Colitis, necrotizing, ulcerative, diffuse, acute, severe, with intralesional bacteria (007)
19. Skin caudal vertebral column and caudal ischium area and associated subcutaneous and muscles: Shotgun wound and hemorrhage with intralesional shotgun pellet, focally extensive, acute, moderate (018)
20. Coelomic cavity: Hemocoelium, extensive, acute, severe (018)
21. Upper gastrointestinal tract content:
 - a. Only grit in the stomach (001, 002, 013, 014,018)
 - b. 30.1 g of wheat grain and brown plant fiber in the stomach (003)
 - c. Moderate amount of granular to pasty pale green material in oropharynx (occluding the choanae and the larynx), esophagus, proventriculus and ventriculus (007)
22. Intestinal content:
 - a. Presence of fibrin casts in duodenum (001, 002)
 - b. Moderate amount of clear gelatinous fluid with clumps of thick, stringy yellow material in small intestine and many pinpoint to 1-mm diameter raised yellow mucosal foci (acanthocephalans) (014)
 - c. Unremarkable (003,007, 013,018)

Ancillary test results:

- Routine bacterial culture and *Salmonella* sp. culture from liver (accessions 001 to 003, 007, 013 and 014): **Negative**
- Avian influenza matrix RT-PCR screening from tracheal and cloacal swabs (accessions 001 to 003, 007, 013, 014 and 018): **Negative**
- Viral isolation in Vero cells and Muscovy duck embryo fibroblasts (MDEF) from kidney (accessions 001 to 003, 007, 013 and 014): **Negative**
- Viral isolation in Vero cells and MDEF from colon (accession 007): **Negative**
- Mouse toxicity and neutralization bioassay for detection of type C botulinum toxin (accessions 001 to 003): **Negative**
- Cholinesterase activity in brain (accessions 001 to 003): **Within the normal levels**
- Toxic elements panel from liver and kidney (accessions 001 to 003):
 - Manganese (Mn), Zinc (Zn), Copper (Cu) and Cadmium (Cd) levels are above normal ranges for domestic geese (*Branta spp.*) (table with results has been submitted in a supplemental PDF document)
- Toxic elements panel from esophagus wash and stomach content from pooled accessions 001 and 002:
 - Mn, Zn and Cu were present. In addition, Aluminum, Barium, Calcium, Chromium, Iron, Potassium, Magnesium, Sodium, Phosphorus, Lead and Sulfur were also detected
- Gas chromatography-mass spectrometry (GC/MS) from gastric content (accession 003): **Negative**

Note about toxicology testing: Both toxic elements panel (heavy metals) and GC/MS were performed at Michigan State University's Diagnostic Center for Population and Animal Health. Toxic elements panel includes Aluminum, Antimony, Arsenic, Barium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Phosphorus, Potassium, Selenium, Sodium, Sulfur, Thallium, and Zinc. GC/MS is a sensitive method that detects over 500,000 inorganic chemical compounds by using a modified Wiley 9 mass spectral library.

Leg and breast muscles from accessions 001-003, 007, 013 and 014; liver from accessions 003, 007, 013 and 014; and kidney from accession 007, 013 and 014 were submitted for Inductively Coupled Plasma Mass Spectrometry (ICP-MS) detection of mercury, cyanide and other metals and metalloids to other toxicology laboratories through United States Environmental Protection Agency (EPA).

Samples saved frozen for further testing: Oral or esophageal mucosa with lesions, kidney, liver, spleen, esophagus, proventriculus and ventriculus, intestine, brain, lung, trachea, feathered skin and subcutaneous fat, pectoral muscle (accessions 001 to 003, 007, 013, 014 and 018), heart with intracardiac blood (accessions 007, 013 and 014), and distal ileum (007).

CASE: 27653
EPIZOO: 2016-184
Legal ☒ INV#: 2016605539
Declassified ☐

Final Report

3/15/2017

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Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

Copies To:

This is a Report for your submission to the National Wildlife Health Center.

For consultation regarding diagnostic findings or laboratory testing and results, please contact the pathologist. Contact information can be found underneath the signature line on this report.

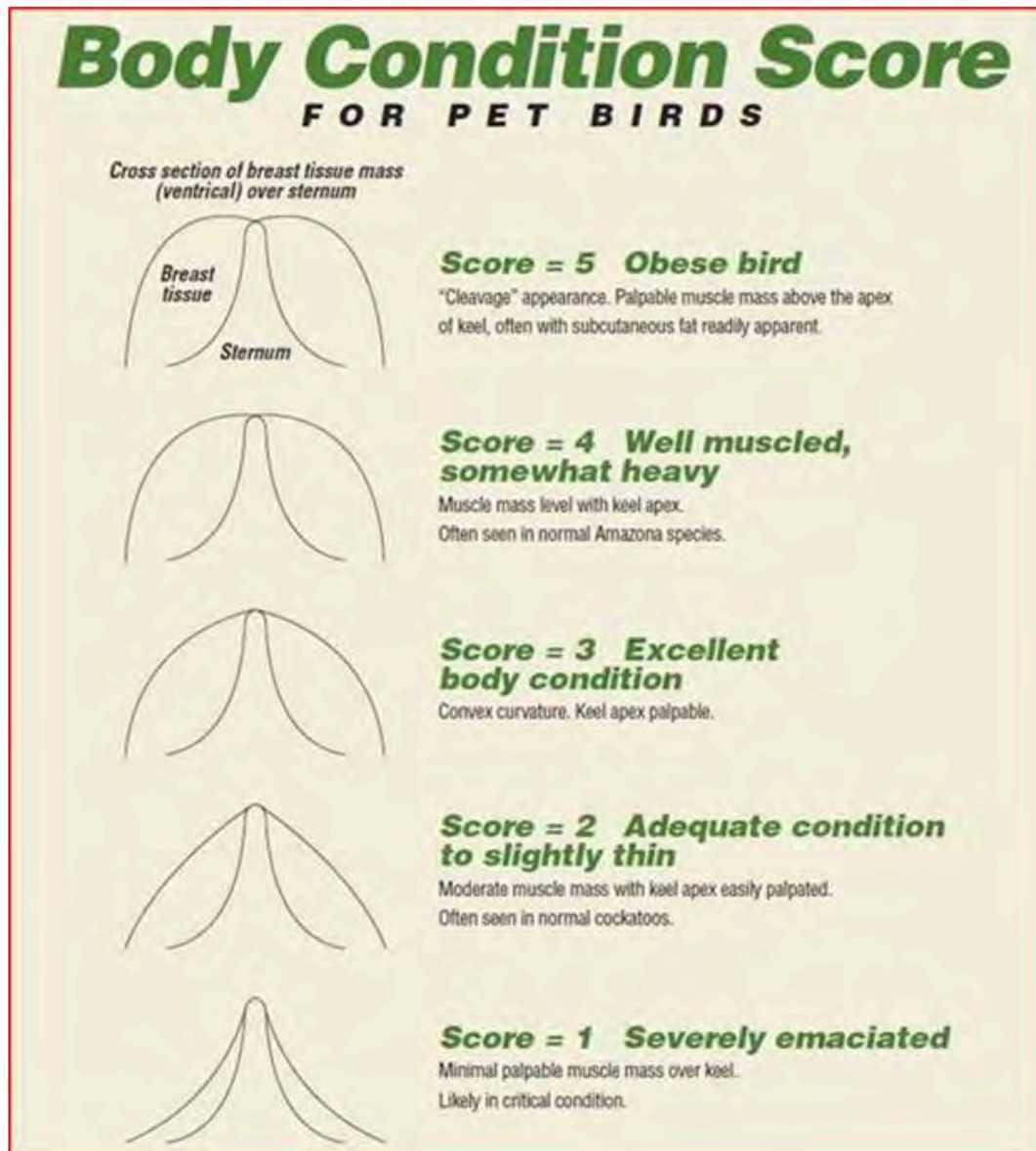
For consultation on the significance of this disease to wildlife populations in your area, assistance with disease control and response, or to report field updates (numbers and species affected, geographical distribution, end date, etc.), please contact an NWHC epidemiologist at NWHC-epi@usgs.gov or 608-270-2480.

Appendix 2

Significant tissue toxic elements panel results on liver and kidney of snow geese 001-003 (Michigan State University's Diagnostic Center for Population and Animal Health)				
Accession number	Organ tested	Toxic element	Levels (ppm dry weight)	Normal range domestic goose (R. Puls, 1994) (ppm estimate dry weight)
001	Liver	Mn	298.93	6-18
		Zn	955.68	75-330
		Cu	122.49	18-90
		Cd	4.3	<0.6-1.8
		Fe	1914.37	600-1500
	Kidney	Mn	547.17	4.2-12
		Zn	427.53	42-96
		Cu	34.62	9-21
		Cd	2.52	<0.6-6
	Fe	441.73	450-1050	
002	Liver	Mn	322.24	6-18
		Zn	902.63	75-330
		Cu	188.85	18-90
		Cd	4.04	<0.6-1.8
		Fe	1927.96	600-1500
	Kidney	Mn	424.15	4.2-12
		Zn	599.15	42-96
		Cu	44.8	9-21
		Cd	3.63	<0.6-6
	Fe	520.76	450-1050	
003	Liver	Mn	194.46	6-18
		Zn	387.27	75-330
		Cu	83.4	18-90
		Cd	2.72	<0.6-1.8
		Fe	1405.87	600-1500
	Kidney	Mn	374.63	4.2-12
		Zn	230.49	42-96
		Cu	23.58	9-21
		Cd	2.55	<0.6-6
	Fe	642.15	450-1050	

Appendix 3

Below is a well-established body condition scoring system for evaluating the condition of avian species. Below is a scale developed for “pet birds”, this was adapted for use with the birds received from the Berkeley Pit.



Appendix B

Analytical Report for Avian Tissue Project
ALS Environmental



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

February 27, 2017

Analytical Report for Service Request No: K1700165

Bill Stubblefield
Oregon State University
Wiegand Hall 421
3051 Campus Way
Corvallis, OR 97331

RE: Avian Tissue Project

Dear Bill,

Enclosed are the results of the sample(s) submitted to our laboratory December 29, 2016
For your reference, these analyses have been assigned our service request number **K1700165**.

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

Please contact me if you have any questions. My extension is 3356. You may also contact me via email at Kurt.Clarkson@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kurt Clarkson
Client Services
Manager



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Table of Contents

Acronyms

Qualifiers

State Certifications, Accreditations, And Licenses

Case Narrative

Chain of Custody

Total Solids

General Chemistry

Metals

Acronyms

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

Inorganic Data Qualifiers

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

Metals Data Qualifiers

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

Organic Data Qualifiers

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

Additional Petroleum Hydrocarbon Specific Qualifiers

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

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

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

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

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



Case Narrative

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

ALS ENVIRONMENTAL

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request No.: K1700165
Date Received: 12/29/16

Case Narrative

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

Sample Receipt

Twenty animal tissue samples were received for analysis at ALS Environmental on 12/29/16. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were frozen at -20°C upon receipt at the laboratory.

General Chemistry Parameters

Total Cyanide by EPA Method 9012B:

Samples 1-5 and 20-25 were received past holding time. The analysis was performed as soon as possible after receipt by the laboratory. The data was flagged to indicate the holding time violation.

The spike recovery for Laboratory Control Sample (LCS) 1 was outside the lower control criterion. The error associated with reduced recovery indicated a potential low bias. Additional analysis of the associated field sample was not performed because the result was within manufacturer's acceptance limits. The data was flagged to indicate the anomaly.

The upper control criterion was exceeded in Laboratory Control Samples (LCS) 2 & 5. The error associated with elevated recovery indicated a high bias. Additional analysis of the associated field sample was not performed because the result was within manufacturer's acceptance limits. No further corrective action was appropriate.

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

Total Metals

Matrix Spike Recovery Exceptions:

The control criteria for matrix spike recovery of Iron, Magnesium, Potassium, Sodium and Zinc for sample Bird No. 16-17 Liver were not applicable. The analyzed concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

Approved by



The control criteria for matrix spike recovery of Aluminum, Chromium, Copper, Iron, Potassium, Sodium and Zinc for the Batch QC1 sample were not applicable. The analyzed concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

The matrix spike recovery of Calcium for the Batch QC sample was outside control criteria. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. No further corrective action was appropriate.

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

Approved by

A handwritten signature in black ink, appearing to read "Kurt Clarkson", written over a horizontal line.



Chain of Custody

ALS Environmental—Kelso Laboratory
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Laboratory Management Program LaMP Chain of Custody Record

K1700165

Running number	ID	Weight	Sex	Liver	Kidney	GI tract	GI contents	Breast muscle	Thigh muscle	Bone (including marrow)
		(g)	(m/f)							
1	16-1	1772	m	x	x	x	x	x	x	x
2	16-2	2475	m	x	x	x	x	x	x	x
3	16-3	1964	m	x	x	x	x	x	x	x
4	16-4	2419	m	x	x	x	x	x	x	x
5	16-5	2887	m	x	x	x	x	x	x	x
6	16-6	1893	m	x	x	x	x	x	x	x
7	16-7	2317	f	x	x	x	x	x	x	x
8	16-8	2518	m	x	x	x	x	x	x	x
9	16-9	2274	f	x	x	x	x	x	x	x
10	16-10	2521	m	x	x	x	x	x	x	x
11	16-11	2152	m	x	x	x	x	x	x	x
12	16-12	1864	f	x	x	x	x	x	x	x
13	16-13	2170	f	x	x	x	x	x	x	x
14	16-14	1941	f	x	x	x	x	x	x	x
15	16-15	1973	m	x	x	x	x	x	x	x
16	16-16	2532	f	x	x	x	x	x	x	x
17	16-17	2624	m	x	x	x	x	x	x	x
18	16-18	2445	m	x	x	x	x	x	x	x
19	16-19	2418	f	x	x	x	x	x	x	x
20	16-20	2197	m	x	x	x	x	x	x	x
21	16-21	1537	f	x	x	x	x	x	x	x
22	16-22	1741	m	x	x	x	x	x	x	x
23	16-23	1853	f	x	x	x	x	x	x	x
24	16-24	1795	m	x	x	x	x	x	x	x
25	16-25	1838	m	x	x	x	x	x	x	x



Cooler Receipt and Preservation Form

PC GSClient OSU USFWService Request K1700165Received: 12-29-16Opened: 12-29-16By: egUnloaded: 12-29-16By: eg

1. Samples were received via? Mail Fed Ex UPS DHL PDX Courier Hand Delivered
2. Samples were received in: (circle) Cooler Box Envelope Other NA
3. Were custody seals on coolers? NA Y N If yes, how many and where? NA
- If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID	Tracking Number	NA	Filed
-16.8	-10.8	-	-	4	361		12 788 146 01 4816	NA	1144

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

Sample ID on Bottle	Sample ID on COC	Identified by:

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

Notes, Discrepancies, & Resolutions:

Page ____ of ____



Total Solids

ALS Environmental—Kelso Laboratory
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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue
Analysis Method: Freeze Dry
Prep Method: None

Service Request: K1700165
Date Collected: 12/08/16 - 12/19/16
Date Received: 12/29/16
Units: Percent
Basis: Wet

Total Solids

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
Bird No. 16-1 Liver	K1700165-001	22.8	-	-	1	01/17/17 11:40	
Bird No. 16-2 Liver	K1700165-002	29.3	-	-	1	01/17/17 11:40	
Bird No. 16-3 Liver	K1700165-003	26.0	-	-	1	01/17/17 11:40	
Bird No. 16-4 Liver	K1700165-004	27.5	-	-	1	01/17/17 11:40	
Bird No. 16-5 Liver	K1700165-005	25.4	-	-	1	01/17/17 11:40	
Bird No. 16-6 Liver	K1700165-006	27.2	-	-	1	01/17/17 11:40	
Bird No. 16-7 Liver	K1700165-007	28.6	-	-	1	01/17/17 11:40	
Bird No. 16-8 Liver	K1700165-008	27.2	-	-	1	01/17/17 11:40	
Bird No. 16-9 Liver	K1700165-009	26.3	-	-	1	01/17/17 11:40	
Bird No. 16-10 Liver	K1700165-010	26.4	-	-	1	01/17/17 11:40	
Bird No. 16-11 Liver	K1700165-011	26.9	-	-	1	01/17/17 11:40	
Bird No. 16-12 Liver	K1700165-012	28.1	-	-	1	01/17/17 11:40	
Bird No. 16-13 Liver	K1700165-013	29.3	-	-	1	01/17/17 11:40	
Bird No. 16-14 Liver	K1700165-014	27.5	-	-	1	01/17/17 11:40	
Bird No. 16-15 Liver	K1700165-015	28.0	-	-	1	01/17/17 11:40	
Bird No. 16-16 Liver	K1700165-016	27.4	-	-	1	01/17/17 11:40	
Bird No. 16-17 Liver	K1700165-017	28.6	-	-	1	01/17/17 11:40	
Bird No. 16-18 Liver	K1700165-018	29.7	-	-	1	01/17/17 11:40	
Bird No. 16-19 Liver	K1700165-019	28.9	-	-	1	01/17/17 11:40	
Bird No. 16-20 Liver	K1700165-020	27.7	-	-	1	01/17/17 11:40	
Bird No. 16-21 Liver	K1700165-021	26.6	-	-	1	01/17/17 11:40	
Bird No. 16-22 Liver	K1700165-022	28.6	-	-	1	01/17/17 11:40	
Bird No. 16-23 Liver	K1700165-023	23.4	-	-	1	01/17/17 11:40	
Bird No. 16-24 Liver	K1700165-024	29.4	-	-	1	01/17/17 11:40	
Bird No. 16-25 Liver	K1700165-025	26.3	-	-	1	01/17/17 11:40	



General Chemistry

ALS Environmental—Kelso Laboratory
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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue
Analysis Method: 9012B
Prep Method: EPA 9010B

Service Request: K1700165
Date Collected: 12/08/16 - 12/19/16
Date Received: 12/29/16
Units: mg/Kg
Basis: Wet

Cyanide, Total

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Bird No. 16-1 Liver	K1700165-001	3.35	0.10	-	1	01/30/17 12:38	1/30/17	**
Bird No. 16-2 Liver	K1700165-002	1.58	0.10	-	1	01/30/17 12:38	1/30/17	**
Bird No. 16-3 Liver	K1700165-003	1.66	0.10	-	1	01/30/17 12:38	1/30/17	**
Bird No. 16-4 Liver	K1700165-004	1.69	0.10	-	1	01/30/17 12:38	1/30/17	**
Bird No. 16-5 Liver	K1700165-005	2.28	0.10	-	1	01/30/17 12:38	1/30/17	*
Bird No. 16-6 Liver	K1700165-006	1.92	0.10	-	1	01/30/17 12:38	1/30/17	*
Bird No. 16-7 Liver	K1700165-007	1.99	0.10	-	1	01/30/17 12:38	1/30/17	*
Bird No. 16-8 Liver	K1700165-008	1.96	0.10	-	1	01/30/17 12:38	1/30/17	*
Bird No. 16-9 Liver	K1700165-009	1.49	0.10	-	1	01/30/17 12:38	1/30/17	*
Bird No. 16-10 Liver	K1700165-010	2.08	0.10	-	1	01/30/17 12:38	1/30/17	*
Bird No. 16-11 Liver	K1700165-011	1.55	0.10	-	1	01/30/17 12:38	1/30/17	*
Bird No. 16-12 Liver	K1700165-012	1.86	0.10	-	1	01/30/17 12:38	1/30/17	*
Bird No. 16-13 Liver	K1700165-013	2.11	0.10	-	1	01/30/17 12:38	1/30/17	*
Bird No. 16-14 Liver	K1700165-014	1.54	0.10	-	1	01/30/17 12:38	1/30/17	*
Bird No. 16-15 Liver	K1700165-015	1.27	0.10	-	1	01/30/17 12:38	1/30/17	*
Bird No. 16-16 Liver	K1700165-016	1.92	0.10	-	1	01/30/17 12:38	1/30/17	*
Bird No. 16-17 Liver	K1700165-017	1.71	0.10	-	1	01/30/17 12:38	1/30/17	*
Bird No. 16-18 Liver	K1700165-018	1.68	0.10	-	1	01/30/17 12:38	1/30/17	*
Bird No. 16-19 Liver	K1700165-019	1.87	0.10	-	1	01/30/17 12:38	1/30/17	*
Bird No. 16-20 Liver	K1700165-020	0.76	0.10	-	1	01/30/17 12:38	1/30/17	**
Bird No. 16-21 Liver	K1700165-021	1.56	0.10	-	1	01/31/17 14:36	1/30/17	**
Bird No. 16-22 Liver	K1700165-022	1.88	0.10	-	1	01/31/17 14:36	1/30/17	**
Bird No. 16-23 Liver	K1700165-023	2.04	0.10	-	1	01/31/17 14:36	1/30/17	**
Bird No. 16-24 Liver	K1700165-024	2.70	0.10	-	1	01/31/17 14:36	1/30/17	**
Bird No. 16-25 Liver	K1700165-025	2.59	0.10	-	1	01/31/17 14:36	1/30/17	**
Method Blank	K1700165-MB1	ND U	0.10	-	1	01/30/17 12:38	1/30/17	
Method Blank	K1700165-MB2	ND U	0.10	-	1	01/31/17 14:36	1/30/17	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Oregon State University
Project Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request:K1700165
Date Collected:NA
Date Received:12/29/16

Analysis Method: 9012B
Prep Method: EPA 9010B

Units:mg/Kg
Basis:Wet

Replicate Sample Summary
Cyanide, Total

Sample Name:	Lab Code:	MRL	MDL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Bird No. 16-17 Liver	K1700165-017DUP	0.10	-	1.71	1.59	1.65	7	20	01/30/17
Batch QC	K1700171-024DUP	0.10	-	1.70	1.48	1.59	14	20	01/31/17

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

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

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

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700165
Date Collected: N/A
Date Received: 12/29/16
Date Analyzed: 01/30/17
Date Extracted: 01/30/17

Duplicate Matrix Spike Summary
Cyanide, Total

Sample Name: Bird No. 16-17 Liver
Lab Code: K1700165-017
Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet

Analyte Name	Sample Result	Result	Matrix Spike K1700165-017MS		Result	Duplicate Matrix Spike K1700165-017DMS		% Rec Limits	RPD	RPD Limit
			Spike Amount	% Rec		Spike Amount	% Rec			
Cyanide, Total	1.71	3.09	4.74	29	3.49	4.87	37	10-171	12	20

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

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

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

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700165
Date Collected: N/A
Date Received: N/A
Date Analyzed: 01/31/17
Date Extracted: 01/30/17

Duplicate Matrix Spike Summary
Cyanide, Total

Sample Name: Batch QC
Lab Code: K1700171-024
Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet

Analyte Name	Sample Result	Result	Matrix Spike K1700171-024MS		Result	Duplicate Matrix Spike K1700171-024DMS		% Rec Limits	RPD	RPD Limit
			Spike Amount	% Rec		Spike Amount	% Rec			
Cyanide, Total	1.70	4.55	4.89	58	4.75	4.86	63	10-171	4	20

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

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

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

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700165
Date Analyzed: 01/30/17
Date Extracted: 01/30/17

Lab Control Sample Summary
Cyanide, Total

Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet
Analysis Lot: 532887

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1700165-LCS1	33.1	70.3	47 *	62-128

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700165
Date Analyzed: 01/31/17
Date Extracted: 01/30/17

Lab Control Sample Summary
Cyanide, Total

Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet
Analysis Lot: 533083

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1700165-LCS2	96.8	70.3	138 *	62-128
Lab Control Sample	K1700165-LCS3	83.5	70.3	119	62-128
Lab Control Sample	K1700165-LCS4	79.8	70.3	113	62-128
Lab Control Sample	K1700165-LCS5	93.3	70.3	133 *	62-128

Client: Oregon State University
Project: Avian Tissue Project

Service Request: K1700165

Continuing Calibration Verification (CCV) Summary

Cyanide, Total

Analysis Method: 9012B

Units: ug/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	532887	KQ1700962-10	01/30/17 12:38	100	104	104	90-110
CCV2	532887	KQ1700962-11	01/30/17 12:38	100	104	104	90-110
CCV3	532887	KQ1700962-12	01/30/17 12:38	100	104	104	90-110
CCV4	532887	KQ1700962-13	01/30/17 12:38	100	104	104	90-110
CCV5	533083	KQ1701041-04	01/31/17 14:36	100	103	103	90-110
CCV6	533083	KQ1701041-05	01/31/17 14:36	100	104	104	90-110
CCV7	533083	KQ1701041-06	01/31/17 14:36	100	104	104	90-110
CCV8	533083	KQ1701041-07	01/31/17 14:36	100	103	103	90-110

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project

Service Request:K1700165

Continuing Calibration Blank (CCB) Summary
Cyanide, Total

Analysis Method: 9012B

Units:mg/Kg

	Analysis Lot	Lab Code	Date Analyzed	MRL	MDL	Result	Q
CCB1	532887	KQ1700962-06	01/30/17 12:38	0.10		ND	U
CCB2	532887	KQ1700962-07	01/30/17 12:38	0.10		ND	U
CCB3	532887	KQ1700962-08	01/30/17 12:38	0.10		ND	U
CCB4	532887	KQ1700962-09	01/30/17 12:38	0.10		ND	U
CCB5	533083	KQ1701041-01	01/31/17 14:36	0.10		ND	U
CCB6	533083	KQ1701041-02	01/31/17 14:36	0.10		ND	U
CCB7	533083	KQ1701041-03	01/31/17 14:36	0.10		ND	U
CCB8	533083	KQ1701041-08	01/31/17 14:36	0.10		ND	U



Metals

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

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700165
Date Collected: 12/08-19/16
Date Received: 12/29/16

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/g
Basis: Dry

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Bird No. 16-1 Liver	K1700165-001	1.0	0.06	1	01/30/17	01/31/17	24.8	
Bird No. 16-2 Liver	K1700165-002	0.9	0.06	1	01/30/17	01/31/17	58.9	
Bird No. 16-3 Liver	K1700165-003	1.0	0.06	1	01/30/17	01/31/17	12.1	
Bird No. 16-4 Liver	K1700165-004	0.9	0.06	1	01/30/17	01/31/17	22.6	
Bird No. 16-5 Liver	K1700165-005	0.9	0.06	1	01/30/17	01/31/17	23.7	
Bird No. 16-6 Liver	K1700165-006	1.0	0.06	1	01/30/17	01/31/17	13.2	
Bird No. 16-7 Liver	K1700165-007	1.0	0.06	1	01/30/17	01/31/17	14.6	
Bird No. 16-8 Liver	K1700165-008	1.0	0.06	1	01/30/17	01/31/17	16.2	
Bird No. 16-9 Liver	K1700165-009	1.0	0.06	1	01/30/17	01/31/17	13.8	
Bird No. 16-10 Liver	K1700165-010	0.9	0.06	1	01/30/17	01/31/17	14.7	
Bird No. 16-11 Liver	K1700165-011	1.0	0.06	1	01/30/17	01/31/17	20.2	
Bird No. 16-12 Liver	K1700165-012	1.0	0.06	1	01/30/17	01/31/17	19.6	
Bird No. 16-13 Liver	K1700165-013	1.0	0.06	1	01/30/17	01/31/17	13.2	
Bird No. 16-14 Liver	K1700165-014	1.0	0.06	1	01/30/17	01/31/17	17.5	
Bird No. 16-15 Liver	K1700165-015	1.0	0.06	1	01/30/17	01/31/17	19.8	
Bird No. 16-16 Liver	K1700165-016	1.0	0.06	1	01/30/17	01/31/17	28.1	
Bird No. 16-17 Liver	K1700165-017	1.0	0.06	1	01/30/17	01/31/17	9.41	
Bird No. 16-18 Liver	K1700165-018	1.0	0.06	1	01/30/17	01/31/17	12.5	
Bird No. 16-19 Liver	K1700165-019	1.0	0.06	1	01/30/17	01/31/17	11.9	
Bird No. 16-20 Liver	K1700165-020	0.9	0.06	1	01/30/17	01/31/17	16.4	
Method Blank 1	K1700165-MB1	1.0	0.06	1	01/30/17	01/31/17	ND	
Method Blank 2	K1700165-MB2	1.0	0.06	1	01/30/17	01/31/17	ND	
Method Blank 3	K1700165-MB3	1.0	0.06	1	01/30/17	01/31/17	ND	

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700165
Date Collected: 12/19/16
Date Received: 12/29/16

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/g
Basis: Dry

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Bird No. 16-21 Liver	K1700165-021	1.0	0.06	1	01/30/17	01/31/17	14.7	
Bird No. 16-22 Liver	K1700165-022	1.0	0.06	1	01/30/17	01/31/17	29.8	
Bird No. 16-23 Liver	K1700165-023	1.0	0.06	1	01/30/17	01/31/17	9.27	
Bird No. 16-24 Liver	K1700165-024	1.0	0.06	1	01/30/17	01/31/17	8.02	
Bird No. 16-25 Liver	K1700165-025	1.0	0.06	1	01/30/17	01/31/17	8.61	
Method Blank 1	K1700165-MB1	1.0	0.06	1	01/30/17	01/31/17	ND	
Method Blank 2	K1700165-MB2	1.0	0.06	1	01/30/17	01/31/17	ND	
Method Blank 3	K1700165-MB3	1.0	0.06	1	01/30/17	01/31/17	ND	

ALS Group USA, Corp.

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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700165
Date Collected: 12/08/16
Date Received: 12/29/16
Date Extracted: 01/30/17
Date Analyzed: 01/31/17

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name: Bird No. 16-1 Liver Units: ng/g
Lab Code: K1700165-001S, K1700165-001SD Basis: Dry
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		ALS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Mercury	METHOD	1631E	5.0	243	250	24.8	282	283	106	103	70-130	<1	

ALS Group USA, Corp.
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 QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700165
Date Collected: NA
Date Received: 12/29/16
Date Extracted: 01/30/17
Date Analyzed: 01/31/17

Matrix Spike/Duplicate Matrix Spike Summary
 Total Metals

Sample Name: Bird No. 16-11 Liver Units: ng/g
 Lab Code: K1700165-011S, K1700165-011SD Basis: Dry
 Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		ALS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Mercury	METHOD	1631E	4.6	230	230	20.2	262	254	105	102	70-130	3	

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700165
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 01/31/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Initial) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery	Result Notes
						Acceptance Limits	
Mercury	METHOD	1631E	5.00	5.43	109	70-130	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700165
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 01/31/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	5.30	106	70-130	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Animal tissue

Service Request: K1700165
Date Collected: NA
Date Received: NA
Date Extracted: 01/30/17
Date Analyzed: 01/31/17

Quality Control Sample (QCS) Summary
Total Metals

Sample Name: Quality Control Sample
Lab Code:
Test Notes:

Units: ng/g
Basis: Dry

Source: TORT-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery	Result Notes
						Acceptance Limits	
Mercury	METHOD	1631E	292	287	98	70-130	

ALS Group USA, Corp.
dba ALS Environmental
 QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700165
Date Collected: 12/19/16
Date Received: 12/29/16
Date Extracted: 01/30/17
Date Analyzed: 01/31/17

Matrix Spike/Duplicate Matrix Spike Summary
 Total Metals

Sample Name: Bird No. 16-21 Liver Units: ng/g
 Lab Code: K1700165-021S, K1700165-021SD Basis: Dry
 Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		ALS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Mercury	METHOD	1631E	4.8	249	242	14.7	270	259	103	101	70-130	4	

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700165
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 01/31/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Initial) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	4.97	99	70-130	

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700165
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 01/31/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	4.94	99	70-130	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Animal tissue

Service Request: K1700165
Date Collected: NA
Date Received: NA
Date Extracted: 01/30/17
Date Analyzed: 01/31/17

Quality Control Sample (QCS) Summary
Total Metals

Sample Name: Quality Control Sample
Lab Code:
Test Notes:

Units: ng/g
Basis: Dry

Source: TORT-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	292	271	93	70-130	

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-1 Liver

Lab Code: K1700165-001

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	7.9		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/30/17	0.434		
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.03	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/30/17	0.086		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.003	J	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	4.01		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	566		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.97		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.996		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	129		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	3450		
Lead	6020A	0.0192	0.0005	5.0	01/29/17	01/30/17	0.0408		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	1010		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	122		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	1.10		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	11000		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	4.3		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.042		
Sodium	6010C	19.2	1.9	1.0	01/29/17	01/31/17	3790		
Thallium	6020A	0.0192	0.0009	5.0	01/29/17	01/30/17	0.0013	J	
Vanadium	6020A	0.192	0.007	5.0	01/29/17	01/30/17	0.042	J	
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	1270		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-2 Liver

Lab Code: K1700165-002

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	13.9		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/30/17	0.163		
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.05	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/30/17	0.127		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.005	J	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	3.95		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	451		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.48		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	1.09		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	165		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	1470		
Lead	6020A	0.0192	0.0005	5.0	01/29/17	01/30/17	0.0343		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	861		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	88.1		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.78		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	9740		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	3.1		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.061		
Sodium	6010C	19.2	1.9	1.0	01/29/17	01/31/17	2370		
Thallium	6020A	0.0192	0.0009	5.0	01/29/17	01/30/17	0.0016	J	
Vanadium	6020A	0.192	0.007	5.0	01/29/17	01/30/17	0.036	J	
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	465		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-3 Liver

Lab Code: K1700165-003

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	3.4		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/30/17	0.151		
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.03	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/30/17	0.901		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	7.80		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	418		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.23		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.273		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	138		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	3350		
Lead	6020A	0.0192	0.0005	5.0	01/29/17	01/30/17	0.150		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	790		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	22.9		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.14	J	
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	11000		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	5.8		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.019		
Sodium	6010C	19.2	1.9	1.0	01/29/17	01/31/17	3680		
Thallium	6020A	0.0192	0.0009	5.0	01/29/17	01/30/17	0.0009	U	
Vanadium	6020A	0.192	0.007	5.0	01/29/17	01/30/17	0.040	J	
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	1410		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-4 Liver

Lab Code: K1700165-004

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	11.6		
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/30/17	0.112		
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/30/17	0.04	J	
Barium	6020A	0.050	0.005	5.0	01/29/17	01/30/17	0.128		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.003	J	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	2.99		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	658		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.21		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	1.51		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	93.9		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	1510		
Lead	6020A	0.0200	0.0005	5.0	01/29/17	01/30/17	0.0833		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	1120		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	184		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	1.09		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	9240		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	5.5		
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.025		
Sodium	6010C	20.0	2.0	1.0	01/29/17	01/31/17	1910		
Thallium	6020A	0.0200	0.0009	5.0	01/29/17	01/30/17	0.0140	J	
Vanadium	6020A	0.200	0.007	5.0	01/29/17	01/30/17	0.065	J	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	552		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-5 Liver

Lab Code: K1700165-005

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	6.9		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/30/17	0.035	J	
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.02	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/30/17	0.072		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.003	J	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	5.82		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	604		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.17	J	
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	1.24		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	153		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	1720		
Lead	6020A	0.0192	0.0005	5.0	01/29/17	01/30/17	0.0529		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	1070		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	139		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.90		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	9160		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	6.6		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.014	J	
Sodium	6010C	19.2	1.9	1.0	01/29/17	01/31/17	2670		
Thallium	6020A	0.0192	0.0009	5.0	01/29/17	01/30/17	0.0016	J	
Vanadium	6020A	0.192	0.007	5.0	01/29/17	01/30/17	0.039	J	
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	1050		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-6 Liver

Lab Code: K1700165-006

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.8	0.2	5.0	01/29/17	01/30/17	2.6		
Antimony	6020A	0.046	0.002	5.0	01/29/17	01/30/17	0.040	J	
Arsenic	6020A	0.46	0.02	5.0	01/29/17	01/30/17	0.02	J	
Barium	6020A	0.046	0.005	5.0	01/29/17	01/30/17	0.247		
Beryllium	6020A	0.018	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.018	0.002	5.0	01/29/17	01/30/17	4.59		
Calcium	6010C	3.7	1.8	1.0	01/29/17	01/31/17	312		
Chromium	6020A	0.18	0.02	5.0	01/29/17	01/30/17	0.20		
Cobalt	6020A	0.018	0.003	5.0	01/29/17	01/30/17	0.319		
Copper	6010C	0.37	0.08	1.0	01/29/17	01/31/17	120		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	2570		
Lead	6020A	0.0184	0.0005	5.0	01/29/17	01/30/17	0.0732		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	848		
Manganese	6010C	0.09	0.02	1.0	01/29/17	01/31/17	32.9		
Nickel	6020A	0.18	0.02	5.0	01/29/17	01/30/17	0.20		
Potassium	6010C	18	3.7	1.0	01/29/17	01/31/17	10800		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	5.3		
Silver	6020A	0.018	0.006	5.0	01/29/17	01/30/17	0.011	J	
Sodium	6010C	18.4	1.8	1.0	01/29/17	01/31/17	2780		
Thallium	6020A	0.0184	0.0008	5.0	01/29/17	01/30/17	0.0010	J	
Vanadium	6020A	0.184	0.006	5.0	01/29/17	01/30/17	0.033	J	
Zinc	6010C	0.37	0.06	1.0	01/29/17	01/31/17	931		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-7 Liver

Lab Code: K1700165-007

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.8	0.2	5.0	01/29/17	01/30/17	6.5		
Antimony	6020A	0.044	0.002	5.0	01/29/17	01/30/17	0.043	J	
Arsenic	6020A	0.44	0.02	5.0	01/29/17	01/30/17	0.02	J	
Barium	6020A	0.044	0.004	5.0	01/29/17	01/30/17	0.153		
Beryllium	6020A	0.018	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.018	0.002	5.0	01/29/17	01/30/17	3.74		
Calcium	6010C	3.6	1.8	1.0	01/29/17	01/31/17	572		
Chromium	6020A	0.18	0.02	5.0	01/29/17	01/30/17	0.12	J	
Cobalt	6020A	0.018	0.003	5.0	01/29/17	01/30/17	1.20		
Copper	6010C	0.36	0.08	1.0	01/29/17	01/31/17	67.2		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	1490		
Lead	6020A	0.0178	0.0004	5.0	01/29/17	01/30/17	0.113		
Magnesium	6010C	0.9	0.4	1.0	01/29/17	01/31/17	975		
Manganese	6010C	0.09	0.02	1.0	01/29/17	01/31/17	144		
Nickel	6020A	0.18	0.02	5.0	01/29/17	01/30/17	0.73		
Potassium	6010C	18	3.6	1.0	01/29/17	01/31/17	9890		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	4.1		
Silver	6020A	0.018	0.005	5.0	01/29/17	01/30/17	0.005	U	
Sodium	6010C	17.8	1.8	1.0	01/29/17	01/31/17	2360		
Thallium	6020A	0.0178	0.0008	5.0	01/29/17	01/30/17	0.0008	U	
Vanadium	6020A	0.178	0.006	5.0	01/29/17	01/30/17	0.024	J	
Zinc	6010C	0.36	0.05	1.0	01/29/17	01/31/17	460		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-8 Liver

Lab Code: K1700165-008

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	6.4		
Antimony	6020A	0.049	0.002	5.0	01/29/17	01/30/17	0.023	J	
Arsenic	6020A	0.49	0.02	5.0	01/29/17	01/30/17	0.37	J	
Barium	6020A	0.049	0.005	5.0	01/29/17	01/30/17	0.087		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	5.18		
Calcium	6010C	3.9	2.0	1.0	01/29/17	01/31/17	615		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.17	J	
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	1.52		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	112		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	1620		
Lead	6020A	0.0195	0.0005	5.0	01/29/17	01/30/17	0.0915		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	1030		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	153		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	1.01		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	8520		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	4.7		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.037		
Sodium	6010C	19.5	2.0	1.0	01/29/17	01/31/17	2090		
Thallium	6020A	0.0195	0.0009	5.0	01/29/17	01/30/17	0.0009	U	
Vanadium	6020A	0.195	0.007	5.0	01/29/17	01/30/17	0.103	J	
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	601		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-9 Liver

Lab Code: K1700165-009

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	10.7		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/30/17	0.069		
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.04	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/30/17	0.091		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.005	J	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	3.65		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	531		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.20		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	1.62		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	160		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	1440		
Lead	6020A	0.0194	0.0005	5.0	01/29/17	01/30/17	0.0378		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	1100		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	170		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	1.12		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	10100		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	6.0		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.042		
Sodium	6010C	19.4	1.9	1.0	01/29/17	01/31/17	1970		
Thallium	6020A	0.0194	0.0009	5.0	01/29/17	01/30/17	0.0027	J	
Vanadium	6020A	0.194	0.007	5.0	01/29/17	01/30/17	0.024	J	
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	548		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-10 Liver

Lab Code: K1700165-010

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	4.5		
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/30/17	0.075		
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/30/17	0.02	U	
Barium	6020A	0.050	0.005	5.0	01/29/17	01/30/17	0.112		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	9.95		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	395		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.29		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.504		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	281		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	2180		
Lead	6020A	0.0199	0.0005	5.0	01/29/17	01/30/17	0.165		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	859		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	61.2		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.40		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	10500		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	6.0		
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.026		
Sodium	6010C	19.9	2.0	1.0	01/29/17	01/31/17	3040		
Thallium	6020A	0.0199	0.0009	5.0	01/29/17	01/30/17	0.0028	J	
Vanadium	6020A	0.199	0.007	5.0	01/29/17	01/30/17	0.036	J	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	975		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-11 Liver

Lab Code: K1700165-011

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	16.2		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/30/17	0.046	J	
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.03	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/30/17	0.088		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.005	J	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	10.7		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	388		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.11	J	
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.672		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	277		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	4200		
Lead	6020A	0.0192	0.0005	5.0	01/29/17	01/30/17	0.103		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	859		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	78.1		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.40		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	10300		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	5.8		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.027		
Sodium	6010C	19.2	1.9	1.0	01/29/17	01/31/17	3510		
Thallium	6020A	0.0192	0.0009	5.0	01/29/17	01/30/17	0.0009	U	
Vanadium	6020A	0.192	0.007	5.0	01/29/17	01/30/17	0.061	J	
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	1690		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-12 Liver

Lab Code: K1700165-012

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	3.9		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/30/17	0.019	J	
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.03	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/30/17	0.158		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	8.86		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	284		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.10	J	
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.471		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	236		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	2340		
Lead	6020A	0.0190	0.0005	5.0	01/29/17	01/30/17	0.0423		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	702		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	74.8		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.23		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	9230		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	5.1		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.042		
Sodium	6010C	19.0	1.9	1.0	01/29/17	01/31/17	3470		
Thallium	6020A	0.0190	0.0009	5.0	01/29/17	01/30/17	0.0030	J	
Vanadium	6020A	0.190	0.007	5.0	01/29/17	01/30/17	0.045	J	
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	781		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-13 Liver

Lab Code: K1700165-013

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	8.7		
Antimony	6020A	0.049	0.002	5.0	01/29/17	01/30/17	0.062		
Arsenic	6020A	0.49	0.02	5.0	01/29/17	01/30/17	0.03	J	
Barium	6020A	0.049	0.005	5.0	01/29/17	01/30/17	0.102		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	4.83		
Calcium	6010C	3.9	2.0	1.0	01/29/17	01/31/17	338		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.14	J	
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.625		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	125		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	2630		
Lead	6020A	0.0195	0.0005	5.0	01/29/17	01/30/17	0.0940		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	758		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	70.2		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.42		
Potassium	6010C	20	3.9	1.0	01/29/17	01/31/17	9280		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	5.3		
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.022		
Sodium	6010C	19.5	2.0	1.0	01/29/17	01/31/17	2860		
Thallium	6020A	0.0195	0.0009	5.0	01/29/17	01/30/17	0.0009	U	
Vanadium	6020A	0.195	0.007	5.0	01/29/17	01/30/17	0.041	J	
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	555		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-14 Liver

Lab Code: K1700165-014

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	27.8		
Antimony	6020A	0.049	0.002	5.0	01/29/17	01/30/17	0.045	J	
Arsenic	6020A	0.49	0.02	5.0	01/29/17	01/30/17	0.03	J	
Barium	6020A	0.049	0.005	5.0	01/29/17	01/30/17	0.103		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.012	J	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	10.6		
Calcium	6010C	3.9	2.0	1.0	01/29/17	01/31/17	476		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.32		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	1.39		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	201		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	4700		
Lead	6020A	0.0195	0.0005	5.0	01/29/17	01/30/17	0.192		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	1070		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	171		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	1.06		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	10100		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	5.5		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.023		
Sodium	6010C	19.5	2.0	1.0	01/29/17	01/31/17	3630		
Thallium	6020A	0.0195	0.0009	5.0	01/29/17	01/30/17	0.0103	J	
Vanadium	6020A	0.195	0.007	5.0	01/29/17	01/30/17	0.081	J	
Zinc	6010C	3.90	0.58	10.0	01/29/17	01/31/17	2000		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-15 Liver

Lab Code: K1700165-015

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	2.8		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/30/17	0.020	J	
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.04	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/30/17	0.094		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	11.6		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	252		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.12	J	
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.352		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	197		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	4380		
Lead	6020A	0.0194	0.0005	5.0	01/29/17	01/30/17	0.191		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	758		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	18.7		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.12	J	
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	10600		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	5.7		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.016	J	
Sodium	6010C	19.4	1.9	1.0	01/29/17	01/31/17	3330		
Thallium	6020A	0.0194	0.0009	5.0	01/29/17	01/30/17	0.0009	U	
Vanadium	6020A	0.194	0.007	5.0	01/29/17	01/30/17	0.181	J	
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	1470		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-16 Liver

Lab Code: K1700165-016

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	15.5		
Antimony	6020A	0.047	0.002	5.0	01/29/17	01/30/17	0.024	J	
Arsenic	6020A	0.47	0.02	5.0	01/29/17	01/30/17	0.08	J	
Barium	6020A	0.047	0.005	5.0	01/29/17	01/30/17	0.178		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.004	J	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	4.52		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	447		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.09	J	
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	1.30		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	135		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	2220		
Lead	6020A	0.0188	0.0005	5.0	01/29/17	01/30/17	0.181		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	1060		
Manganese	6010C	0.09	0.02	1.0	01/29/17	01/31/17	164		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.81		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	10700		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	5.3		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.049		
Sodium	6010C	18.8	1.9	1.0	01/29/17	01/31/17	2550		
Thallium	6020A	0.0188	0.0008	5.0	01/29/17	01/30/17	0.0008	U	
Vanadium	6020A	0.188	0.007	5.0	01/29/17	01/30/17	0.050	J	
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	561		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-17 Liver

Lab Code: K1700165-017

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	12.9		
Antimony	6020A	0.047	0.002	5.0	01/29/17	01/30/17	0.023	J	
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.02	U	
Barium	6020A	0.047	0.005	5.0	01/29/17	01/30/17	0.036	J	
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	3.53		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	356		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.08	J	
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	1.07		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	92.6		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	1670		
Lead	6020A	0.0190	0.0005	5.0	01/29/17	01/30/17	0.0700		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	930		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	133		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.69		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	9320		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	5.9		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.020		
Sodium	6010C	19.0	1.9	1.0	01/29/17	01/31/17	2320		
Thallium	6020A	0.0190	0.0009	5.0	01/29/17	01/30/17	0.0009	U	
Vanadium	6020A	0.190	0.007	5.0	01/29/17	01/30/17	0.019	J	
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	487		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-18 Liver

Lab Code: K1700165-018

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	12.7		
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/30/17	0.084		
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/30/17	0.03	J	
Barium	6020A	0.050	0.005	5.0	01/29/17	01/30/17	0.073		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.009	J	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	4.11		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	410		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.20		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	1.17		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	74.8		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	1900		
Lead	6020A	0.0199	0.0005	5.0	01/29/17	01/30/17	0.104		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	867		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	126		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.85		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	8400		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	4.6		
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.023		
Sodium	6010C	19.9	2.0	1.0	01/29/17	01/31/17	1790		
Thallium	6020A	0.0199	0.0009	5.0	01/29/17	01/30/17	0.0020	J	
Vanadium	6020A	0.199	0.007	5.0	01/29/17	01/30/17	0.048	J	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	503		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-19 Liver

Lab Code: K1700165-019

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.8	0.2	5.0	01/29/17	01/30/17	4.6		
Antimony	6020A	0.046	0.002	5.0	01/29/17	01/30/17	0.041	J	
Arsenic	6020A	0.46	0.02	5.0	01/29/17	01/30/17	0.03	J	
Barium	6020A	0.046	0.005	5.0	01/29/17	01/30/17	0.123		
Beryllium	6020A	0.018	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.018	0.002	5.0	01/29/17	01/30/17	4.37		
Calcium	6010C	3.7	1.8	1.0	01/29/17	01/31/17	316		
Chromium	6020A	0.18	0.02	5.0	01/29/17	01/30/17	0.16	J	
Cobalt	6020A	0.018	0.003	5.0	01/29/17	01/30/17	0.653		
Copper	6010C	0.37	0.08	1.0	01/29/17	01/31/17	104		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	1680		
Lead	6020A	0.0184	0.0005	5.0	01/29/17	01/30/17	0.0912		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	843		
Manganese	6010C	0.09	0.02	1.0	01/29/17	01/31/17	97.0		
Nickel	6020A	0.18	0.02	5.0	01/29/17	01/30/17	0.44		
Potassium	6010C	18	3.7	1.0	01/29/17	01/31/17	10700		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	4.9		
Silver	6020A	0.018	0.006	5.0	01/29/17	01/30/17	0.033		
Sodium	6010C	18.4	1.8	1.0	01/29/17	01/31/17	2260		
Thallium	6020A	0.0184	0.0008	5.0	01/29/17	01/30/17	0.0008	U	
Vanadium	6020A	0.184	0.006	5.0	01/29/17	01/30/17	0.075	J	
Zinc	6010C	0.37	0.06	1.0	01/29/17	01/31/17	355		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-20 Liver

Lab Code: K1700165-020

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.8	0.2	5.0	01/29/17	01/30/17	17.0		
Antimony	6020A	0.045	0.002	5.0	01/29/17	01/30/17	0.135		
Arsenic	6020A	0.46	0.02	5.0	01/29/17	01/30/17	0.03	J	
Barium	6020A	0.045	0.005	5.0	01/29/17	01/30/17	0.101		
Beryllium	6020A	0.018	0.003	5.0	01/29/17	01/30/17	0.008	J	
Cadmium	6020A	0.018	0.002	5.0	01/29/17	01/30/17	7.54		
Calcium	6010C	3.6	1.8	1.0	01/29/17	01/31/17	644		
Chromium	6020A	0.18	0.02	5.0	01/29/17	01/30/17	0.17	J	
Cobalt	6020A	0.018	0.003	5.0	01/29/17	01/30/17	1.43		
Copper	6010C	0.36	0.08	1.0	01/29/17	01/31/17	230		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	2540		
Lead	6020A	0.0182	0.0005	5.0	01/29/17	01/30/17	0.0560		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	1000		
Manganese	6010C	0.09	0.02	1.0	01/29/17	01/31/17	186		
Nickel	6020A	0.18	0.02	5.0	01/29/17	01/30/17	1.03		
Potassium	6010C	18	3.6	1.0	01/29/17	01/31/17	8210		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	3.5		
Silver	6020A	0.018	0.005	5.0	01/29/17	01/30/17	0.021		
Sodium	6010C	18.2	1.8	1.0	01/29/17	01/31/17	2780		
Thallium	6020A	0.0182	0.0008	5.0	01/29/17	01/30/17	0.0040	J	
Vanadium	6020A	0.182	0.006	5.0	01/29/17	01/30/17	0.049	J	
Zinc	6010C	0.36	0.06	1.0	01/29/17	01/31/17	1150		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-21 Liver

Lab Code: K1700165-021

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/31/17	3.9		
Antimony	6020A	0.049	0.002	5.0	01/29/17	01/31/17	0.200		
Arsenic	6020A	0.49	0.02	5.0	01/29/17	01/31/17	0.03	J	
Barium	6020A	0.049	0.005	5.0	01/29/17	01/31/17	0.073		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/31/17	13.7		
Calcium	6010C	3.9	2.0	1.0	01/29/17	01/31/17	283		N
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.24		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.425		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	431		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	2700		
Lead	6020A	0.0195	0.0005	5.0	01/29/17	01/31/17	0.0296		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	755		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	42.6		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.23		
Potassium	6010C	20	3.9	1.0	01/29/17	01/31/17	10900		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	5.7		
Silver	6020A	0.020	0.006	5.0	01/29/17	01/31/17	0.059		
Sodium	6010C	19.5	2.0	1.0	01/29/17	01/31/17	3740		
Thallium	6020A	0.0195	0.0009	5.0	01/29/17	01/31/17	0.0009	U	
Vanadium	6020A	0.195	0.007	5.0	01/29/17	01/31/17	0.101	J	
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	1160		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-22 Liver

Lab Code: K1700165-022

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/31/17	3.5		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/31/17	0.096		
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/31/17	0.03	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/31/17	0.160		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/31/17	7.07		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	228		N
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/31/17	0.10	J	
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.262		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	158		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	2340		
Lead	6020A	0.0194	0.0005	5.0	01/29/17	01/31/17	0.0664		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	812		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	18.6		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/31/17	0.10	J	
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	11400		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	5.3		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/31/17	0.023		
Sodium	6010C	19.4	1.9	1.0	01/29/17	01/31/17	2960		
Thallium	6020A	0.0194	0.0009	5.0	01/29/17	01/31/17	0.0033	J	
Vanadium	6020A	0.194	0.007	5.0	01/29/17	01/31/17	0.061	J	
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	1140		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-23 Liver

Lab Code: K1700165-023

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/31/17	3.4		
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/31/17	0.076		
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/31/17	0.02	U	
Barium	6020A	0.050	0.005	5.0	01/29/17	01/31/17	0.149		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/31/17	7.02		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	296		N
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.11	J	
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.233		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	103		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	3040		
Lead	6020A	0.0198	0.0005	5.0	01/29/17	01/31/17	0.0950		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	772		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	15.2		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.06	J	
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	11500		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	4.6		
Silver	6020A	0.020	0.006	5.0	01/29/17	01/31/17	0.016	J	
Sodium	6010C	19.8	2.0	1.0	01/29/17	01/31/17	3560		
Thallium	6020A	0.0198	0.0009	5.0	01/29/17	01/31/17	0.0009	U	
Vanadium	6020A	0.198	0.007	5.0	01/29/17	01/31/17	0.067	J	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	1360		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-24 Liver

Lab Code: K1700165-024

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/31/17	2.5		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/31/17	0.065		
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/31/17	0.02	U	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/31/17	0.151		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/31/17	6.46		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	291		N
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/31/17	0.10	J	
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.211		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	145		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	2170		
Lead	6020A	0.0194	0.0005	5.0	01/29/17	01/31/17	0.563		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	662		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	41.6		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/31/17	0.12	J	
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	9390		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	5.3		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/31/17	0.016	J	
Sodium	6010C	19.4	1.9	1.0	01/29/17	01/31/17	3230		
Thallium	6020A	0.0194	0.0009	5.0	01/29/17	01/31/17	0.0009	U	
Vanadium	6020A	0.194	0.007	5.0	01/29/17	01/31/17	0.042	J	
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	526		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-25 Liver

Lab Code: K1700165-025

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/31/17	7.3		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/31/17	0.087		
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/31/17	0.03	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/31/17	0.166		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/31/17	8.32		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	361		N
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/31/17	0.15	J	
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.184		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	53.5		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	4820		
Lead	6020A	0.0193	0.0005	5.0	01/29/17	01/31/17	0.266		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	744		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	11.0		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/31/17	0.10	J	
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	9830		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	4.9		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/31/17	0.007	J	
Sodium	6010C	19.3	1.9	1.0	01/29/17	01/31/17	3350		
Thallium	6020A	0.0193	0.0009	5.0	01/29/17	01/31/17	0.0009	U	
Vanadium	6020A	0.193	0.007	5.0	01/29/17	01/31/17	0.119	J	
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	1390		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received:

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Method Blank

Lab Code: KQ1700678-01

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	0.2	U	
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/30/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/30/17	0.02	U	
Barium	6020A	0.050	0.005	5.0	01/29/17	01/30/17	0.005	U	
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	0.002	U	
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	2.0	U	
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.02	U	
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.003	U	
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	0.09	U	
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	0.2	U	
Lead	6020A	0.0200	0.0005	5.0	01/29/17	01/30/17	0.0005	U	
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	0.5	U	
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	0.02	U	
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.02	U	
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	4.0	U	
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	0.2	U	
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/29/17	01/31/17	2.0	U	
Thallium	6020A	0.0200	0.0009	5.0	01/29/17	01/30/17	0.0009	U	
Vanadium	6020A	0.200	0.007	5.0	01/29/17	01/30/17	0.007	U	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	0.06	U	

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received:

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Method Blank

Lab Code: KQ1700682-01

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/31/17	0.4	J	
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/31/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/31/17	0.02	U	
Barium	6020A	0.050	0.005	5.0	01/29/17	01/31/17	0.005	U	
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/31/17	0.003	J	
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	2.1	J	N
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.02	U	
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.003	U	
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	0.18	J	
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	0.2	U	
Lead	6020A	0.0200	0.0005	5.0	01/29/17	01/31/17	0.0005	U	
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	0.5	U	
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	0.03	J	
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.02	U	
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	7.7	J	
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	0.3	J	
Silver	6020A	0.020	0.006	5.0	01/29/17	01/31/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/29/17	01/31/17	2.0	U	
Thallium	6020A	0.0200	0.0009	5.0	01/29/17	01/31/17	0.0009	U	
Vanadium	6020A	0.200	0.007	5.0	01/29/17	01/31/17	0.007	U	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	0.11	J	

Comments:

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum	100.0	91.5	92	25.0	25.0	100	24.9	100	6020A
Antimony	25.0	25.8	103	25.0	25.1	100	25.1	100	6020A
Arsenic	25.0	25.6	102	25.0	25.5	102	25.1	100	6020A
Barium	100.0	103.0	103	25.0	25.0	100	24.8	99	6020A
Beryllium	2.50	2.52	101	25.00	24.96	100	24.23	97	6020A
Cadmium	12.5	12.9	103	25.0	25.6	102	25.4	102	6020A
Calcium	5000	4972	99	500	500	100	501	100	6010C
Calcium	12500	12510	100	10000	10020	100	10020	100	6010C
Chromium	10.0	10.3	103	25.0	24.9	100	25.4	102	6020A
Cobalt	25.0	25.5	102	25.0	24.7	99	24.8	99	6020A
Copper	625	607	97	250	252	101	251	100	6010C
Iron	50.0	55.0	110	25.0	24.7	99	25.0	100	6020A
Lead	25.0	25.0	100	25.0	24.8	99	24.8	99	6020A
Magnesium	12500	12220	98	10000	10100	101	9985	100	6010C
Magnesium	5000	4969	99	250	252	101	254	102	6010C
Manganese	1250	1231	98	250	249	100	252	101	6010C
Nickel	25.0	25.6	102	25.0	24.4	98	24.9	100	6020A
Potassium	12500	12520	100	10000	10160	102	10120	101	6010C
Selenium	25.0	24.9	100	25.0	24.2	97	24.9	100	6020A
Silver	12.5	13.0	104	25.0	25.3	101	25.6	102	6020A
Sodium	12500	12460	100	10000	10170	102	10120	101	6010C
Thallium	25.0	24.7	99	25.0	24.7	99	24.8	99	6020A
Vanadium	25.0	25.8	103	25.0	24.8	99	25.1	100	6020A
Zinc	1250	1237	99	250	249	100	249	100	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	24.7	99	25.0	100	6020A
Antimony				25.0	25.2	101	25.3	101	6020A
Arsenic				25.0	25.7	103	26.1	104	6020A
Barium				25.0	24.9	100	24.6	98	6020A
Beryllium				25.00	23.96	96	23.54	94	6020A
Cadmium				25.0	25.4	102	25.5	102	6020A
Calcium				10000	9960	100	9978	100	6010C
Calcium				500	499	100	496	99	6010C
Chromium				25.0	25.7	103	25.8	103	6020A
Cobalt				25.0	25.2	101	25.4	102	6020A
Copper				250	251	100	255	102	6010C
Iron				25.0	25.2	101	25.0	100	6020A
Lead				25.0	24.8	99	25.0	100	6020A
Magnesium				10000	9947	99	9934	99	6010C
Magnesium				250	256	102	254	102	6010C
Manganese				250	252	101	252	101	6010C
Nickel				25.0	25.3	101	25.2	101	6020A
Potassium				10000	10110	101	10070	101	6010C
Selenium				25.0	25.3	101	26.2	105	6020A
Silver				25.0	24.2	97	25.1	100	6020A
Sodium				10000	10090	101	10080	101	6010C
Thallium				25.0	24.8	99	25.0	100	6020A
Vanadium				25.0	25.5	102	25.4	102	6020A
Zinc				250	251	100	253	101	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.3	101	25.4	102	6020A
Antimony				25.0	25.5	102	25.9	104	6020A
Arsenic				25.0	25.4	102	26.5	106	6020A
Barium				25.0	24.9	100	25.5	102	6020A
Beryllium				25.00	23.86	95	24.60	98	6020A
Cadmium				25.0	25.4	102	25.7	103	6020A
Calcium				10000	9872	99	10030	100	6010C
Calcium				500	498	100	497	99	6010C
Chromium				25.0	25.1	100	26.4	106	6020A
Cobalt				25.0	25.2	101	25.4	102	6020A
Copper				250	253	101	252	101	6010C
Iron				25.0	25.6	102	25.8	103	6020A
Lead				25.0	25.2	101	25.2	101	6020A
Magnesium				10000	9914	99	9716	97	6010C
Magnesium				250	255	102	254	102	6010C
Manganese				250	249	100	251	100	6010C
Nickel				25.0	25.3	101	25.6	102	6020A
Potassium				10000	10110	101	10130	101	6010C
Selenium				25.0	25.7	103	26.2	105	6020A
Silver				25.0	25.3	101	25.1	100	6020A
Sodium				10000	10150	102	9947	99	6010C
Thallium				25.0	25.2	101	25.4	102	6020A
Vanadium				25.0	25.8	103	26.5	106	6020A
Zinc				250	249	100	252	101	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.6	102	25.8	103	6020A
Antimony				25.0	26.7	107	26.5	106	6020A
Arsenic				25.0	25.9	104	26.5	106	6020A
Barium				25.0	26.0	104	26.1	104	6020A
Beryllium				25.00	24.45	98	24.13	97	6020A
Cadmium				25.0	25.8	103	25.5	102	6020A
Calcium				10000	10020	100	9980	100	6010C
Calcium				500	497	99	494	99	6010C
Chromium				25.0	26.5	106	26.6	106	6020A
Cobalt				25.0	25.8	103	26.0	104	6020A
Copper				250	253	101	249	100	6010C
Iron				25.0	25.2	101	26.5	106	6020A
Lead				25.0	25.9	104	25.7	103	6020A
Magnesium				10000	9798	98	9719	97	6010C
Magnesium				250	253	101	252	101	6010C
Manganese				250	249	100	250	100	6010C
Nickel				25.0	25.9	104	25.8	103	6020A
Potassium				10000	10110	101	10010	100	6010C
Selenium				25.0	25.1	100	25.4	102	6020A
Silver				25.0	24.1	96	25.0	100	6020A
Sodium				10000	10040	100	9957	100	6010C
Thallium				25.0	25.9	104	25.5	102	6020A
Vanadium				25.0	26.2	105	26.6	106	6020A
Zinc				250	251	100	251	100	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	26.3	105	26.5	106	6020A
Antimony				25.0	26.4	106	26.6	106	6020A
Arsenic				25.0	27.3	109	26.6	106	6020A
Barium				25.0	26.1	104	26.4	106	6020A
Beryllium				25.00	24.98	100	25.19	101	6020A
Cadmium				25.0	27.6	110	26.9	108	6020A
Calcium				10000	10030	100	9927	99	6010C
Calcium				500	496	99	496	99	6010C
Chromium				25.0	27.1	108	26.3	105	6020A
Cobalt				25.0	26.4	106	26.1	104	6020A
Copper				250	248	99	251	100	6010C
Iron				25.0	26.4	106	25.8	103	6020A
Lead				25.0	25.8	103	25.6	102	6020A
Magnesium				10000	9512	95	9755	98	6010C
Magnesium				250	254	102	252	101	6010C
Manganese				250	252	101	249	100	6010C
Nickel				25.0	26.1	104	26.0	104	6020A
Potassium				10000	9933	99	10120	101	6010C
Selenium				25.0	26.4	106	26.6	106	6020A
Silver				25.0	27.3	109	25.6	102	6020A
Sodium				10000	9763	98	10030	100	6010C
Thallium				25.0	25.7	103	25.6	102	6020A
Vanadium				25.0	27.1	108	26.3	105	6020A
Zinc				250	253	101	251	100	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	26.6	106	26.5	106	6020A
Antimony				25.0	27.0	108	27.4	110	6020A
Arsenic				25.0	26.7	107	27.0	108	6020A
Barium				25.0	26.4	106	27.0	108	6020A
Beryllium				25.00	24.77	99	24.92	100	6020A
Cadmium				25.0	26.4	106	26.5	106	6020A
Calcium				10000	9967	100	9987	100	6010C
Calcium				500	497	99	498	100	6010C
Chromium				25.0	27.3	109	27.1	108	6020A
Cobalt				25.0	26.9	108	26.5	106	6020A
Copper				250	247	99	248	99	6010C
Iron				25.0	26.9	108	27.5	110	6020A
Lead				25.0	26.6	106	26.6	106	6020A
Magnesium				10000	9731	97	9808	98	6010C
Magnesium				250	252	101	250	100	6010C
Manganese				250	253	101	250	100	6010C
Nickel				25.0	27.0	108	27.2	109	6020A
Potassium				10000	10050	100	10100	101	6010C
Selenium				25.0	26.5	106	26.0	104	6020A
Silver				25.0	26.5	106	25.5	102	6020A
Sodium				10000	9944	99	10010	100	6010C
Thallium				25.0	26.5	106	26.4	106	6020A
Vanadium				25.0	27.1	108	26.9	108	6020A
Zinc				250	251	100	249	100	6010C

- 2a -

Client: Oregon State University

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

	Initial Calibration			Continuing Calibration					
Analyte	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	Method
Arsenic	25.0	25.5	102	25.0	25.0	100	25.0	100	6020A

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University **SDG No.:** K1700165
Contract: _____ **Lab Code:** ALSK **Case No.:** _____ **SAS No.:** _____
Initial Calibration Source: Inorganic Ventures
Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLICVT1									
	Aluminum	4.123	4.000	103	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Antimony	0.118	0.100	118	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Arsenic	1.125	1.000	112	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Barium	0.101	0.100	101	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Beryllium	0.034	0.040	85	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Cadmium	0.052	0.040	130	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Chromium	0.414	0.400	104	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Cobalt	0.037	0.040	92	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Iron	1.999	2.000	100	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Lead	0.043	0.040	108	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Nickel	0.393	0.400	98	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Selenium	2.379	2.000	119	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Silver	0.048	0.040	120	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Thallium	0.041	0.040	102	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Vanadium	0.416	0.400	104	70.0 - 130.0	MS	1/30/2017	16:41	013017a
LLCCVT1									
	Aluminum	4.080	4.000	102	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Antimony	0.122	0.100	122	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Arsenic	1.051	1.000	105	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Barium	0.092	0.100	92	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Beryllium	0.035	0.040	88	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Cadmium	0.038	0.040	95	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Chromium	0.464	0.400	116	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Cobalt	0.039	0.040	98	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Iron	2.031	2.000	102	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Lead	0.038	0.040	95	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Nickel	0.422	0.400	106	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Selenium	2.140	2.000	107	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Silver	0.039	0.040	98	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Thallium	0.039	0.040	98	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Vanadium	0.420	0.400	105	70.0 - 130.0	MS	1/30/2017	20:30	013017a

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University SDG No.: K1700165
 Contract: _____ Lab Code: ALSK Case No.: _____ SAS No.: _____
 Initial Calibration Source: Inorganic Ventures
 Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLCCVT2									
	Aluminum	4.509	4.000	113	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Antimony	0.130	0.100	130	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Arsenic	1.126	1.000	113	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Barium	0.105	0.100	105	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Beryllium	0.039	0.040	98	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Cadmium	0.047	0.040	118	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Chromium	0.456	0.400	114	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Cobalt	0.041	0.040	102	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Iron	2.528	2.000	126	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Lead	0.046	0.040	115	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Nickel	0.420	0.400	105	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Selenium	2.408	2.000	120	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Silver	0.046	0.040	115	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Thallium	0.044	0.040	110	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Vanadium	0.424	0.400	106	70.0 - 130.0	MS	1/31/2017	00:23	013017a
LLCCVT3									
	Aluminum	4.372	4.000	109	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Antimony	0.127	0.100	127	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Arsenic	1.195	1.000	120	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Barium	0.109	0.100	109	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Beryllium	0.035	0.040	88	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Cadmium	0.044	0.040	110	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Chromium	0.484	0.400	121	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Cobalt	0.046	0.040	115	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Iron	2.362	2.000	118	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Lead	0.046	0.040	115	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Nickel	0.409	0.400	102	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Selenium	2.441	2.000	122	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Silver	0.044	0.040	110	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Thallium	0.045	0.040	112	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Vanadium	0.450	0.400	112	70.0 - 130.0	MS	1/31/2017	03:26	013017a

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION
Client: Oregon State University
SDG No.: K1700165
Contract: _____ **Lab Code:** ALSK
Case No.: _____ **SAS No.:** _____

Initial Calibration Source: Inorganic Ventures
Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLICV1									
	Calcium	21.3	20.0	106	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
	Copper	4.60	5.0	92	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
	Magnesium	5.8	5.0	116	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
	Potassium	205.3	200.0	103	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
	Sodium	192.3	200.0	96	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
	Zinc	4.3	4.0	108	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
LLICV1									
	Manganese	1.19	1.0	119	70.0 - 130.0	P	1/31/2017	10:34	013117AICP
LLCCV1									
	Calcium	20.7	20.0	104	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Copper	4.80	5.0	96	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Magnesium	5.3	5.0	106	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Manganese	1.01	1.0	101	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Potassium	224.0	200.0	112	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Sodium	222.8	200.0	111	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Zinc	4.3	4.0	108	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
LLCCV2									
	Calcium	20.7	20.0	104	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Copper	4.70	5.0	94	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Magnesium	5.4	5.0	108	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Manganese	1.10	1.0	110	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Potassium	234.7	200.0	117	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Sodium	203.5	200.0	102	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Zinc	4.6	4.0	115	70.0 - 130.0	P	1/31/2017	15:19	013117AICP

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION**Client:** Oregon State University**SDG No.:** K1700165**Contract:** _____ **Lab Code:** ALSK**Case No.:** _____ **SAS No.:** _____**Initial Calibration Source:** Inorganic Ventures**Continuing Calibration Source:** ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLCCV3									
	Calcium	21.2	20.0	106	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Copper	4.80	5.0	96	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Magnesium	5.2	5.0	104	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Manganese	0.98	1.0	98	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Potassium	218.2	200.0	109	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Sodium	211.2	200.0	106	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Zinc	4.4	4.0	110	70.0 - 130.0	P	1/31/2017	17:01	013117AICP

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION**Client:** Oregon State University**SDG No.:** K1700165**Contract:** _____ **Lab Code:** ALSK**Case No.:** _____ **SAS No.:** _____**Initial Calibration Source:** Inorganic Ventures**Continuing Calibration Source:** ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLICVT1									
	Arsenic	0.986	1.000	99	70.0 - 130.0	MS	1/31/2017	12:56	013117a
LLCCVT1									
	Arsenic	1.075	1.000	108	70.0 - 130.0	MS	1/31/2017	13:22	013117a

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Antimony	0.009	J	-0.006	J	0.005	J	-0.006	J	6020A
Arsenic	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Barium	0.010	U	0.010	U	0.010	U	0.010	U	6020A
Beryllium	0.006	U	0.006	U	0.006	U	0.006	U	6020A
Cadmium	0.004	U	0.004	U	0.004	U	0.004	U	6020A
Calcium	20.0	U	20.0	U	20.0	U	20.0	U	6010C
Chromium	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Cobalt	0.006	U	0.006	U	0.006	U	0.006	U	6020A
Copper	0.90	U	0.90	U	0.90	U	1.30	J	6010C
Iron	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Lead	-0.0017	J	-0.0016	J	-0.0016	J	-0.0022	J	6020A
Magnesium	5.0	U	5.0	U	5.0	U	5.0	U	6010C
Manganese	0.200	U	0.200	U	0.200	U	0.200	U	6010C
Nickel	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Potassium	40.0	U	40.0	U	40.0	U	40.0	U	6010C
Selenium	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Silver	0.012	U	0.012	U	0.012	U	0.012	U	6020A
Sodium	20.0	U	20.0	U	20.0	U	20.0	U	6010C
Thallium	-0.0021	J	-0.0022	J	-0.0032	J	-0.0030	J	6020A
Vanadium	0.014	U	0.014	U	0.014	U	0.014	U	6020A
Zinc	0.600	U	0.600	U	0.600	U	1.500	J	6010C

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.006	J	-0.007	J	0.008	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.018	J	0.004	U	0.004	U	6020A
Calcium			20.0	U	20.0	U	20.0	U	6010C
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			0.90	U	0.90	U	0.90	U	6010C
Iron			1.0	J	0.4	U	0.4	U	6020A
Lead			-0.0021	J	-0.0018	J	-0.0012	J	6020A
Magnesium			5.0	U	5.0	U	5.0	U	6010C
Manganese			0.200	U	0.200	U	0.200	U	6010C
Nickel			0.04	U	0.04	U	0.04	U	6020A
Potassium			40.0	U	40.0	U	40.0	U	6010C
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.015	J	0.012	U	0.012	U	6020A
Sodium			20.0	U	20.0	U	20.0	U	6010C
Thallium			-0.0031	J	-0.0031	J	-0.0027	J	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A
Zinc			1.000	J	0.900	J	0.700	J	6010C

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.008	J	0.007	J	0.013	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.004	U	0.004	U	0.004	U	6020A
Calcium			20.0	U	20.0	U	20.0	U	6010C
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			1.00	J	1.10	J	1.00	J	6010C
Iron			0.4	U	0.4	U	0.4	U	6020A
Lead			-0.0015	J	-0.0019	J	-0.0011	J	6020A
Magnesium			5.0	U	5.0	U	5.0	U	6010C
Manganese			0.200	U	0.200	U	0.280	J	6010C
Nickel			0.04	U	0.04	U	0.04	U	6020A
Potassium			61.1	J	51.6	J	41.5	J	6010C
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.012	U	0.012	U	0.012	U	6020A
Sodium			20.0	U	20.0	U	20.0	U	6010C
Thallium			-0.0023	J	-0.0027	J	0.0018	U	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A
Zinc			0.600	U	0.600	U	1.200	J	6010C

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.013	J	0.014	J	0.010	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.004	U	0.004	U	0.004	U	6020A
Calcium			20.0	U	20.0	U	20.0	U	6010C
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			1.40	J	1.10	J	1.90	J	6010C
Iron			0.4	U	0.4	U	0.4	U	6020A
Lead			0.0010	U	-0.0012	J	0.0010	U	6020A
Magnesium			5.0	U	5.0	U	5.0	U	6010C
Manganese			0.200	U	0.200	U	0.200	U	6010C
Nickel			0.04	U	0.04	U	0.04	U	6020A
Potassium			40.0	U	40.0	U	52.4	J	6010C
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.012	U	0.012	U	0.012	U	6020A
Sodium			20.0	U	20.0	U	20.0	U	6010C
Thallium			-0.0022	J	-0.0021	J	-0.0018	J	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A
Zinc			0.600	U	0.600	U	0.600	J	6010C

Metals

- 3 -
 BLANKS

Client: Oregon State University Service Request: K1700165
 Project No.: NA
 Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Arsenic	0.04	U	0.04	U	0.04	U			6020A

Metals

- 4 -

ICP INTERFERENCE CHECK SAMPLE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

ICS Source: Inorganic Ventures

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Calcium	500000.0	500000.0	486500.0	488100.0	98			
Copper	0.0	500.0	-0.8	453.0	91			
Magnesium	500000.0	500000.0	521700.0	520800.0	104			
Manganese	0.0	500.0	0.1	496.6	99			
Potassium	0.0		-81.2	-35.2				
Sodium	0.0		8.1	1.6				
Zinc	0.0	1000.0	0.8	947.6	95			

Metals

- 4 -

ICP INTERFERENCE CHECK SAMPLE
Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-MS-04

ICS Source: Inorganic Ventures

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Aluminum			19072.5	18965.1				
Antimony			0.0	0.0				
Arsenic		25	0.1	24.6	98			
Barium			1.0	1.0				
Beryllium			0.0	0.0				
Cadmium		25	0.0	26.1	104			
Chromium		50	0.7	54.6	109			
Cobalt		50	0.7	51.8	104			
Iron			49292.8	47560.4				
Lead			0.2	0.1				
Nickel		50	0.5	48.9	98			
Selenium		25	0.3	24.0	96			
Silver		13	0.0	12.39	99			
Thallium			0.0	0.0				
Vanadium		50	0.0	55.9	112			

- 4 -

Service Request: K1700165

Project Name: Avian Tissue Project

ICS Source: Inorganic Ventures

Concentration Units): ug/L

Metals
- 5A -
SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Bird No. 16-17 LiverS

Lab Code: K1700165-017S

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum	75 - 125	181.8		12.9		188.1	90		6020A
Antimony	75 - 125	47.432		0.023	J	47.022	101		6020A
Arsenic	75 - 125	18.97		0.02	U	15.71	121		6020A
Barium	75 - 125	93.626		0.036	J	94.044	100		6020A
Beryllium	75 - 125	4.619		0.003	U	4.702	98		6020A
Cadmium	75 - 125	8.439		3.529		4.702	104		6020A
Calcium	75 - 125	535		356		156.77	114		6010C
Chromium	75 - 125	19.48		0.08	J	18.81	103		6020A
Cobalt	75 - 125	48.521		1.072		47.022	101		6020A
Copper	75 - 125	116		92.6		23.51	100		6010C
Iron		1753.4		1672.0		94.0	87		6020A
Lead	75 - 125	46.8364		0.0700		47.0219	99		6020A
Magnesium		1100		930		156.77	108		6010C
Manganese	75 - 125	176		133		47.02	91		6010C
Nickel	75 - 125	47.36		0.69		47.02	99		6020A
Potassium		9500		9320		156.77	115		6010C
Selenium	75 - 125	25.1		5.9		15.7	122		6020A
Silver	75 - 125	4.701		0.020		4.702	100		6020A
Sodium		2500		2320		156.77	115		6010C
Thallium	75 - 125	3.3567		0.0008	U	3.1317	107		6020A
Vanadium	75 - 125	48.704		0.019	J	47.022	104		6020A
Zinc		538		487		47.02	108		6010C

An empty field in the Control Limit column indicates the control limit is not applicable

Metals
- 5A -
SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Batch QC1S

Lab Code: K1700171-024S

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum		1417.7		1064.7		185.8	190		6020A
Antimony	75 - 125	46.955		0.007	J	46.440	101		6020A
Arsenic	75 - 125	18.04		0.28	J	15.51	115		6020A
Barium	75 - 125	124.334		14.231		92.879	119		6020A
Beryllium	75 - 125	5.188		0.180		4.644	108		6020A
Cadmium	75 - 125	7.387		1.906		4.644	118		6020A
Calcium	75 - 125	597		399		154.83	128	N	6010C
Chromium		144.66		118.51		18.58	141		6020A
Cobalt	75 - 125	52.474		1.827		46.440	109		6020A
Copper		133		108		23.22	108		6010C
Iron		1215.7		1080.2		92.9	146		6020A
Lead	75 - 125	49.7155		0.3088		46.4396	106		6020A
Magnesium	75 - 125	730		581		154.83	96		6010C
Manganese	75 - 125	154		101		46.44	114		6010C
Nickel	75 - 125	101.77		49.33		46.44	113		6020A
Potassium		6540		6250		154.83	187		6010C
Selenium	75 - 125	20.2		1.9		15.5	118		6020A
Silver	75 - 125	5.203		0.008	J	4.644	112		6020A
Sodium		2780		2610		154.83	110		6010C
Thallium	75 - 125	3.6309		0.0008	U	3.0929	117		6020A
Vanadium	75 - 125	52.074		1.219		46.440	110		6020A
Zinc		695		595		46.44	215		6010C

An empty field in the Control Limit column indicates the control limit is not applicable

Metals

- 5B -

POST SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Basis: DRY

Matrix: WATER

Sample Name: Bird No. 16-17 LiverA

Lab Code: K1700165-017A

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum	80 - 120	72.7		27.1		50.0	91		6020A
Antimony	80 - 120	55.976		0.049		50.0	112		6020A
Arsenic	80 - 120	57.29		0.04		50.0	115		6020A
Barium	80 - 120	52.981		0.077		50.0	106		6020A
Beryllium	80 - 120	52.281		0.006		50.0	105		6020A
Cadmium	80 - 120	61.874		7.434		50.0	109		6020A
Chromium	80 - 120	53.13		0.17		50.0	106		6020A
Cobalt	80 - 120	53.352		2.258		50.0	102		6020A
Lead	80 - 120	51.4386		0.1474		50.0	103		6020A
Nickel	80 - 120	52.13		1.46		50.0	101		6020A
Selenium	80 - 120	69.8		12.4		50.0	115		6020A
Silver	80 - 120	9.830		0.041		10.0	98		6020A
Thallium	80 - 120	51.2968		0.0018		50.0	103		6020A
Vanadium	80 - 120	52.774		0.040		50.0	105		6020A

Metals

- 5B -

POST SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Basis: DRY

Matrix: WATER

Sample Name: Batch QC1A

Lab Code: K1700171-024A

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Antimony	80 - 120	58.400		0.014		50.0	117		6020A
Arsenic	80 - 120	51.20		0.60		50.0	101		6020A
Barium	80 - 120	84.149		30.076		50.0	108		6020A
Beryllium	80 - 120	54.259		0.380		50.0	108		6020A
Cadmium	80 - 120	60.807		4.027		50.0	114		6020A
Calcium	80 - 120	23890.0		4214.0		20800	95		6010C
Chromium	80 - 120	307.21		250.46		50.0	114		6020A
Cobalt	80 - 120	57.724		3.862		50.0	108		6020A
Copper	80 - 120	2072.0		1136.0		1040	90		6010C
Iron	80 - 120	2492.6		2282.9		200.0	105		6020A
Lead	80 - 120	53.5096		0.6526		50.0	106		6020A
Magnesium	80 - 120	26410.0		6141.0		20800	97		6010C
Manganese	80 - 120	2973.10		1068.30		2080	92		6010C
Nickel	80 - 120	158.67		104.25		50.0	109		6020A
Potassium	80 - 120	84530.0		66080.0		20800	89		6010C
Selenium	80 - 120	53.4		4.0		50.0	99		6020A
Silver	80 - 120	10.085		0.017		10.0	101		6020A
Sodium	80 - 120	47570.0		27600.0		20800	96		6010C
Thallium	80 - 120	52.1276		0.0018		50.0	104		6020A
Vanadium	80 - 120	58.440		2.576		50.0	112		6020A
Zinc	80 - 120	7948.00		6282.00		2080	80		6010C

Metals
- 6 -
DUPLICATES

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Bird No. 16-17 LiverD

Lab Code: K1700165-017D

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Aluminum	20	12.9		14.6		12.4		6020A
Antimony		0.023	J	0.041	J	56.2		6020A
Arsenic		0.02	U	0.03	J	200.0		6020A
Barium		0.036	J	0.051		34.5		6020A
Beryllium		0.003	U	0.006	J	200.0		6020A
Cadmium	20	3.529		3.737		5.7		6020A
Calcium	20	356		364		2.2		6010C
Chromium		0.08	J	0.11	J	31.6		6020A
Cobalt	20	1.072		1.122		4.6		6020A
Copper	20	92.6		94.3		1.8		6010C
Iron	20	1672.0		1775.6		6.0		6020A
Lead		0.0700		0.0824		16.3		6020A
Magnesium	20	930		931		0.1		6010C
Manganese	20	133		134		0.7		6010C
Nickel		0.69		0.72		4.3		6020A
Potassium	20	9320		9430		1.2		6010C
Selenium	20	5.9		5.8		1.7		6020A
Silver		0.020		0.124		144.4		6020A
Sodium	20	2320		2340		0.9		6010C
Thallium		0.0009	U	0.0047	J	200.0		6020A
Vanadium		0.019	J	0.025	J	27.3		6020A
Zinc	20	487		498		2.2		6010C

An empty field in the Control Limit column indicates the control limit is not applicable.

Metals
- 6 -
DUPLICATES

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Batch QC1D

Lab Code: K1700171-024D

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Aluminum	20	1064.7		1127.8		5.8		6020A
Antimony		0.007	J	0.007	J	0.0		6020A
Arsenic		0.28	J	0.29	J	3.5		6020A
Barium	20	14.231		15.693		9.8		6020A
Beryllium	20	0.180		0.203		12.0		6020A
Cadmium	20	1.906		1.941		1.8		6020A
Calcium	20	399		441		10.0		6010C
Chromium	20	118.51		125.78		6.0		6020A
Cobalt	20	1.827		1.891		3.4		6020A
Copper	20	108		108		0.0		6010C
Iron	20	1080.2		1113.8		3.1		6020A
Lead	20	0.3088		0.3149		2.0		6020A
Magnesium	20	581		553		4.9		6010C
Manganese	20	101		101		0.0		6010C
Nickel	20	49.33		52.54		6.3		6020A
Potassium	20	6250		6220		0.5		6010C
Selenium		1.9		1.7		11.1		6020A
Silver		0.008	J	0.005	U	200.0		6020A
Sodium	20	2610		2600		0.4		6010C
Thallium		0.0009	U	0.0014	J	200.0		6020A
Vanadium	20	1.219		1.452		17.4		6020A
Zinc	20	595		610		2.5		6010C

An empty field in the Control Limit column indicates the control limit is not applicable.

Metals

- 7 -

LABORATORY CONTROL SAMPLE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

Aqueous LCS Source: ALS MIXED

Solid LCS Source:

Analyte	Aqueous (ug/L)			Solid (mg/kg)				
	True	Found	%R	True	Found	C	Limits	%R
Aluminum	2000	1860	93					
Antimony	500	488	98					
Arsenic	167	199	119					
Barium	1000	1043	104					
Beryllium	50.0	51.8	104					
Cadmium	50.0	53.2	106					
Calcium	1667	1880	113					
Chromium	200	205	102					
Cobalt	500	502	100					
Copper	250	253	101					
Iron	1000	996	100					
Lead	500	508	102					
Magnesium	1667	1860	112					
Manganese	500	498	100					
Nickel	500	499	100					
Potassium	1667	1920	115					
Selenium	167	200	120					
Silver	50.0	50.1	100					
Sodium	1667	1890	113					
Thallium	33	37	111					
Vanadium	500	516	103					
Zinc	500	503	101					

Metals

- 7 -

LABORATORY CONTROL SAMPLE

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

Aqueous LCS Source: ALS MIXED

Solid LCS Source:

Analyte	Aqueous (ug/L)			Solid (mg/kg)				
	True	Found	%R	True	Found	C	Limits	%R
Aluminum	2000	1941	97					
Antimony	500	525	105					
Arsenic	167	189	113					
Barium	1000	1066	107					
Beryllium	50.0	51.1	102					
Cadmium	50.0	55.0	110					
Calcium	1667	1870	112					
Chromium	200	220	110					
Cobalt	500	545	109					
Copper	250	250	100					
Iron	1000	1081	108					
Lead	500	528	106					
Magnesium	1667	1870	112					
Manganese	500	495	99					
Nickel	500	537	107					
Potassium	1667	1890	113					
Selenium	167	191	114					
Silver	50.0	52.7	105					
Sodium	1667	1880	113					
Thallium	33	39	117					
Vanadium	500	546	109					
Zinc	500	505	101					

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700165
Date Collected: NA
Date Received: NA
Date Extracted: 01/29/17
Date Analyzed: 01/30-31/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700165-SRM1
Test Notes: Dorm-4 Solids = 94.5%
Source: N.R.C.C. Dorm-4

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	6.8	7.4	109	4.93-8.93	
Cadmium	PSEP Tissue	6020A	0.306	0.316	103	0.233 - 0.385	
Chromium	PSEP Tissue	6020A	1.87	1.81	97	1.37-2.44	
Copper	PSEP Tissue	6010C	15.9	15.3	96	12.0 - 20.2	
Iron	PSEP Tissue	6020A	341	341	100	251-442	
Lead	PSEP Tissue	6020A	0.416	0.364	88	0.290 - 0.563	
Nickel	PSEP Tissue	6020A	1.36	1.24	91	0.912-1.9	
Selenium	PSEP Tissue	6020A	3.56	4.36	122	2.58 - 4.68	
Zinc	PSEP Tissue	6010C	52.20	52.2	100	39.2 - 66.5	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700165
Date Collected: NA
Date Received: NA
Date Extracted: 01/29/17
Date Analyzed: 01/30-31/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700165-SRM2
Test Notes: Tort-3 Solids = 99.1%
Source: N.R.C.C. Tort-3

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	59.5	68.2	115	44.6-76.0	
Cadmium	PSEP Tissue	6020A	42.3	44.1	104	32.4-52.9	
Chromium	PSEP Tissue	6020A	1.95	2.36	121	1.37-2.63	
Copper	PSEP Tissue	6010C	497	443	89	380-623	
Iron	PSEP Tissue	6020A	179	171	96	137-224	
Lead	PSEP Tissue	6020A	0.225	0.200	89	0.166-0.292	
Manganese	PSEP Tissue	6010C	15.6	14.7	94	11.7-19.9	
Nickel	PSEP Tissue	6020A	5.3	5.4	102	4.05-6.65	
Selenium	PSEP Tissue	6020A	10.9	11.7	107	7.9-14.3	
Vanadium	PSEP Tissue	6020A	9.1	9.2	101	7.0-11.4	
Zinc	PSEP Tissue	6010C	136	135	99	104-170	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700165
Date Collected: NA
Date Received: NA
Date Extracted: 01/29/17
Date Analyzed: 01/30-31/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700165-SRM3
Test Notes: Dorm-4 Solids = 94.5%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Dorm-4

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	6.8	7.8	115	4.93-8.93	
Cadmium	PSEP Tissue	6020A	0.306	0.324	106	0.233 - 0.385	
Chromium	PSEP Tissue	6020A	1.87	1.91	102	1.37-2.44	
Copper	PSEP Tissue	6010C	15.9	15.4	97	12.0 - 20.2	
Iron	PSEP Tissue	6020A	341	365	107	251-442	
Lead	PSEP Tissue	6020A	0.416	0.367	88	0.290 - 0.563	
Nickel	PSEP Tissue	6020A	1.36	1.33	98	0.912-1.9	
Selenium	PSEP Tissue	6020A	3.56	4.25	119	2.58 - 4.68	
Zinc	PSEP Tissue	6010C	52.20	53.3	102	39.2 - 66.5	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700165
Date Collected: NA
Date Received: NA
Date Extracted: 01/29/17
Date Analyzed: 01/30-31/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700165-SRM4
Test Notes: Tort-3 Solids = 99.1%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Tort-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	59.5	68.6	115	44.6-76.0	
Cadmium	PSEP Tissue	6020A	42.3	45.2	107	32.4-52.9	
Chromium	PSEP Tissue	6020A	1.95	1.94	99	1.37-2.63	
Copper	PSEP Tissue	6010C	497	427	86	380-623	
Iron	PSEP Tissue	6020A	179	176	98	137-224	
Lead	PSEP Tissue	6020A	0.225	0.203	90	0.166-0.292	
Manganese	PSEP Tissue	6010C	15.6	14.2	91	11.7-19.9	
Nickel	PSEP Tissue	6020A	5.3	5.3	100	4.05-6.65	
Selenium	PSEP Tissue	6020A	10.9	11.6	106	7.9-14.3	
Vanadium	PSEP Tissue	6020A	9.1	9.6	105	7.0-11.4	
Zinc	PSEP Tissue	6010C	136	132	97	104-170	

Metals

- 9 -

ICP SERIAL DILUTIONS
Client: Oregon State University

Service Request: K1700165

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Sample Name: Bird No. 16-17 LiverL

Lab Code: K1700165-017L

Analyte	Initial Sample Result (I)		Serial Dilution Result (S)		% Differ- ence	Q	M
Aluminum	27.1		27.4		1		MS
Antimony	0.049	J	0.020	U	100.0		MS
Arsenic	0.04	U	0.20	U			MS
Barium	0.077	J	0.069	J	10		MS
Beryllium	0.006	U	0.030	U			MS
Cadmium	7.434		6.858		8		MS
Calcium	3746.0		3846.0		2.7		P
Chromium	0.17	J	0.20	U	100.0		MS
Cobalt	2.258		2.146		5		MS
Copper	975.0		1009.0		3.5		P
Iron	3522.4		3844.6		9		MS
Lead	0.1474		0.1387	J	6		MS
Magnesium	9798.0		9540.0		2.6		P
Manganese	1404.40		1422.75		1.3		P
Nickel	1.46		1.49	J	2		MS
Potassium	98200.0		97500.0		0.7		P
Selenium	12.4		11.6		6		MS
Silver	0.041		0.060	U	100.0		MS
Sodium	24420.0		24055.0		1.5		P
Thallium	0.0018	U	0.0090	U			MS
Vanadium	0.040	J	0.070	U	100.0		MS
Zinc	5134.00		5205.00		1.4		P

Metals

- 9 -

ICP SERIAL DILUTIONS
Client: Oregon State University

Service Request: K1700165

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Sample Name: Batch QC1L

Lab Code: K1700171-024L

Analyte	Initial Sample Result (I) C	Serial Dilution Result (S) C	% Differ- ence	Q	M
Aluminum	2250.0	2210.8	2		MS
Antimony	0.014 J	0.020 U	100.0		MS
Arsenic	0.60 J	0.67 J	12		MS
Barium	30.076	27.978	7		MS
Beryllium	0.380	0.350	8		MS
Cadmium	4.027	3.885	4		MS
Calcium	4214.0	4431.5	5.2		P
Chromium	250.46	243.19	3		MS
Cobalt	3.862	3.830	1		MS
Copper	1136.0	1187.0	4.5		P
Iron	2282.9	2227.8	2		MS
Lead	0.6526	0.6429	1		MS
Magnesium	6141.0	6300.0	2.6		P
Manganese	1068.30	1086.65	1.7		P
Nickel	104.25	101.29	3		MS
Potassium	66080.0	65750.0	0.5		P
Selenium	4.0	5.5 J	38		MS
Silver	0.017 J	0.060 U	100.0		MS
Sodium	27600.0	27460.0	0.5		P
Thallium	0.0018 U	0.0090 U			MS
Vanadium	2.576	2.559	1		MS
Zinc	6282.00	6360.00	1.2		P

- 10 -

Service Request: K1700165

Project Name: Avian Tissue Project

GFAA ID #:

AA ID #:

Analyte	Wave-length (nm)	Back-ground	MRL ug/L	MDL ug/L	M
Calcium	393.3		40.0	20.0	P
Copper	327.3		4.0	0.9	P
Magnesium	279.5		10.0	5.0	P
Manganese	257.6		1.00	0.20	P
Potassium	766.5		200.0	40.0	P
Sodium	589.5		200.0	20.0	P
Zinc	206.2		4.00	0.60	P

Comments:

Metals

- 10 -

DETECTION LIMITS**Client:** Oregon State University**Service Request:** K1700165**Project No.:** NA**Project Name:** Avian Tissue Project**ICP/ICP-MS ID #:** K-ICP-MS-04**GFAA ID #:****AA ID #:**

Analyte	Isotope	Back-ground	MRL ug/L	MDL ug/L	M
Aluminum	27		4.0	0.4	MS
Antimony	123		0.100	0.004	MS
Arsenic	75		1.00	0.04	MS
Barium	137		0.100	0.010	MS
Beryllium	9		0.040	0.006	MS
Cadmium	111		0.040	0.004	MS
Chromium	52		0.40	0.04	MS
Cobalt	59		0.040	0.006	MS
Iron	56		2.0	0.4	MS
Lead	208		0.0400	0.0010	MS
Nickel	60		0.40	0.04	MS
Selenium	78		2.0	0.4	MS
Silver	107		0.040	0.012	MS
Thallium	205		0.0400	0.0018	MS
Vanadium	51		0.400	0.014	MS

Comments:

Metals

- 11A -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Al	Ca	Fe	Mg	Ag
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	-0.0001350	0.0000000	0.0000000
Arsenic	189.042	0.0000420	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000070	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	-0.0006190	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000620	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0000150	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	-0.0000970	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000140	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000130	0.0000000	0.0000310	0.0000000

Comments:

Metals

- 11A -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	0.0000000	-0.0000420	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0001090	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		As	B	Ba	Be	Cd
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.042	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	-0.0001240
Cobalt	228.616	0.0000000	0.0000000	-0.0001140	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Co	Cr	Cu	K	Li
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	-0.0004810	0.0000000	0.0000000
Arsenic	189.042	0.0000000	0.0005710	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0025040	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0000520	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0002840	0.0000000	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0003570	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0001760	0.0000000	0.0000000
Nickel	231.604	-0.0001780	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0016430	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Service Request: K1700165

Project Name: Avian Tissue Project

K-ICP-AES-03

Vanadium	292.402	0.0000000	-0.0025430	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0007230	0.0000000	0.0000000

Form XI (PART 2) - IN

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Mn	Mo	Na	Ni	Pb
	182.034	0.0041380	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	-0.0007310	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.042	-0.0003130	0.0017060	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	-0.0000720	-0.0004190	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	-0.0019530	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	-0.0000310	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	-0.0011810	0.0000000	0.0000990	0.0000000
Copper	327.396	0.0000000	-0.0002870	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	-0.0005980	0.0000000	0.0002670	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0004730	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0123240	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0016500	0.0001830	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	-0.0005630	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0001330	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	-0.0002140	0.0000000	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	-0.0001370	0.0000000	0.0060370	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		P	Sb	Se	Si	Sn
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.042	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0001370	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Sr	Ti	Tl	V	Zn
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	0.0000000	0.0023400	0.0000000
Arsenic	189.042	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	0.0000000	-0.0004790	0.0000000
Cadmium	226.502	0.0000000	0.0000240	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0025120	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0001450	0.0000000	-0.0001220	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000820	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0008000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Service Request: K1700165

Project Name: Avian Tissue Project

K-ICP-AES-03

Vanadium	292.402	0.0000000	0.0004600	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	-0.0005560	0.0000000	0.0000000	0.0000000

Form XI (PART 2) - IN

Metals
 -12-
 ICP LINEAR RANGES (QUARTERLY)

Client: Oregon State University Service Request: K1700165
 Project No.: NA
 Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	Method
Calcium	15.000	900000	6010C
Copper	15.000	90000	6010C
Magnesium	15.000	90000	6010C
Manganese	15.000	9000	6010C
Potassium	15.000	450000	6010C
Sodium	15.000	450000	6010C
Zinc	15.000	18000	6010C

Comments:

Metals

-12-

ICP LINEAR RANGES (QUARTERLY)

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-MS-04

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	Method
Aluminum	45.000	18000	6020A
Antimony	45.000	900	6020A
Arsenic	45.000	3000	6020A
Barium	45.000	3000	6020A
Beryllium	45.000	900	6020A
Cadmium	45.000	3000	6020A
Chromium	45.000	3000	6020A
Cobalt	45.000	3000	6020A
Iron	45.000	18000	6020A
Lead	45.000	3000	6020A
Nickel	45.000	3000	6020A
Selenium	45.000	3000	6020A
Silver	45.000	900	6020A
Thallium	45.000	3000	6020A
Vanadium	45.000	3000	6020A

Comments:

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

Method: P

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700165-001	1/29/2017	0.3120	30.0
K1700165-002	1/29/2017	0.3130	30.0
K1700165-003	1/29/2017	0.3120	30.0
K1700165-004	1/29/2017	0.3000	30.0
K1700165-005	1/29/2017	0.3120	30.0
K1700165-006	1/29/2017	0.3260	30.0
K1700165-007	1/29/2017	0.3380	30.0
K1700165-008	1/29/2017	0.3080	30.0
K1700165-009	1/29/2017	0.3100	30.0
K1700165-010	1/29/2017	0.3020	30.0
K1700165-011	1/29/2017	0.3130	30.0
K1700165-012	1/29/2017	0.3150	30.0
K1700165-013	1/29/2017	0.3070	30.0
K1700165-014	1/29/2017	0.3080	30.0
K1700165-015	1/29/2017	0.3100	30.0
K1700165-016	1/29/2017	0.3190	30.0
K1700165-017	1/29/2017	0.3160	30.0
K1700165-017D	1/29/2017	0.3070	30.0
K1700165-017S	1/29/2017	0.3190	30.0
K1700165-018	1/29/2017	0.3010	30.0
K1700165-019	1/29/2017	0.3260	30.0
K1700165-020	1/29/2017	0.3300	30.0
KQ1700678-01	1/29/2017	0.3000	30.0
KQ1700678-02	1/29/2017	30.0	30.0
KQ1700678-03	1/29/2017	0.3040	30.0
KQ1700678-04	1/29/2017	0.3170	30.0

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

Method: P

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700165-021	1/29/2017	0.3070	30.0
K1700165-022	1/29/2017	0.3100	30.0
K1700165-023	1/29/2017	0.3030	30.0
K1700165-024	1/29/2017	0.3100	30.0
K1700165-025	1/29/2017	0.3110	30.0
K1700171-024D	1/29/2017	0.3330	30.0
K1700171-024S	1/29/2017	0.3230	30.0
KQ1700682-01	1/29/2017	0.3000	30.0
KQ1700682-02	1/29/2017	30.0	30.0
KQ1700682-03	1/29/2017	0.3010	30.0
KQ1700682-04	1/29/2017	0.3000	30.0

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

Method: MS

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700165-001	1/29/2017	0.3120	30.0
K1700165-002	1/29/2017	0.3130	30.0
K1700165-003	1/29/2017	0.3120	30.0
K1700165-004	1/29/2017	0.3000	30.0
K1700165-005	1/29/2017	0.3120	30.0
K1700165-006	1/29/2017	0.3260	30.0
K1700165-007	1/29/2017	0.3380	30.0
K1700165-008	1/29/2017	0.3080	30.0
K1700165-009	1/29/2017	0.3100	30.0
K1700165-010	1/29/2017	0.3020	30.0
K1700165-011	1/29/2017	0.3130	30.0
K1700165-012	1/29/2017	0.3150	30.0
K1700165-013	1/29/2017	0.3070	30.0
K1700165-014	1/29/2017	0.3080	30.0
K1700165-015	1/29/2017	0.3100	30.0
K1700165-016	1/29/2017	0.3190	30.0
K1700165-017	1/29/2017	0.3160	30.0
K1700165-017D	1/29/2017	0.3070	30.0
K1700165-017S	1/29/2017	0.3190	30.0
K1700165-018	1/29/2017	0.3010	30.0
K1700165-019	1/29/2017	0.3260	30.0
K1700165-020	1/29/2017	0.3300	30.0
KQ1700678-01	1/29/2017	0.3000	30.0
KQ1700678-02	1/29/2017	30.0	30.0
KQ1700678-03	1/29/2017	0.3040	30.0
KQ1700678-04	1/29/2017	0.3170	30.0

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Project Name: Avian Tissue Project

Method: MS

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700165-021	1/29/2017	0.3070	30.0
K1700165-022	1/29/2017	0.3100	30.0
K1700165-023	1/29/2017	0.3030	30.0
K1700165-024	1/29/2017	0.3100	30.0
K1700165-025	1/29/2017	0.3110	30.0
K1700171-024D	1/29/2017	0.3330	30.0
K1700171-024S	1/29/2017	0.3230	30.0
KQ1700682-01	1/29/2017	0.3000	30.0
KQ1700682-02	1/29/2017	30.0	30.0
KQ1700682-03	1/29/2017	0.3010	30.0
KQ1700682-04	1/29/2017	0.3000	30.0

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K S	S E	A G	N A	T L	V Z
BLK	1.0	10:15							X			X			X	X			X			X			X
STD A	1.0	10:17							X			X			X	X									X
STD B	1.0	10:20							X						X				X			X			
ICV1	1.0	10:22							X						X										
ICV1	1.0	10:25							X			X			X	X			X			X			X
ICB1	1.0	10:29							X			X			X	X			X			X			X
LLICV1	1.0	10:31							X			X			X				X			X			X
LLICV1	1.0	10:34														X									
ZZZZZ	1.0	10:37																							
CCV1	1.0	10:39							X						X				X			X			
CCV1	1.0	10:42							X			X			X	X									X
CCB1	1.0	10:44							X			X			X	X			X			X			X
ICS-A1	1.0	10:46							X			X			X	X			X			X			X
ICS-AB1	1.0	10:49							X			X			X	X			X			X			X
ZZZZZ	1.0	10:52																							
KQ1700678-01	1.0	10:58							X			X			X	X			X			X			X
KQ1700678-02	1.0	11:01							X			X			X	X			X			X			X
KQ1700678-03	1.0	11:03																							
KQ1700678-04	1.0	11:05																							
K1700165-017	1.0	11:08							X			X			X	X			X			X			X
K1700165-017D	1.0	11:10							X			X			X	X			X			X			X
K1700165-017L	5.0	11:13							X			X			X	X			X			X			X
K1700165-017S	1.0	11:15							X			X			X	X			X			X			X
K1700165-001	1.0	11:17							X			X			X	X			X			X			X
CCV2	1.0	11:20							X						X				X			X			
CCV2	1.0	11:22							X			X			X	X									X
CCB2	1.0	11:25							X			X			X	X			X			X			X
K1700165-002	1.0	11:27							X			X			X	X			X			X			X
K1700165-003	1.0	11:30							X			X			X	X			X			X			X
K1700165-004	1.0	11:32							X			X			X	X			X			X			X
K1700165-005	1.0	11:35							X			X			X	X			X			X			X
K1700165-006	1.0	11:37							X			X			X	X			X			X			X

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K E	S E	A G	N A	T L	V N
K1700165-007	1.0	11:40							X			X			X	X			X			X			X
K1700165-008	1.0	11:42							X			X			X	X			X			X			X
K1700165-009	1.0	11:45							X			X			X	X			X			X			X
K1700165-010	1.0	11:47							X			X			X	X			X			X			X
K1700165-011	1.0	11:50							X			X			X	X			X			X			X
CCV3	1.0	11:52							X						X				X			X			
CCV3	1.0	11:55							X			X			X	X									X
CCB3	1.0	11:57							X			X			X	X			X			X			X
K1700165-012	1.0	11:59							X			X			X	X			X			X			X
K1700165-013	1.0	12:02							X			X			X	X			X			X			X
K1700165-014	1.0	12:04							X			X			X	X			X			X			
K1700165-015	1.0	12:07							X			X			X	X			X			X			X
K1700165-016	1.0	12:09							X			X			X	X			X			X			X
K1700165-018	1.0	12:11							X			X			X	X			X			X			X
K1700165-019	1.0	12:14							X			X			X	X			X			X			X
K1700165-020	1.0	12:16							X			X			X	X			X			X			X
ZZZZZZ	1.0	12:19																							
ZZZZZZ	1.0	12:21																							
CCV4	1.0	12:24							X						X				X			X			
CCV4	1.0	12:26							X			X			X	X									X
CCB4	1.0	12:28							X			X			X	X			X			X			X
ZZZZZZ	1.0	12:31																							
ZZZZZZ	1.0	12:33																							
ZZZZZZ	1.0	12:36																							
ZZZZZZ	1.0	12:38																							
ZZZZZZ	5.0	12:41																							
ZZZZZZ	1.0	12:43																							
ZZZZZZ	1.0	12:45																							
ZZZZZZ	1.0	12:48																							
ZZZZZZ	1.0	12:50																							
ZZZZZZ	1.0	12:53																							
CCV5	1.0	12:55							X						X				X			X			

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K S	S E	A G	N A	T L	V
CCV5	1.0	12:58								X			X			X	X								X
CCB5	1.0	13:00								X			X			X	X			X			X		X
ZZZZZZ	1.0	13:02																							
ZZZZZZ	1.0	13:05																							
ZZZZZZ	1.0	13:07																							
ZZZZZZ	1.0	13:10																							
ZZZZZZ	1.0	13:12																							
ZZZZZZ	1.0	13:15																							
ZZZZZZ	1.0	13:17																							
ZZZZZZ	1.0	13:20																							
ZZZZZZ	1.0	13:22																							
ZZZZZZ	1.0	13:25																							
CCV6	1.0	13:27								X						X				X			X		
CCV6	1.0	13:30								X			X			X	X								X
CCB6	1.0	13:32								X			X			X	X			X			X		X
LLCCV1	1.0	13:35								X			X			X	X			X			X		X
ZZZZZZ	1.0	13:38																							
ZZZZZZ	1.0	13:41																							
ZZZZZZ	1.0	13:43																							
ZZZZZZ	1.0	13:46																							
ZZZZZZ	1.0	13:48																							
ZZZZZZ	1.0	13:51																							
ZZZZZZ	1.0	13:53																							
ZZZZZZ	1.0	13:55																							
ZZZZZZ	1.0	13:58																							
ZZZZZZ	1.0	14:00																							
ZZZZZZ	1.0	14:03																							
CCV7	1.0	14:05								X						X				X			X		
CCV7	1.0	14:08								X			X			X	X								X
CCB7	1.0	14:10								X			X			X	X			X			X		X
ZZZZZZ	1.0	14:12																							
ZZZZZZ	1.0	14:15																							

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
ZZZZZZ	1.0	14:17																							
ZZZZZZ	1.0	14:20																							
ZZZZZZ	1.0	14:22																							
ZZZZZZ	1.0	14:24																							
ZZZZZZ	1.0	14:27																							
ZZZZZZ	5.0	14:29																							
ZZZZZZ	1.0	14:31																							
ZZZZZZ	1.0	14:34																							
CCV8	1.0	14:36							X						X				X			X			
CCV8	1.0	14:39							X			X			X	X								X	
CCB8	1.0	14:41							X			X			X	X			X			X		X	
ZZZZZZ	1.0	14:43																							
ZZZZZZ	1.0	14:46																							
ZZZZZZ	1.0	14:48																							
ZZZZZZ	1.0	14:50																							
ZZZZZZ	1.0	14:53																							
ZZZZZZ	1.0	14:55																							
ZZZZZZ	1.0	14:58																							
ZZZZZZ	1.0	15:00																							
ZZZZZZ	1.0	15:02																							
ZZZZZZ	1.0	15:05																							
CCV9	1.0	15:08							X						X				X			X			
CCV9	1.0	15:10							X			X			X	X								X	
CCB9	1.0	15:12							X			X			X	X			X			X		X	
ZZZZZZ	1.0	15:15																							
LLCCV2	1.0	15:19							X			X			X	X			X			X		X	
ZZZZZZ	1.0	15:22																							
ZZZZZZ	1.0	15:24																							
ZZZZZZ	1.0	15:27																							
KQ1700682-01	1.0	15:29							X			X			X	X			X			X		X	
KQ1700682-02	1.0	15:32							X			X			X	X			X			X		X	
KQ1700682-03	1.0	15:34																							

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K S	S E	A G	N A	T L	V
KQ1700682-04	1.0	15:36																							
K1700165-021	1.0	15:39							X			X			X	X			X			X			X
K1700165-022	1.0	15:41							X			X			X	X			X			X			X
K1700165-023	1.0	15:44							X			X			X	X			X			X			X
K1700165-024	1.0	15:46							X			X			X	X			X			X			X
CCV10	1.0	15:48							X						X				X			X			
CCV10	1.0	15:51							X			X			X	X									X
CCB10	1.0	15:53							X			X			X	X			X			X			X
K1700165-025	1.0	15:56							X			X			X	X			X			X			X
ZZZZZZ	1.0	15:58																							
ZZZZZZ	1.0	16:01																							
ZZZZZZ	1.0	16:03																							
ZZZZZZ	1.0	16:06																							
ZZZZZZ	1.0	16:08																							
ZZZZZZ	1.0	16:10																							
ZZZZZZ	1.0	16:13																							
ZZZZZZ	1.0	16:15																							
ZZZZZZ	1.0	16:17																							
CCV11	1.0	16:20							X						X				X			X			
CCV11	1.0	16:22							X			X			X	X									X
CCB11	1.0	16:25							X			X			X	X			X			X			X
K1700171-024D	1.0	16:27							X			X			X	X			X			X			X
K1700171-024L	5.0	16:30							X			X			X	X			X			X			X
K1700171-024S	1.0	16:32							X			X			X	X			X			X			X
ZZZZZZ	1.0	16:34																							
K1700165-014	10.0	16:37																							X
ZZZZZZ	1.0	16:39																							
ZZZZZZ	10.0	16:42																							
K1700171-024A	1.0	16:44							X			X			X	X			X			X			X
CCV12	1.0	16:46							X						X				X			X			
CCV12	1.0	16:49							X			X			X	X									X
ZZZZZZ	1.0	16:51																							

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																							
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K E	S G	A A	N L	T V	Z N	C N	
CCB12	1.0	16:54							X			X			X	X			X			X			X		
ZZZZZZ	1.0	16:56																									
ZZZZZZ	1.0	16:59																									
LLCCV3	1.0	17:01							X			X			X	X			X			X			X		

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Run Number: 013017a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/30/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
Blank	1.0	16:14		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
Standard 1	1.0	16:19		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ICV1	1.0	16:23		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCV1	1.0	16:28		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ICB1	1.0	16:32		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB1	1.0	16:37		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
LLICVT1	1.0	16:41		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ICS-A1	1.0	16:46		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ICS-AB1	1.0	16:50		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	16:55																							
KQ1700678-01	5.0	16:59		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
KQ1700678-02	5.0	17:04		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
KQ1700678-03	5.0	17:08																							
KQ1700678-04	5.0	17:13																							
K1700165-001	5.0	17:17		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-002	5.0	17:22		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-003	5.0	17:26		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCV2	1.0	17:31		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB2	1.0	17:35		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-004	5.0	17:40		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-005	5.0	17:44		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-006	5.0	17:49		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-007	5.0	17:53		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-008	5.0	17:58		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-009	5.0	18:02		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-010	5.0	18:07		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-011	5.0	18:11		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-012	5.0	18:16		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-013	5.0	18:20		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCV3	1.0	18:25		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	18:29																							
CCB3	1.0	18:33		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X

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Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Run Number: 013017a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/30/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
K1700165-014	5.0	18:38		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-015	5.0	18:42		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-016	5.0	18:47		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-017	5.0	18:51		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-017D	5.0	18:56		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-017L	5.0	19:00		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-017A	5.0	19:05		X	X	X	X	X	X		X	X			X				X		X	X		X	X
K1700165-017S	5.0	19:09		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-018	5.0	19:14		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-019	5.0	19:18		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCV4	1.0	19:23		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB4	1.0	19:27		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-020	5.0	19:32		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	19:36																							
ZZZZZZ	5.0	19:41																							
ZZZZZZ	5.0	19:45																							
ZZZZZZ	5.0	19:50																							
ZZZZZZ	5.0	19:54																							
ZZZZZZ	5.0	19:59																							
ZZZZZZ	5.0	20:03																							
ZZZZZZ	5.0	20:08																							
ZZZZZZ	5.0	20:12																							
CCV5	1.0	20:17		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	20:21																							
CCB5	1.0	20:25		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
LLCCVT1	1.0	20:30		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	20:34																							
ZZZZZZ	5.0	20:39																							
ZZZZZZ	5.0	20:43																							
ZZZZZZ	5.0	20:48																							
ZZZZZZ	5.0	20:52																							
ZZZZZZ	5.0	20:57																							

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Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Run Number: 013017a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/30/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
ZZZZZZ	5.0	21:01																							
ZZZZZZ	5.0	21:06																							
ZZZZZZ	5.0	21:10																							
ZZZZZZ	5.0	21:15																							
ZZZZZZ	5.0	21:19																							
CCV6	1.0	21:24		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB6	1.0	21:28		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	21:33																							
ZZZZZZ	5.0	21:37																							
ZZZZZZ	5.0	21:42																							
ZZZZZZ	5.0	21:46																							
ZZZZZZ	5.0	21:51																							
ZZZZZZ	5.0	21:55																							
ZZZZZZ	5.0	22:00																							
ZZZZZZ	5.0	22:04																							
ZZZZZZ	5.0	22:09																							
ZZZZZZ	5.0	22:13																							
CCV7	1.0	22:18		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB7	1.0	22:22		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	22:27																							
ZZZZZZ	5.0	22:31																							
ZZZZZZ	5.0	22:36																							
ZZZZZZ	5.0	22:40																							
ZZZZZZ	5.0	22:45																							
ZZZZZZ	5.0	22:49																							
ZZZZZZ	5.0	22:54																							
ZZZZZZ	5.0	22:58																							
ZZZZZZ	5.0	23:03																							
ZZZZZZ	5.0	23:07																							
CCV8	1.0	23:12		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB8	1.0	23:16		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	23:21																							

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Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Run Number: 013017a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/30/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
ZZZZZZ	5.0	23:25																							
ZZZZZZ	5.0	23:29																							
ZZZZZZ	5.0	23:34																							
ZZZZZZ	5.0	23:38																							
ZZZZZZ	5.0	23:43																							
ZZZZZZ	5.0	23:47																							
ZZZZZZ	5.0	23:52																							
ZZZZZZ	5.0	23:56																							
ZZZZZZ	5.0	00:01																							
ZZZZZZ	1.0	00:05																							
CCV9	1.0	00:10		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB9	1.0	00:14		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	00:19																							
LLCCVT2	1.0	00:23		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	00:28																							
ZZZZZZ	5.0	00:32																							
ZZZZZZ	5.0	00:37																							
ZZZZZZ	5.0	00:41																							
ZZZZZZ	5.0	00:45																							
ZZZZZZ	5.0	00:50																							
ZZZZZZ	5.0	00:54																							
KQ1700682-01	5.0	00:59		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
KQ1700682-02	5.0	01:03		X	X		X	X	X		X	X		X	X				X		X	X		X	X
KQ1700682-03	5.0	01:08																							
CCV10	1.0	01:12		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	01:17																							
CCB10	1.0	01:21		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
KQ1700682-04	5.0	01:26																							
K1700165-021	5.0	01:30		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-022	5.0	01:35		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-023	5.0	01:39		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700165-024	5.0	01:44		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X

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Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Run Number: 013017a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/30/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																											
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V	Z N	C N				
K1700165-025	5.0	01:48		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X						
ZZZZZZ	5.0	01:53																													
ZZZZZZ	5.0	01:57																													
ZZZZZZ	5.0	02:02																													
ZZZZZZ	5.0	02:06																													
ZZZZZZ	1.0	02:11																													
CCV11	1.0	02:15		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X						
CCB11	1.0	02:19		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X						
ZZZZZZ	5.0	02:24																													
ZZZZZZ	5.0	02:28																													
ZZZZZZ	5.0	02:33																													
ZZZZZZ	5.0	02:37																													
ZZZZZZ	5.0	02:42																													
K1700171-024D	5.0	02:46		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X						
K1700171-024L	5.0	02:51		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X						
K1700171-024A	5.0	02:55			X	X	X	X	X		X	X		X	X				X		X	X		X	X						
K1700171-024S	5.0	03:00		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X						
ZZZZZZ	5.0	03:04																													
CCV12	1.0	03:09									X	X													X						
CCV12	1.0	03:13		X	X	X	X	X	X					X	X				X		X	X		X							
CCB12	1.0	03:18		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X						
ZZZZZZ	1.0	03:22																													
LLCCVT3	1.0	03:26		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X						

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700165

Project No.: NA

Run Number: 013117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																											
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V	Z N	C N				
Blank	1.0	12:41				X																									
Standard 1	1.0	12:43				X																									
ICV2	1.0	12:46				X																									
CCV1	1.0	12:48				X																									
ICB2	1.0	12:51				X																									
CCB1	1.0	12:54				X																									
LLICVT1	1.0	12:56				X																									
ICS-A1	1.0	12:59				X																									
ICS-AB1	1.0	13:01				X																									
ZZZZZZ	1.0	13:04																													
ZZZZZZ	5.0	13:06																													
ZZZZZZ	5.0	13:09																													
ZZZZZZ	5.0	13:12																													
KQ1700682-02	5.0	13:14				X																									
CCV2	1.0	13:17				X																									
CCB2	1.0	13:19				X																									
LLCCVT1	1.0	13:22				X																									

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp.

Contract: _____

Lab Code: ALSK

Case No.: _____

NRAS No.: _____

SDG NO.: K1700165ICP-MS Instrument ID: K-ICP-MS-04Start Date: 01/30/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:													
			Element		Q	Element		Q	Element		Q	Element		Q		
			Ge72	KED		Y89	KED		Sc45	KED		Rh103	KED		In115	KED
Blank	Blank	1614	100			100			100			100			100	
Standard 1	Standard 1	1619	100			98			100			95			99	
ICV1	ICV	1623	98			97			101			95			99	
CCV1	CCV	1628	99			97			101			94			99	
ICB1	ICB	1632	99			97			100			97			99	
CCB1	CCB	1637	100			96			101			95			100	
LLICVT1	LLICVT1	1641	99			94			99			93			97	
ICS-A1	ICSA	1646	91			97			98			85			91	
ICS-AB1	ICSAB	1650	94			97			101			86			92	
ZZZZZZ	ZZZZZZ	1655														
KQ1700678-01	Method Blank	1659	101			98			102			97			99	
KQ1700678-02	Lab Control	1704	100			96			101			95			100	
KQ1700678-03	K1700165-SRM1	1708	100			96			107			93			97	
KQ1700678-04	K1700165-SRM2	1713	99			102			104			91			96	
K1700165-001	Bird No. 16-1	1717	101			97			107			91			103	
K1700165-002	Bird No. 16-2	1722	102			102			107			97			104	
K1700165-003	Bird No. 16-3	1726	100			102			107			96			102	
CCV2	CCV	1731	99			99			106			96			104	
CCB2	CCB	1735	99			100			105			98			101	
K1700165-004	Bird No. 16-4	1740	100			98			109			92			103	
K1700165-005	Bird No. 16-5	1744	100			103			111			96			105	
K1700165-006	Bird No. 16-6	1749	99			103			110			97			105	
K1700165-007	Bird No. 16-7	1753	101			99			112			96			105	
K1700165-008	Bird No. 16-8	1758	101			101			115			96			108	
K1700165-009	Bird No. 16-9	1802	100			101			112			98			107	
K1700165-010	Bird No. 16-10	1807	99			98			114			95			107	
K1700165-011	Bird No. 16-11	1811	99			105			114			98			106	
K1700165-012	Bird No. 16-12	1816	99			99			113			97			108	
K1700165-013	Bird No. 16-13	1820	98			98			111			94			105	
CCV3	CCV	1825	97			96			109			95			104	
ZZZZZZ	ZZZZZZ	1829														
CCB3	CCB	1833	96			98			104			97			102	
K1700165-014	Bird No. 16-14	1838	97			99			109			91			103	
K1700165-015	Bird No. 16-15	1842	99			100			108			94			104	
K1700165-016	Bird No. 16-16	1847	97			98			109			92			103	
K1700165-017	Bird No. 16-17	1851	98			98			109			96			103	
K1700165-017D	Bird No. 16-17	1856	97			100			111			94			106	
K1700165-017L	Bird No. 16-17	1900	97			97			109			95			105	
K1700165-017A	Bird No. 16-17	1905	99			102			108			97			102	
K1700165-017S	Bird No. 16-17	1909	98			98			114			95			106	
K1700165-018	Bird No. 16-18	1914	98			97			112			93			105	
K1700165-019	Bird No. 16-19	1918	97			98			111			95			104	
CCV4	CCV	1923	97			95			111			93			106	
CCB4	CCB	1927	95			99			105			96			102	

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700165

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 01/30/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:																					
			Element Ge72 KED		Q	Element Y89 KED		2	Q	Element Sc45 KED		1	Q	Element Rh103 KED		2	Q	Element In115 KED		1	Q	Element Lu175 KED		1
K1700165-020	Bird No. 16-20	1932	97			98				109				94				104				102		
ZZZZZZ	ZZZZZZ	1936																						
ZZZZZZ	ZZZZZZ	1941																						
ZZZZZZ	ZZZZZZ	1945																						
ZZZZZZ	ZZZZZZ	1950																						
ZZZZZZ	ZZZZZZ	1954																						
ZZZZZZ	ZZZZZZ	1959																						
ZZZZZZ	ZZZZZZ	2003																						
ZZZZZZ	ZZZZZZ	2008																						
ZZZZZZ	ZZZZZZ	2012																						
CCV5	CCV	2017	98			97				109				94				105				102		
ZZZZZZ	ZZZZZZ	2021																						
CCB5	CCB	2025	96			94				107				94				101				99		
LLCCVT1	LLCCVT1	2030	96			96				107				96				103				102		
ZZZZZZ	ZZZZZZ	2034																						
ZZZZZZ	ZZZZZZ	2039																						
ZZZZZZ	ZZZZZZ	2043																						
ZZZZZZ	ZZZZZZ	2048																						
ZZZZZZ	ZZZZZZ	2052																						
ZZZZZZ	ZZZZZZ	2057																						
ZZZZZZ	ZZZZZZ	2101																						
ZZZZZZ	ZZZZZZ	2106																						
ZZZZZZ	ZZZZZZ	2110																						
ZZZZZZ	ZZZZZZ	2115																						
ZZZZZZ	ZZZZZZ	2119																						
CCV6	CCV	2124	95			91				102				92				99				97		
CCB6	CCB	2128	93			92				101				92				100				98		
ZZZZZZ	ZZZZZZ	2133																						
ZZZZZZ	ZZZZZZ	2137																						
ZZZZZZ	ZZZZZZ	2142																						
ZZZZZZ	ZZZZZZ	2146																						
ZZZZZZ	ZZZZZZ	2151																						
ZZZZZZ	ZZZZZZ	2155																						
ZZZZZZ	ZZZZZZ	2200																						
ZZZZZZ	ZZZZZZ	2204																						
ZZZZZZ	ZZZZZZ	2209																						
ZZZZZZ	ZZZZZZ	2213																						
CCV7	CCV	2218	92			94				102				92				98				95		
CCB7	CCB	2222	92			95				102				92				99				96		
ZZZZZZ	ZZZZZZ	2227																						
ZZZZZZ	ZZZZZZ	2231																						
ZZZZZZ	ZZZZZZ	2236																						
ZZZZZZ	ZZZZZZ	2240																						
ZZZZZZ	ZZZZZZ	2245																						

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700165

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 01/30/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:											
			Element Ge72 KED Q	Element Y89 KED2 Q	Element Sc45 KED1 Q	Element Rh103 KED2Q	Element In115 KED1Q	Element Lu175 KED1Q						
ZZZZZZ	ZZZZZZ	2249												
ZZZZZZ	ZZZZZZ	2254												
ZZZZZZ	ZZZZZZ	2258												
ZZZZZZ	ZZZZZZ	2303												
ZZZZZZ	ZZZZZZ	2307												
CCV8	CCV	2312	93	94	105	93	99	98						
CCB8	CCB	2316	92	92	102	90	97	97						
ZZZZZZ	ZZZZZZ	2321												
ZZZZZZ	ZZZZZZ	2325												
ZZZZZZ	ZZZZZZ	2329												
ZZZZZZ	ZZZZZZ	2334												
ZZZZZZ	ZZZZZZ	2338												
ZZZZZZ	ZZZZZZ	2343												
ZZZZZZ	ZZZZZZ	2347												
ZZZZZZ	ZZZZZZ	2352												
ZZZZZZ	ZZZZZZ	2356												
ZZZZZZ	ZZZZZZ	0001												
ZZZZZZ	ZZZZZZ	0005												
CCV9	CCV	0010	92	90	102	87	99	97						
CCB9	CCB	0014	92	89	100	89	95	96						
ZZZZZZ	ZZZZZZ	0019												
LLCCVT2	LLCCVT2	0023	91	89	100	87	96	95						
ZZZZZZ	ZZZZZZ	0028												
ZZZZZZ	ZZZZZZ	0032												
ZZZZZZ	ZZZZZZ	0037												
ZZZZZZ	ZZZZZZ	0041												
ZZZZZZ	ZZZZZZ	0045												
ZZZZZZ	ZZZZZZ	0050												
ZZZZZZ	ZZZZZZ	0054												
KQ1700682-01	Method Blank	0059	90	88	99	90	95	93						
KQ1700682-02	Lab Control	0103	90	92	100	90	95	95						
KQ1700682-03	K1700165-SRM3	0108	92	93	106	85	95	97						
CCV10	CCV	0112	92	91	101	89	97	97						
ZZZZZZ	ZZZZZZ	0117												
CCB10	CCB	0121	89	88	99	89	94	93						
KQ1700682-04	K1700165-SRM4	0126	89	96	99	84	91	94						
K1700165-021	Bird No. 16-21	0130	90	92	102	88	96	97						
K1700165-022	Bird No. 16-22	0135	90	92	101	88	97	96						
K1700165-023	Bird No. 16-23	0139	88	90	103	87	98	97						
K1700165-024	Bird No. 16-24	0144	90	94	103	89	95	96						
K1700165-025	Bird No. 16-25	0148	91	90	102	85	96	95						
ZZZZZZ	ZZZZZZ	0153												
ZZZZZZ	ZZZZZZ	0157												
ZZZZZZ	ZZZZZZ	0202												

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700165

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 01/30/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:											
			Element Ge72 KED Q	Element Y89 KED2 Q	Element Sc45 KED1 Q	Element Rh103 KED2Q	Element In115 KED1Q	Element Lu175 KED1Q						
ZZZZZZ	ZZZZZZ	0206												
ZZZZZZ	ZZZZZZ	0211												
CCV11	CCV	0215	89	89	101	87	97	94						
CCB11	CCB	0219	89	88	100	87	95	93						
ZZZZZZ	ZZZZZZ	0224												
ZZZZZZ	ZZZZZZ	0228												
ZZZZZZ	ZZZZZZ	0233												
ZZZZZZ	ZZZZZZ	0237												
ZZZZZZ	ZZZZZZ	0242												
K1700171-024D	Batch QC1D	0246	90	107	104	85	96	99						
K1700171-024L	Batch QC1L	0251	89	92	101	85	97	95						
K1700171-024A	Batch QC1A	0255	89	107	103	88	95	95						
K1700171-024S	Batch QC1S	0300	91	105	105	83	96	96						
ZZZZZZ	ZZZZZZ	0304												
CCV12	CCV	0309	88	87	95	84	91	90						
CCV12	CCV	0313	87	86	98	86	93	91						
CCB12	CCB	0318	86	87	95	87	92	91						
ZZZZZZ	ZZZZZZ	0322												
LLCCVT3	LLCCVT3	0326	86	82	95	84	91	89						

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____
 Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700165
 ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 01/31/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:											
			Element Ge72 KED	Q	Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
Blank	Blank	1241	100											
Standard 1	Standard 1	1243	101											
ICV2	ICV	1246	102											
CCV1	CCV	1248	102											
ICB2	ICB	1251	101											
CCB1	CCB	1254	101											
LLICVT1	LLICVT1	1256	100											
ICS-A1	ICSA	1259	93											
ICS-AB1	ICSAB	1301	92											
ZZZZZZ	ZZZZZZ	1304												
ZZZZZZ	ZZZZZZ	1306												
ZZZZZZ	ZZZZZZ	1309												
ZZZZZZ	ZZZZZZ	1312												
KQ1700682-02	Lab Control	1314	104											
CCV2	CCV	1317	103											
CCB2	CCB	1319	102											
LLCCVT1	LLCCVT1	1322	101											



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February 27, 2017

Analytical Report for Service Request No: K1700168

Bill Stubblefield
Oregon State University
Wiegand Hall 421
3051 Campus Way
Corvallis, OR 97331

RE: Avian Tissue Project

Dear Bill,

Enclosed are the results of the sample(s) submitted to our laboratory December 29, 2016
For your reference, these analyses have been assigned our service request number **K1700168**.

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

Please contact me if you have any questions. My extension is 3356. You may also contact me via email at Kurt.Clarkson@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kurt Clarkson
Client Services
Manager



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Table of Contents

Acronyms

Qualifiers

State Certifications, Accreditations, And Licenses

Case Narrative

Chain of Custody

Total Solids

General Chemistry

Metals

Acronyms

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

Inorganic Data Qualifiers

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

Metals Data Qualifiers

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

Organic Data Qualifiers

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

Additional Petroleum Hydrocarbon Specific Qualifiers

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

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

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

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

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



Case Narrative

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

ALS ENVIRONMENTAL

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request No.: K1700168
Date Received: 12/29/16

Case Narrative

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

Sample Receipt

Nineteen animal tissue samples were received for analysis at ALS Environmental on 12/29/16. The following discrepancies were noted upon initial sample inspection. The exceptions are also noted on the cooler receipt and preservation form included in this data package. We did not receive sample number "Bird no.16-17". The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were frozen at -20°C upon receipt at the laboratory.

General Chemistry Parameters

Total Cyanide by EPA Method 9012B:

Samples 1-4 and 20-25 were received past holding time. The analysis was performed as soon as possible after receipt by the laboratory. The data was flagged to indicate the holding time violation.

The upper control criterion was exceeded in Laboratory Control Samples (LCS) 2 & 5. The error associated with elevated recovery indicated a high bias. The sample data was not significantly affected. Additional analysis of the associated field samples were not performed because the results were within manufacturer's acceptance limits. No further corrective action was appropriate.

The Relative Percent Difference (RPD) for the Duplicate Lab Control Sample Summary 1 was outside control criteria.

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

Total Metals

Matrix Spike Recovery Exceptions:

The control criteria for matrix spike recovery of Potassium, Sodium and Zinc for sample Bird No. 16-10 Kidney were not applicable. The analyzed concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

Approved by



The matrix spike recovery of Arsenic and Selenium for sample Bird No. 16-10 Kidney was outside control criteria. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. No further corrective action was appropriate.

The control criteria for matrix spike recovery of Aluminum, Chromium, Copper, Iron, Potassium, Sodium and Zinc for the Batch QC1 sample were not applicable. The analyzed concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

The matrix spike recovery of Calcium for the Batch QC sample was outside control criteria. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. No further corrective action was appropriate.

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

Approved by Kurt Claesson



Chain of Custody

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

Laboratory Management Program LaMP Chain of Custody Record

K1700168

Running number	ID	Weight (g)	Sex (m/f)	Liver	Kidney	GI tract	GI contents	Breast muscle	Thigh muscle	Bone (including marrow)
1	16-1	1772	m	x	x	x	x	x	x	x
2	16-2	2475	m	x	x	x	x	x	x	x
3	16-3	1964	m	x	x	x	x	x	x	x
4	16-4	2419	m	x	x	x	x	x	x	x
5	16-5	2887	m	x	x	x	x	x	x	x
6	16-6	1893	m	x	x	x	x	x	x	x
7	16-7	2317	f	x	x	x	x	x	x	x
8	16-8	2518	m	x	x	x	x	x	x	x
9	16-9	2274	f	x	x	x	x	x	x	x
10	16-10	2521	m	x	x	x	x	x	x	x
11	16-11	2152	m	x	x	x	x	x	x	x
12	16-12	1864	f	x	x	x	x	x	x	x
13	16-13	2170	f	x	x	x	x	x	x	x
14	16-14	1941	f	x	x	x	x	x	x	x
15	16-15	1973	m	x	x	x	x	x	x	x
16	16-16	2532	f	x	x	x	x	x	x	x
17	16-17	2624	m	x	x	x	x	x	x	x
18	16-18	2445	m	x	x	x	x	x	x	x
19	16-19	2418	f	x	x	x	x	x	x	x
20	16-20	2197	m	x	x	x	x	x	x	x
21	16-21	1537	f	x	x	x	x	x	x	x
22	16-22	1741	m	x	x	x	x	x	x	x
23	16-23	1853	f	x	x	x	x	x	x	x
24	16-24	1795	m	x	x	x	x	x	x	x
25	16-25	1838	m	x	x	x	x	x	x	x



Cooler Receipt and Preservation Form

PC GSClient OSU USFWService Request K17 00168Received: 12-29-16 Opened: 12-29-16 By: eg Unloaded: 12-29-16 By: eg

1. Samples were received via? Mail Fed Ex UPS DHL PDX Courier Hand Delivered
2. Samples were received in: (circle) Cooler Box Envelope Other NA
3. Were custody seals on coolers? NA Y N If yes, how many and where? NA
- If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID	Tracking Number	NA	Filed
-10.8	-10.8	-	-	<u>Q</u>	361		12 788 146 01 4816	NA	114

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

Sample ID on Bottle	Sample ID on COC	Identified by:

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

Notes, Discrepancies, & Resolutions:

Page ____ of ____



Total Solids

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Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue
Analysis Method: Freeze Dry
Prep Method: None

Service Request: K1700168
Date Collected: 12/08/16 - 12/19/16
Date Received: 12/29/16
Units: Percent
Basis: Wet

Total Solids

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
Bird No. 16-1 Kidney	K1700168-001	20.9	-	-	1	01/17/17 11:40	
Bird No. 16-2 Kidney	K1700168-002	36.7	-	-	1	01/17/17 11:40	
Bird No. 16-3 Kidney	K1700168-003	25.0	-	-	1	01/17/17 11:40	
Bird No. 16-4 Kidney	K1700168-004	37.1	-	-	1	01/17/17 11:40	
Bird No. 16-5 Kidney	K1700168-005	24.9	-	-	1	01/17/17 11:40	
Bird No. 16-6 Kidney	K1700168-006	29.8	-	-	1	01/17/17 11:40	
Bird No. 16-7 Kidney	K1700168-007	31.1	-	-	1	01/17/17 11:40	
Bird No. 16-8 Kidney	K1700168-008	31.0	-	-	1	01/17/17 11:40	
Bird No. 16-9 Kidney	K1700168-009	27.6	-	-	1	01/17/17 11:40	
Bird No. 16-10 Kidney	K1700168-010	44.7	-	-	1	01/17/17 11:40	
Bird No. 16-11 Kidney	K1700168-011	26.9	-	-	1	01/17/17 11:40	
Bird No. 16-12 Kidney	K1700168-012	31.1	-	-	1	01/17/17 11:40	
Bird No. 16-13 Kidney	K1700168-013	28.0	-	-	1	01/17/17 11:40	
Bird No. 16-14 Kidney	K1700168-014	39.3	-	-	1	01/17/17 11:40	
Bird No. 16-15 Kidney	K1700168-015	27.3	-	-	1	01/17/17 11:40	
Bird No. 16-16 Kidney	K1700168-016	37.4	-	-	1	01/17/17 11:40	
Bird No. 16-17 Kidney	K1700168-017	25.4	-	-	1	01/17/17 11:40	
Bird No. 16-18 Kidney	K1700168-018	32.6	-	-	1	01/17/17 11:40	
Bird No. 16-19 Kidney	K1700168-019	30.2	-	-	1	01/17/17 11:40	
Bird No. 16-20 Kidney	K1700168-020	26.9	-	-	1	01/17/17 11:40	
Bird No. 16-21 Kidney	K1700168-021	29.1	-	-	1	01/17/17 11:40	
Bird No. 16-22 Kidney	K1700168-022	36.5	-	-	1	01/17/17 11:40	
Bird No. 16-23 Kidney	K1700168-023	21.3	-	-	1	01/17/17 11:40	
Bird No. 16-24 Kidney	K1700168-024	32.6	-	-	1	01/17/17 11:40	
Bird No. 16-25 Kidney	K1700168-025	23.2	-	-	1	01/17/17 11:40	



General Chemistry

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ALS Group USA, Corp.
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Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue
Analysis Method: 9012B
Prep Method: EPA 9010B

Service Request: K1700168
Date Collected: 12/08/16 - 12/19/16
Date Received: 12/29/16
Units: mg/Kg
Basis: Wet

Cyanide, Total

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Bird No. 16-1 Kidney	K1700168-001	0.59	0.10	-	1	02/02/17 11:22	1/31/17	**
Bird No. 16-2 Kidney	K1700168-002	2.09	0.10	-	1	02/02/17 11:22	1/31/17	**
Bird No. 16-3 Kidney	K1700168-003	0.82	0.10	-	1	02/02/17 11:22	1/31/17	**
Bird No. 16-4 Kidney	K1700168-004	2.25	0.10	-	1	02/02/17 11:22	1/31/17	**
Bird No. 16-5 Kidney	K1700168-005	1.23	0.10	-	1	02/02/17 11:22	1/31/17	*
Bird No. 16-6 Kidney	K1700168-006	2.25	0.10	-	1	02/02/17 11:22	1/31/17	*
Bird No. 16-7 Kidney	K1700168-007	3.00	0.10	-	1	02/02/17 11:22	1/31/17	*
Bird No. 16-8 Kidney	K1700168-008	3.48	0.10	-	1	02/02/17 11:22	1/31/17	*
Bird No. 16-9 Kidney	K1700168-009	2.64	0.10	-	1	02/02/17 11:22	1/31/17	*
Bird No. 16-10 Kidney	K1700168-010	1.22	0.10	-	1	02/02/17 11:22	1/31/17	*
Bird No. 16-11 Kidney	K1700168-011	0.73	0.10	-	1	02/02/17 11:22	1/31/17	*
Bird No. 16-12 Kidney	K1700168-012	1.43	0.10	-	1	02/02/17 11:22	1/31/17	*
Bird No. 16-13 Kidney	K1700168-013	1.49	0.10	-	1	02/02/17 11:22	1/31/17	*
Bird No. 16-14 Kidney	K1700168-014	0.50	0.10	-	1	02/02/17 11:22	1/31/17	*
Bird No. 16-15 Kidney	K1700168-015	1.21	0.10	-	1	02/02/17 11:22	1/31/17	*
Bird No. 16-16 Kidney	K1700168-016	1.94	0.10	-	1	02/02/17 11:22	1/31/17	*
Bird No. 16-17 Kidney	K1700168-017	2.40	0.10	-	1	02/02/17 11:22	1/31/17	*
Bird No. 16-18 Kidney	K1700168-018	2.40	0.10	-	1	02/02/17 11:22	1/31/17	*
Bird No. 16-19 Kidney	K1700168-019	2.88	0.10	-	1	02/02/17 11:22	1/31/17	*
Bird No. 16-20 Kidney	K1700168-020	2.46	0.10	-	1	02/02/17 11:22	1/31/17	**
Bird No. 16-21 Kidney	K1700168-021	0.95	0.10	-	1	01/31/17 14:36	1/30/17	**
Bird No. 16-22 Kidney	K1700168-022	1.33	0.10	-	1	01/31/17 14:36	1/30/17	**
Bird No. 16-23 Kidney	K1700168-023	1.29	0.10	-	1	01/31/17 14:36	1/30/17	**
Bird No. 16-24 Kidney	K1700168-024	2.34	0.10	-	1	01/31/17 14:36	1/30/17	**
Bird No. 16-25 Kidney	K1700168-025	1.56	0.10	-	1	01/31/17 14:36	1/30/17	**
Method Blank	K1700168-MB1	ND U	0.10	-	1	01/31/17 14:36	1/30/17	
Method Blank	K1700168-MB2	ND U	0.10	-	1	02/02/17 11:22	1/31/17	

ALS Group USA, Corp.

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QA/QC Report

Client: Oregon State University
Project Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700168
Date Collected: NA
Date Received: NA
Date Analyzed: 01/31/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Batch QC
Lab Code: K1700171-024

Units: mg/Kg
Basis: Wet

Analyte Name	Analysis Method	MRL	MDL	Sample Result	Duplicate Sample K1700171-024DUP	Average	RPD	RPD Limit
					Result			
Cyanide, Total	9012B	0.10	-	1.70	1.48	1.59	14	20

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

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

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

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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700168
Date Collected: N/A
Date Received: N/A
Date Analyzed: 01/31/17
Date Extracted: 01/30/17

Duplicate Matrix Spike Summary
Cyanide, Total

Sample Name: Batch QC
Lab Code: K1700171-024
Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet

Analyte Name	Sample Result	Result	Matrix Spike K1700171-024MS		Result	Duplicate Matrix Spike K1700171-024DMS		% Rec Limits	RPD	RPD Limit
			Spike Amount	% Rec		Spike Amount	% Rec			
Cyanide, Total	1.70	4.55	4.89	58	4.75	4.86	63	10-171	4	20

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

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

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

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700168
Date Analyzed: 01/31/17
Date Extracted: 01/30/17

Lab Control Sample Summary
Cyanide, Total

Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet
Analysis Lot: 533083

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1700168-LCS2	96.8	70.3	138 *	62-128
Lab Control Sample	K1700168-LCS3	83.5	70.3	119	62-128
Lab Control Sample	K1700168-LCS4	79.8	70.3	113	62-128
Lab Control Sample	K1700168-LCS5	93.3	70.3	133 *	62-128

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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700168
Date Analyzed: 02/02/17
Date Extracted: 01/31/17

Duplicate Lab Control Sample Summary
General Chemistry Parameters

Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet
Analysis Lot: 533089

Lab Control Sample
K1700168-LCS1

Duplicate Lab Control Sample
K1700168-DLCS1

Analyte Name	Result	Spike Amount	% Rec	Result	Spike Amount	% Rec	% Rec Limits	RPD	RPD Limit
Cyanide, Total	84.3	70.3	120	53.1	70.3	75	62-128	46 *	20

Client: Oregon State University
Project: Avian Tissue Project

Service Request: K1700168

Continuing Calibration Verification (CCV) Summary

Cyanide, Total

Analysis Method: 9012B

Units: ug/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	533083	KQ1701041-04	01/31/17 14:36	100	103	103	90-110
CCV2	533083	KQ1701041-05	01/31/17 14:36	100	104	104	90-110
CCV3	533083	KQ1701041-06	01/31/17 14:36	100	104	104	90-110
CCV4	533083	KQ1701041-07	01/31/17 14:36	100	103	103	90-110
CCV5	533089	KQ1701158-08	02/02/17 11:22	100	102	102	90-110
CCV6	533089	KQ1701158-09	02/02/17 11:22	100	103	103	90-110
CCV7	533089	KQ1701158-10	02/02/17 11:22	100	103	103	90-110
CCV8	533089	KQ1701158-11	02/02/17 11:22	100	103	103	90-110

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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project

Service Request:K1700168

Continuing Calibration Blank (CCB) Summary
Cyanide, Total

Analysis Method: 9012B

Units:mg/Kg

	Analysis Lot	Lab Code	Date Analyzed	MRL	MDL	Result	Q
CCB1	533083	KQ1701041-01	01/31/17 14:36	0.10		ND	U
CCB2	533083	KQ1701041-02	01/31/17 14:36	0.10		ND	U
CCB3	533083	KQ1701041-03	01/31/17 14:36	0.10		ND	U
CCB4	533083	KQ1701041-08	01/31/17 14:36	0.10		ND	U
CCB5	533089	KQ1701158-04	02/02/17 11:22	0.10		ND	U
CCB6	533089	KQ1701158-05	02/02/17 11:22	0.10		ND	U
CCB7	533089	KQ1701158-06	02/02/17 11:22	0.10		ND	U
CCB8	533089	KQ1701158-07	02/02/17 11:22	0.10		ND	U



Metals

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Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700168
Date Collected: 12/08-19/16
Date Received: 12/29/16

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/g
Basis: Dry

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Bird No. 16-1 Kidney	K1700168-001	1.0	0.06	1	01/30/17	01/31/17	24.4	
Bird No. 16-2 Kidney	K1700168-002	1.0	0.06	1	01/30/17	01/31/17	23.1	
Bird No. 16-3 Kidney	K1700168-003	2.0	0.12	1	01/30/17	01/31/17	10.7	
Bird No. 16-4 Kidney	K1700168-004	1.0	0.06	1	01/30/17	01/31/17	12.6	
Bird No. 16-5 Kidney	K1700168-005	1.0	0.06	1	01/30/17	01/31/17	11.0	
Bird No. 16-6 Kidney	K1700168-006	1.0	0.06	1	01/30/17	01/31/17	9.25	
Bird No. 16-7 Kidney	K1700168-007	1.0	0.06	1	01/30/17	01/31/17	11.6	
Bird No. 16-8 Kidney	K1700168-008	1.0	0.06	1	01/30/17	01/31/17	7.33	
Bird No. 16-9 Kidney	K1700168-009	4.0	0.24	1	01/30/17	01/31/17	16.7	
Bird No. 16-10 Kidney	K1700168-010	1.0	0.06	1	01/30/17	01/31/17	7.03	
Bird No. 16-11 Kidney	K1700168-011	1.9	0.11	1	01/30/17	01/31/17	24.9	
Bird No. 16-12 Kidney	K1700168-012	1.0	0.06	1	01/30/17	01/31/17	9.73	
Bird No. 16-13 Kidney	K1700168-013	1.0	0.06	1	01/30/17	01/31/17	6.69	
Bird No. 16-14 Kidney	K1700168-014	1.0	0.06	1	01/30/17	01/31/17	10.6	
Bird No. 16-15 Kidney	K1700168-015	1.0	0.06	1	01/30/17	01/31/17	13.0	
Bird No. 16-16 Kidney	K1700168-016	1.0	0.06	1	01/30/17	01/31/17	21.8	
Bird No. 16-17 Kidney	K1700168-017	1.8	0.11	1	01/30/17	01/31/17	10.0	
Bird No. 16-18 Kidney	K1700168-018	1.0	0.06	1	01/30/17	01/31/17	9.51	
Bird No. 16-19 Kidney	K1700168-019	1.0	0.06	1	01/30/17	01/31/17	8.06	
Bird No. 16-20 Kidney	K1700168-020	4.0	0.24	1	01/30/17	01/31/17	12.1	
Method Blank 1	K1700168-MB1	1.0	0.06	1	01/30/17	01/31/17	ND	
Method Blank 2	K1700168-MB2	1.0	0.06	1	01/30/17	01/31/17	ND	
Method Blank 3	K1700168-MB3	1.0	0.06	1	01/30/17	01/31/17	ND	

ALS Group USA, Corp.
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Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700168
Date Collected: 12/19/16
Date Received: 12/29/16

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/g
Basis: Dry

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Bird No. 16-21 Kidney	K1700168-021	1.0	0.06	1	01/30/17	01/31/17	7.92	
Bird No. 16-22 Kidney	K1700168-022	0.9	0.06	1	01/30/17	01/31/17	18.6	
Bird No. 16-23 Kidney	K1700168-023	2.0	0.12	1	01/30/17	01/31/17	10.1	
Bird No. 16-24 Kidney	K1700168-024	1.0	0.06	1	01/30/17	01/31/17	6.17	
Bird No. 16-25 Kidney	K1700168-025	0.9	0.06	1	01/30/17	01/31/17	8.08	
Method Blank 1	K1700168-MB1	1.0	0.06	1	01/30/17	01/31/17	ND	
Method Blank 2	K1700168-MB2	1.0	0.06	1	01/30/17	01/31/17	ND	
Method Blank 3	K1700168-MB3	1.0	0.06	1	01/30/17	01/31/17	ND	

ALS Group USA, Corp.

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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700168
Date Collected: NA
Date Received: 12/29/16
Date Extracted: 01/30/17
Date Analyzed: 01/31/17

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name: Bird No. 16-10 Kidney Units: ng/g
Lab Code: K1700168-010S, K1700168-010SD Basis: Dry
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		ALS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Mercury	METHOD	1631E	4.8	243	241	7.03	259	261	104	105	70-130	<1	

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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700168
Date Collected: NA
Date Received: 12/29/16
Date Extracted: 01/30/17
Date Analyzed: 01/31/17

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name: Bird No. 16-19 Kidney Units: ng/g
Lab Code: K1700168-019S, K1700168-019SD Basis: Dry
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		ALS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Mercury	METHOD	1631E	5	241	249	8.06	254	268	102	104	70-130	5	

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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700168**Date Collected:** NA**Date Received:** NA**Date Extracted:** NA**Date Analyzed:** 01/31/17

Ongoing Precision and Recovery (OPR) Sample Summary

Total Metals

Sample Name: Ongoing Precision and Recovery (Initial)**Units:** ng/g**Basis:** NA**Test Notes:**

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	5.30	106	70-130	

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700168
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 01/31/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery	Result Notes
						Acceptance Limits	
Mercury	METHOD	1631E	5.00	5.12	102	70-130	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Animal tissue

Service Request: K1700168
Date Collected: NA
Date Received: NA
Date Extracted: 01/30/17
Date Analyzed: 01/31/17

Quality Control Sample (QCS) Summary
Total Metals

Sample Name: Quality Control Sample
Lab Code:
Test Notes:

Units: ng/g
Basis: Dry

Source: TORT-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	292	283	97	70-130	

ALS Group USA, Corp.
dba ALS Environmental
 QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700168
Date Collected: 12/19/16
Date Received: 12/29/16
Date Extracted: 01/30/17
Date Analyzed: 01/31/17

Matrix Spike/Duplicate Matrix Spike Summary
 Total Metals

Sample Name: Batch QC
 Lab Code: K1700165-021S, K1700165-021SD
 Test Notes:

Units: ng/g
 Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		ALS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Mercury	METHOD	1631E	4.8	249	242	14.7	270	259	103	101	70-130	4	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700168
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 01/31/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Initial) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	4.97	99	70-130	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700168
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 01/31/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	4.94	99	70-130	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Animal tissue

Service Request: K1700168
Date Collected: NA
Date Received: NA
Date Extracted: 01/30/17
Date Analyzed: 01/31/17

Quality Control Sample (QCS) Summary
Total Metals

Sample Name: Quality Control Sample
Lab Code:
Test Notes:

Units: ng/g
Basis: Dry

Source: TORT-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	292	271	93	70-130	

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-1 Kidney

Lab Code: K1700168-001

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	43.8		
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/30/17	0.180		
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/30/17	0.02	J	N
Barium	6020A	0.050	0.005	5.0	01/29/17	01/30/17	1.35		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.009	J	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	6.58		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	1090		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.59		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.740		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	49.5		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	364		
Lead	6020A	0.0199	0.0005	5.0	01/29/17	01/30/17	0.0916		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	785		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	77.6		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.65		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	10300		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	6.3		N
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.016	J	
Sodium	6010C	19.9	2.0	1.0	01/29/17	01/31/17	4830		
Thallium	6020A	0.0199	0.0009	5.0	01/29/17	01/30/17	0.0056	J	
Vanadium	6020A	0.199	0.007	5.0	01/29/17	01/30/17	0.090	J	
Zinc	6010C	3.97	0.60	10.0	01/29/17	01/31/17	2670		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-2 Kidney

Lab Code: K1700168-002

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	19.2		
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/30/17	0.037	J	
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/30/17	0.02	J	N
Barium	6020A	0.050	0.005	5.0	01/29/17	01/30/17	0.284		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.004	J	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	2.38		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	533		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.29		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.894		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	29.0		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	582		
Lead	6020A	0.0199	0.0005	5.0	01/29/17	01/30/17	0.0579		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	584		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	81.5		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.77		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	6830		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	1.8		N
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.9	2.0	1.0	01/29/17	01/31/17	2150		
Thallium	6020A	0.0199	0.0009	5.0	01/29/17	01/30/17	0.0009	U	
Vanadium	6020A	0.199	0.007	5.0	01/29/17	01/30/17	0.010	J	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	255		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-3 Kidney

Lab Code: K1700168-003

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	11.8		
Antimony	6020A	0.049	0.002	5.0	01/29/17	01/30/17	0.059		
Arsenic	6020A	0.49	0.02	5.0	01/29/17	01/30/17	0.02	U	N
Barium	6020A	0.049	0.005	5.0	01/29/17	01/30/17	2.28		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.007	J	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	9.22		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	2060		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.27		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.389		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	41.6		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	482		
Lead	6020A	0.0197	0.0005	5.0	01/29/17	01/30/17	0.108		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	895		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	62.1		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.16	J	
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	10200		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	5.4		N
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.7	2.0	1.0	01/29/17	01/31/17	5140		
Thallium	6020A	0.0197	0.0009	5.0	01/29/17	01/30/17	0.0015	J	
Vanadium	6020A	0.197	0.007	5.0	01/29/17	01/30/17	0.050	J	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	1290		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-4 Kidney

Lab Code: K1700168-004

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	27.5		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/30/17	0.124		
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.02	U	N
Barium	6020A	0.048	0.005	5.0	01/29/17	01/30/17	0.454		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.007	J	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	1.89		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	1080		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.31		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.480		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	20.4		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	510		
Lead	6020A	0.0191	0.0005	5.0	01/29/17	01/30/17	0.114		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	657		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	142		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.53		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	6770		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	2.5		N
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.1	1.9	1.0	01/29/17	01/31/17	1970		
Thallium	6020A	0.0191	0.0009	5.0	01/29/17	01/30/17	0.0170	J	
Vanadium	6020A	0.191	0.007	5.0	01/29/17	01/30/17	0.032	J	
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	235		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-5 Kidney

Lab Code: K1700168-005

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	16.9		
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/30/17	0.030	J	
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/30/17	0.02	U	N
Barium	6020A	0.050	0.005	5.0	01/29/17	01/30/17	0.576		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.005	J	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	12.1		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	608		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.82		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.789		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	55.3		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	381		
Lead	6020A	0.0199	0.0005	5.0	01/29/17	01/30/17	0.160		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	715		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	73.9		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.97		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	9090		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	4.9		N
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.9	2.0	1.0	01/29/17	01/31/17	4040		
Thallium	6020A	0.0199	0.0009	5.0	01/29/17	01/30/17	0.0053	J	
Vanadium	6020A	0.199	0.007	5.0	01/29/17	01/30/17	0.048	J	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	688		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-6 Kidney

Lab Code: K1700168-006

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	6.0		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/30/17	0.053		
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.02	U	N
Barium	6020A	0.048	0.005	5.0	01/29/17	01/30/17	0.423		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	5.32		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	748		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.30		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.708		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	44.1		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	434		
Lead	6020A	0.0191	0.0005	5.0	01/29/17	01/30/17	0.106		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	744		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	72.3		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.66		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	8140		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	3.6		N
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.1	1.9	1.0	01/29/17	01/31/17	3490		
Thallium	6020A	0.0191	0.0009	5.0	01/29/17	01/30/17	0.0011	J	
Vanadium	6020A	0.191	0.007	5.0	01/29/17	01/30/17	0.024	J	
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	491		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-7 Kidney

Lab Code: K1700168-007

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	8.4		
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/30/17	0.056		
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/30/17	0.02	J	N
Barium	6020A	0.050	0.005	5.0	01/29/17	01/30/17	0.799		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.003	J	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	3.99		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	1210		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.43		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.783		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	26.1		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	837		
Lead	6020A	0.0199	0.0005	5.0	01/29/17	01/30/17	0.237		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	875		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	259		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.97		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	8380		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	3.1		N
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.9	2.0	1.0	01/29/17	01/31/17	2830		
Thallium	6020A	0.0199	0.0009	5.0	01/29/17	01/30/17	0.0011	J	
Vanadium	6020A	0.199	0.007	5.0	01/29/17	01/30/17	0.024	J	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	241		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-8 Kidney

Lab Code: K1700168-008

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	32.0		
Antimony	6020A	0.046	0.002	5.0	01/29/17	01/30/17	0.019	J	
Arsenic	6020A	0.46	0.02	5.0	01/29/17	01/30/17	0.03	J	N
Barium	6020A	0.046	0.005	5.0	01/29/17	01/30/17	1.70		
Beryllium	6020A	0.018	0.003	5.0	01/29/17	01/30/17	0.007	J	
Cadmium	6020A	0.018	0.002	5.0	01/29/17	01/30/17	2.73		
Calcium	6010C	3.7	1.9	1.0	01/29/17	01/31/17	1730		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	1.39		
Cobalt	6020A	0.018	0.003	5.0	01/29/17	01/30/17	1.20		
Copper	6010C	0.37	0.08	1.0	01/29/17	01/31/17	19.9		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	428		
Lead	6020A	0.0185	0.0005	5.0	01/29/17	01/30/17	0.154		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	907		
Manganese	6010C	0.09	0.02	1.0	01/29/17	01/31/17	401		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	1.23		
Potassium	6010C	18	3.7	1.0	01/29/17	01/31/17	7030		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	2.9		N
Silver	6020A	0.018	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	18.5	1.9	1.0	01/29/17	01/31/17	2020		
Thallium	6020A	0.0185	0.0008	5.0	01/29/17	01/30/17	0.0008	U	
Vanadium	6020A	0.185	0.006	5.0	01/29/17	01/30/17	0.056	J	
Zinc	6010C	0.37	0.06	1.0	01/29/17	01/31/17	292		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-9 Kidney

Lab Code: K1700168-009

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	14.3		
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/30/17	0.045	J	
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/30/17	0.03	J	N
Barium	6020A	0.050	0.005	5.0	01/29/17	01/30/17	1.80		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	3.83		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	2260		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.35		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.965		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	34.6		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	710		
Lead	6020A	0.0199	0.0005	5.0	01/29/17	01/30/17	0.107		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	1090		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	424		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.97		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	9850		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	4.2		N
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.9	2.0	1.0	01/29/17	01/31/17	3000		
Thallium	6020A	0.0199	0.0009	5.0	01/29/17	01/30/17	0.0022	J	
Vanadium	6020A	0.199	0.007	5.0	01/29/17	01/30/17	0.031	J	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	332		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-10 Kidney

Lab Code: K1700168-010

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	13.5		
Antimony	6020A	0.047	0.002	5.0	01/29/17	01/30/17	0.019	J	
Arsenic	6020A	0.47	0.02	5.0	01/29/17	01/30/17	0.02	U	N
Barium	6020A	0.047	0.005	5.0	01/29/17	01/30/17	0.390		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	3.73		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	565		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.26		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.307		
Copper	6010C	0.38	0.08	1.0	01/29/17	01/31/17	16.7		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	293		
Lead	6020A	0.0188	0.0005	5.0	01/29/17	01/30/17	0.157		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	374		
Manganese	6010C	0.09	0.02	1.0	01/29/17	01/31/17	69.6		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.27		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	4460		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	2.6		N
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	18.8	1.9	1.0	01/29/17	01/31/17	1920		
Thallium	6020A	0.0188	0.0008	5.0	01/29/17	01/30/17	0.0010	J	
Vanadium	6020A	0.188	0.007	5.0	01/29/17	01/30/17	0.019	J	
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	378		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-11 Kidney

Lab Code: K1700168-011

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	34.9		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/30/17	0.011	J	
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.02	J	N
Barium	6020A	0.048	0.005	5.0	01/29/17	01/30/17	0.538		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.012	J	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	11.0		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	871		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.35		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.974		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	42.4		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	353		
Lead	6020A	0.0192	0.0005	5.0	01/29/17	01/30/17	0.176		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	823		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	106		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.56		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	8120		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	5.4		N
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.010	J	
Sodium	6010C	19.2	1.9	1.0	01/29/17	01/31/17	4640		
Thallium	6020A	0.0192	0.0009	5.0	01/29/17	01/30/17	0.0053	J	
Vanadium	6020A	0.192	0.007	5.0	01/29/17	01/30/17	0.071	J	
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	1200		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-12 Kidney

Lab Code: K1700168-012

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	6.6		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/30/17	0.050		
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.02	U	N
Barium	6020A	0.048	0.005	5.0	01/29/17	01/30/17	1.17		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.003	J	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	7.85		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	853		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.16	J	
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.541		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	45.1		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	391		
Lead	6020A	0.0192	0.0005	5.0	01/29/17	01/30/17	0.0636		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	735		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	144		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.39		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	7590		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	4.2		N
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.2	1.9	1.0	01/29/17	01/31/17	3750		
Thallium	6020A	0.0192	0.0009	5.0	01/29/17	01/30/17	0.0119	J	
Vanadium	6020A	0.192	0.007	5.0	01/29/17	01/30/17	0.037	J	
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	633		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-13 Kidney

Lab Code: K1700168-013

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	20.4		
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/30/17	0.085		
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/30/17	0.04	J	N
Barium	6020A	0.050	0.005	5.0	01/29/17	01/30/17	1.34		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.006	J	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	3.76		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	2230		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.35		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.741		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	18.3		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	543		
Lead	6020A	0.0199	0.0005	5.0	01/29/17	01/30/17	0.142		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	1010		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	259		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.72		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	8440		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	3.4		N
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.9	2.0	1.0	01/29/17	01/31/17	3620		
Thallium	6020A	0.0199	0.0009	5.0	01/29/17	01/30/17	0.0043	J	
Vanadium	6020A	0.199	0.007	5.0	01/29/17	01/30/17	0.051	J	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	375		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-14 Kidney

Lab Code: K1700168-014

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	29.1		
Antimony	6020A	0.049	0.002	5.0	01/29/17	01/30/17	0.048	J	
Arsenic	6020A	0.49	0.02	5.0	01/29/17	01/30/17	0.02	J	N
Barium	6020A	0.049	0.005	5.0	01/29/17	01/30/17	0.694		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.008	J	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	6.62		
Calcium	6010C	3.9	2.0	1.0	01/29/17	01/31/17	580		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.29		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.289		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	47.8		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	140		
Lead	6020A	0.0195	0.0005	5.0	01/29/17	01/30/17	0.225		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	486		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	39.1		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.25		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	5710		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	3.0		N
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.5	2.0	1.0	01/29/17	01/31/17	2370		
Thallium	6020A	0.0195	0.0009	5.0	01/29/17	01/30/17	0.0159	J	
Vanadium	6020A	0.195	0.007	5.0	01/29/17	01/30/17	0.035	J	
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	909		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-15 Kidney

Lab Code: K1700168-015

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	11.0		
Antimony	6020A	0.049	0.002	5.0	01/29/17	01/30/17	0.015	J	
Arsenic	6020A	0.49	0.02	5.0	01/29/17	01/30/17	0.02	J	N
Barium	6020A	0.049	0.005	5.0	01/29/17	01/30/17	2.49		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.011	J	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	12.6		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	1880		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.16	J	
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.587		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	64.6		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	370		
Lead	6020A	0.0197	0.0005	5.0	01/29/17	01/30/17	0.249		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	942		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	154		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.26		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	10000		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	4.2		N
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.7	2.0	1.0	01/29/17	01/31/17	4580		
Thallium	6020A	0.0197	0.0009	5.0	01/29/17	01/30/17	0.0045	J	
Vanadium	6020A	0.197	0.007	5.0	01/29/17	01/30/17	0.092	J	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	722		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-16 Kidney

Lab Code: K1700168-016

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	17.1		
Antimony	6020A	0.049	0.002	5.0	01/29/17	01/30/17	0.054		
Arsenic	6020A	0.49	0.02	5.0	01/29/17	01/30/17	0.08	J	N
Barium	6020A	0.049	0.005	5.0	01/29/17	01/30/17	1.12		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	3.35		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	1350		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.15	J	
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.548		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	27.4		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	620		
Lead	6020A	0.0197	0.0005	5.0	01/29/17	01/30/17	0.255		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	825		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	236		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.53		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	7450		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	2.9		N
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.7	2.0	1.0	01/29/17	01/31/17	2380		
Thallium	6020A	0.0197	0.0009	5.0	01/29/17	01/30/17	0.0040	J	
Vanadium	6020A	0.197	0.007	5.0	01/29/17	01/30/17	0.061	J	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	245		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-17 Kidney

Lab Code: K1700168-017

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	11.8		
Antimony	6020A	0.049	0.002	5.0	01/29/17	01/30/17	0.021	J	
Arsenic	6020A	0.49	0.02	5.0	01/29/17	01/30/17	0.02	U	N
Barium	6020A	0.049	0.005	5.0	01/29/17	01/30/17	1.31		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.004	J	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	5.42		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	1980		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.29		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.533		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	22.8		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	779		
Lead	6020A	0.0197	0.0005	5.0	01/29/17	01/30/17	0.170		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	910		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	326		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.57		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	9110		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	4.2		N
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.7	2.0	1.0	01/29/17	01/31/17	3130		
Thallium	6020A	0.0197	0.0009	5.0	01/29/17	01/30/17	0.0009	U	
Vanadium	6020A	0.197	0.007	5.0	01/29/17	01/30/17	0.019	J	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	348		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-18 Kidney

Lab Code: K1700168-018

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.8	0.2	5.0	01/29/17	01/30/17	21.1		
Antimony	6020A	0.046	0.002	5.0	01/29/17	01/30/17	0.036	J	
Arsenic	6020A	0.46	0.02	5.0	01/29/17	01/30/17	0.02	U	N
Barium	6020A	0.046	0.005	5.0	01/29/17	01/30/17	1.79		
Beryllium	6020A	0.018	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.018	0.002	5.0	01/29/17	01/30/17	3.06		
Calcium	6010C	3.7	1.8	1.0	01/29/17	01/31/17	2560		
Chromium	6020A	0.18	0.02	5.0	01/29/17	01/30/17	0.45		
Cobalt	6020A	0.018	0.003	5.0	01/29/17	01/30/17	0.512		
Copper	6010C	0.37	0.08	1.0	01/29/17	01/31/17	15.1		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	510		
Lead	6020A	0.0183	0.0005	5.0	01/29/17	01/30/17	0.177		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	841		
Manganese	6010C	0.09	0.02	1.0	01/29/17	01/31/17	288		
Nickel	6020A	0.18	0.02	5.0	01/29/17	01/30/17	0.53		
Potassium	6010C	18	3.7	1.0	01/29/17	01/31/17	7430		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	3.3		N
Silver	6020A	0.018	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	18.3	1.8	1.0	01/29/17	01/31/17	2740		
Thallium	6020A	0.0183	0.0008	5.0	01/29/17	01/30/17	0.0041	J	
Vanadium	6020A	0.183	0.006	5.0	01/29/17	01/30/17	0.059	J	
Zinc	6010C	0.37	0.06	1.0	01/29/17	01/31/17	207		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-19 Kidney

Lab Code: K1700168-019

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	8.0		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/30/17	0.073		
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.02	U	N
Barium	6020A	0.048	0.005	5.0	01/29/17	01/30/17	0.764		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	5.88		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	1610		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.19		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.739		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	16.1		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	704		
Lead	6020A	0.0191	0.0005	5.0	01/29/17	01/30/17	0.177		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	1040		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	327		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	0.64		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	9600		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	3.3		N
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.1	1.9	1.0	01/29/17	01/31/17	3670		
Thallium	6020A	0.0191	0.0009	5.0	01/29/17	01/30/17	0.0016	J	
Vanadium	6020A	0.191	0.007	5.0	01/29/17	01/30/17	0.038	J	
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	283		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-20 Kidney

Lab Code: K1700168-020

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.8	0.2	5.0	01/29/17	01/30/17	26.0		
Antimony	6020A	0.046	0.002	5.0	01/29/17	01/30/17	0.057		
Arsenic	6020A	0.46	0.02	5.0	01/29/17	01/30/17	0.02	U	N
Barium	6020A	0.046	0.005	5.0	01/29/17	01/30/17	1.21		
Beryllium	6020A	0.018	0.003	5.0	01/29/17	01/30/17	0.009	J	
Cadmium	6020A	0.018	0.002	5.0	01/29/17	01/30/17	5.90		
Calcium	6010C	3.7	1.8	1.0	01/29/17	01/31/17	1660		
Chromium	6020A	0.18	0.02	5.0	01/29/17	01/30/17	0.32		
Cobalt	6020A	0.018	0.003	5.0	01/29/17	01/30/17	1.05		
Copper	6010C	0.37	0.08	1.0	01/29/17	01/31/17	58.7		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	932		
Lead	6020A	0.0184	0.0005	5.0	01/29/17	01/30/17	0.0834		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	928		
Manganese	6010C	0.09	0.02	1.0	01/29/17	01/31/17	202		
Nickel	6020A	0.18	0.02	5.0	01/29/17	01/30/17	0.88		
Potassium	6010C	18	3.7	1.0	01/29/17	01/31/17	8440		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	3.2		N
Silver	6020A	0.018	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	18.4	1.8	1.0	01/29/17	01/31/17	3270		
Thallium	6020A	0.0184	0.0008	5.0	01/29/17	01/30/17	0.0030	J	
Vanadium	6020A	0.184	0.006	5.0	01/29/17	01/30/17	0.032	J	
Zinc	6010C	0.37	0.06	1.0	01/29/17	01/31/17	766		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-21 Kidney

Lab Code: K1700168-021

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/31/17	5.4		
Antimony	6020A	0.049	0.002	5.0	01/29/17	01/31/17	0.041	J	
Arsenic	6020A	0.49	0.02	5.0	01/29/17	01/31/17	0.02	J	
Barium	6020A	0.049	0.005	5.0	01/29/17	01/31/17	0.769		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/31/17	11.2		
Calcium	6010C	3.9	2.0	1.0	01/29/17	01/31/17	884		N
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.21		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.481		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	34.0		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	301		
Lead	6020A	0.0196	0.0005	5.0	01/29/17	01/31/17	0.0408		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	659		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	105		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.30		
Potassium	6010C	20	3.9	1.0	01/29/17	01/31/17	7720		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	5.0		
Silver	6020A	0.020	0.006	5.0	01/29/17	01/31/17	0.006	U	
Sodium	6010C	19.6	2.0	1.0	01/29/17	01/31/17	3480		
Thallium	6020A	0.0196	0.0009	5.0	01/29/17	01/31/17	0.0092	J	
Vanadium	6020A	0.196	0.007	5.0	01/29/17	01/31/17	0.033	J	
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	1130		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-22 Kidney

Lab Code: K1700168-022

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/31/17	8.2		
Antimony	6020A	0.047	0.002	5.0	01/29/17	01/31/17	0.009	J	
Arsenic	6020A	0.47	0.02	5.0	01/29/17	01/31/17	0.02	U	
Barium	6020A	0.047	0.005	5.0	01/29/17	01/31/17	0.676		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/31/17	5.44		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	537		N
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/31/17	0.17	J	
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.240		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	30.3		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/31/17	405		
Lead	6020A	0.0189	0.0005	5.0	01/29/17	01/31/17	0.104		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	468		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	44.0		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/31/17	0.17	J	
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	6540		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/31/17	2.6		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/31/17	0.006	U	
Sodium	6010C	18.9	1.9	1.0	01/29/17	01/31/17	2960		
Thallium	6020A	0.0189	0.0009	5.0	01/29/17	01/31/17	0.0071	J	
Vanadium	6020A	0.189	0.007	5.0	01/29/17	01/31/17	0.033	J	
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	380		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-23 Kidney

Lab Code: K1700168-023

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/31/17	7.8		
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/31/17	0.021	J	
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/31/17	0.02	J	
Barium	6020A	0.050	0.005	5.0	01/29/17	01/31/17	0.609		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/31/17	8.47		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	502		N
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.24		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.199		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	23.1		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	401		
Lead	6020A	0.0198	0.0005	5.0	01/29/17	01/31/17	0.131		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	489		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	29.7		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.15	J	
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	7030		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	3.0		
Silver	6020A	0.020	0.006	5.0	01/29/17	01/31/17	0.006	U	
Sodium	6010C	19.8	2.0	1.0	01/29/17	01/31/17	3520		
Thallium	6020A	0.0198	0.0009	5.0	01/29/17	01/31/17	0.0017	J	
Vanadium	6020A	0.198	0.007	5.0	01/29/17	01/31/17	0.044	J	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	432		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-24 Kidney

Lab Code: K1700168-024

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/31/17	4.0		
Antimony	6020A	0.049	0.002	5.0	01/29/17	01/31/17	0.055		
Arsenic	6020A	0.49	0.02	5.0	01/29/17	01/31/17	0.02	U	
Barium	6020A	0.049	0.005	5.0	01/29/17	01/31/17	0.819		
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/31/17	7.36		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	729		N
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.23		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.305		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	35.1		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	565		
Lead	6020A	0.0197	0.0005	5.0	01/29/17	01/31/17	0.737		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	558		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	65.1		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.21		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	7290		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	3.8		
Silver	6020A	0.020	0.006	5.0	01/29/17	01/31/17	0.006	U	
Sodium	6010C	19.7	2.0	1.0	01/29/17	01/31/17	3730		
Thallium	6020A	0.0197	0.0009	5.0	01/29/17	01/31/17	0.0017	J	
Vanadium	6020A	0.197	0.007	5.0	01/29/17	01/31/17	0.032	J	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	450		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-25 Kidney

Lab Code: K1700168-025

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/31/17	8.5		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/31/17	0.091		
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/31/17	0.02	U	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/31/17	0.536		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/31/17	9.68		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	567		N
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/31/17	0.43		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.264		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	31.2		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	889		
Lead	6020A	0.0192	0.0005	5.0	01/29/17	01/31/17	0.409		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	728		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	15.5		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/31/17	0.24		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	9580		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	4.1		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/31/17	0.006	U	
Sodium	6010C	19.2	1.9	1.0	01/29/17	01/31/17	4220		
Thallium	6020A	0.0192	0.0009	5.0	01/29/17	01/31/17	0.0045	J	
Vanadium	6020A	0.192	0.007	5.0	01/29/17	01/31/17	0.127	J	
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	724		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received:

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Method Blank

Lab Code: KQ1700679-01

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	0.2	U	
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/30/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/30/17	0.02	U	N
Barium	6020A	0.050	0.005	5.0	01/29/17	01/30/17	0.005	U	
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	0.002	U	
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	4.3		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.02	U	
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.003	U	
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	0.24	J	
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	0.2	U	
Lead	6020A	0.0200	0.0005	5.0	01/29/17	01/30/17	0.0005	U	
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	1.1		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	0.04	J	
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.02	U	
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	6.3	J	
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	0.2	U	N
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/29/17	01/31/17	2.5	J	
Thallium	6020A	0.0200	0.0009	5.0	01/29/17	01/30/17	0.0009	U	
Vanadium	6020A	0.200	0.007	5.0	01/29/17	01/30/17	0.007	U	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	0.29	J	

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received:

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Method Blank

Lab Code: KQ1700682-01

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/31/17	0.4	J	
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/31/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/31/17	0.02	U	
Barium	6020A	0.050	0.005	5.0	01/29/17	01/31/17	0.005	U	
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/31/17	0.003	J	
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	2.1	J	N
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.02	U	
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.003	U	
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	0.18	J	
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	0.2	U	
Lead	6020A	0.0200	0.0005	5.0	01/29/17	01/31/17	0.0005	U	
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	0.5	U	
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	0.03	J	
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.02	U	
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	7.7	J	
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	0.3	J	
Silver	6020A	0.020	0.006	5.0	01/29/17	01/31/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/29/17	01/31/17	2.0	U	
Thallium	6020A	0.0200	0.0009	5.0	01/29/17	01/31/17	0.0009	U	
Vanadium	6020A	0.200	0.007	5.0	01/29/17	01/31/17	0.007	U	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	0.11	J	

Comments:

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum	100.0	91.5	92	25.0	25.0	100	24.9	100	6020A
Antimony	25.0	25.8	103	25.0	25.1	100	25.1	100	6020A
Arsenic	25.0	25.6	102	25.0	25.5	102	25.1	100	6020A
Barium	100.0	103.0	103	25.0	25.0	100	24.8	99	6020A
Beryllium	2.50	2.52	101	25.00	24.96	100	24.23	97	6020A
Cadmium	12.5	12.9	103	25.0	25.6	102	25.4	102	6020A
Calcium	5000	4972	99	500	500	100	501	100	6010C
Calcium	12500	12510	100	10000	10020	100	10020	100	6010C
Chromium	10.0	10.3	103	25.0	24.9	100	25.4	102	6020A
Cobalt	25.0	25.5	102	25.0	24.7	99	24.8	99	6020A
Copper	625	607	97	250	252	101	251	100	6010C
Iron	50.0	55.0	110	25.0	24.7	99	25.0	100	6020A
Lead	25.0	25.0	100	25.0	24.8	99	24.8	99	6020A
Magnesium	12500	12220	98	10000	10100	101	9985	100	6010C
Magnesium	5000	4969	99	250	252	101	254	102	6010C
Manganese	1250	1231	98	250	249	100	252	101	6010C
Nickel	25.0	25.6	102	25.0	24.4	98	24.9	100	6020A
Potassium	12500	12520	100	10000	10160	102	10120	101	6010C
Selenium	25.0	24.9	100	25.0	24.2	97	24.9	100	6020A
Silver	12.5	13.0	104	25.0	25.3	101	25.6	102	6020A
Sodium	12500	12460	100	10000	10170	102	10120	101	6010C
Thallium	25.0	24.7	99	25.0	24.7	99	24.8	99	6020A
Vanadium	25.0	25.8	103	25.0	24.8	99	25.1	100	6020A
Zinc	1250	1237	99	250	249	100	249	100	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	24.7	99	25.0	100	6020A
Antimony				25.0	25.2	101	25.3	101	6020A
Arsenic				25.0	25.7	103	26.1	104	6020A
Barium				25.0	24.9	100	24.6	98	6020A
Beryllium				25.00	23.96	96	23.54	94	6020A
Cadmium				25.0	25.4	102	25.5	102	6020A
Calcium				10000	9960	100	9978	100	6010C
Calcium				500	499	100	496	99	6010C
Chromium				25.0	25.7	103	25.8	103	6020A
Cobalt				25.0	25.2	101	25.4	102	6020A
Copper				250	251	100	255	102	6010C
Iron				25.0	25.2	101	25.0	100	6020A
Lead				25.0	24.8	99	25.0	100	6020A
Magnesium				10000	9947	99	9934	99	6010C
Magnesium				250	256	102	254	102	6010C
Manganese				250	252	101	252	101	6010C
Nickel				25.0	25.3	101	25.2	101	6020A
Potassium				10000	10110	101	10070	101	6010C
Selenium				25.0	25.3	101	26.2	105	6020A
Silver				25.0	24.2	97	25.1	100	6020A
Sodium				10000	10090	101	10080	101	6010C
Thallium				25.0	24.8	99	25.0	100	6020A
Vanadium				25.0	25.5	102	25.4	102	6020A
Zinc				250	251	100	253	101	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.3	101	25.4	102	6020A
Antimony				25.0	25.5	102	25.9	104	6020A
Arsenic				25.0	25.4	102	26.5	106	6020A
Barium				25.0	24.9	100	25.5	102	6020A
Beryllium				25.00	23.86	95	24.60	98	6020A
Cadmium				25.0	25.4	102	25.7	103	6020A
Calcium				10000	9872	99	10030	100	6010C
Calcium				500	498	100	497	99	6010C
Chromium				25.0	25.1	100	26.4	106	6020A
Cobalt				25.0	25.2	101	25.4	102	6020A
Copper				250	253	101	252	101	6010C
Iron				25.0	25.6	102	25.8	103	6020A
Lead				25.0	25.2	101	25.2	101	6020A
Magnesium				10000	9914	99	9716	97	6010C
Magnesium				250	255	102	254	102	6010C
Manganese				250	249	100	251	100	6010C
Nickel				25.0	25.3	101	25.6	102	6020A
Potassium				10000	10110	101	10130	101	6010C
Selenium				25.0	25.7	103	26.2	105	6020A
Silver				25.0	25.3	101	25.1	100	6020A
Sodium				10000	10150	102	9947	99	6010C
Thallium				25.0	25.2	101	25.4	102	6020A
Vanadium				25.0	25.8	103	26.5	106	6020A
Zinc				250	249	100	252	101	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.6	102	25.8	103	6020A
Antimony				25.0	26.7	107	26.5	106	6020A
Arsenic				25.0	25.9	104	26.5	106	6020A
Barium				25.0	26.0	104	26.1	104	6020A
Beryllium				25.00	24.45	98	24.13	97	6020A
Cadmium				25.0	25.8	103	25.5	102	6020A
Calcium				10000	10020	100	9980	100	6010C
Calcium				500	497	99	494	99	6010C
Chromium				25.0	26.5	106	26.6	106	6020A
Cobalt				25.0	25.8	103	26.0	104	6020A
Copper				250	253	101	249	100	6010C
Iron				25.0	25.2	101	26.5	106	6020A
Lead				25.0	25.9	104	25.7	103	6020A
Magnesium				10000	9798	98	9719	97	6010C
Magnesium				250	253	101	252	101	6010C
Manganese				250	249	100	250	100	6010C
Nickel				25.0	25.9	104	25.8	103	6020A
Potassium				10000	10110	101	10010	100	6010C
Selenium				25.0	25.1	100	25.4	102	6020A
Silver				25.0	24.1	96	25.0	100	6020A
Sodium				10000	10040	100	9957	100	6010C
Thallium				25.0	25.9	104	25.5	102	6020A
Vanadium				25.0	26.2	105	26.6	106	6020A
Zinc				250	251	100	251	100	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	26.3	105	26.5	106	6020A
Antimony				25.0	26.4	106	26.6	106	6020A
Arsenic				25.0	27.3	109	26.6	106	6020A
Barium				25.0	26.1	104	26.4	106	6020A
Beryllium				25.00	24.98	100	25.19	101	6020A
Cadmium				25.0	27.6	110	26.9	108	6020A
Calcium				10000	10030	100	9927	99	6010C
Calcium				500	496	99	496	99	6010C
Chromium				25.0	27.1	108	26.3	105	6020A
Cobalt				25.0	26.4	106	26.1	104	6020A
Copper				250	248	99	251	100	6010C
Iron				25.0	26.4	106	25.8	103	6020A
Lead				25.0	25.8	103	25.6	102	6020A
Magnesium				10000	9512	95	9755	98	6010C
Magnesium				250	254	102	252	101	6010C
Manganese				250	252	101	249	100	6010C
Nickel				25.0	26.1	104	26.0	104	6020A
Potassium				10000	9933	99	10120	101	6010C
Selenium				25.0	26.4	106	26.6	106	6020A
Silver				25.0	27.3	109	25.6	102	6020A
Sodium				10000	9763	98	10030	100	6010C
Thallium				25.0	25.7	103	25.6	102	6020A
Vanadium				25.0	27.1	108	26.3	105	6020A
Zinc				250	253	101	251	100	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	26.6	106	26.5	106	6020A
Antimony				25.0	27.0	108	27.4	110	6020A
Arsenic				25.0	26.7	107	27.0	108	6020A
Barium				25.0	26.4	106	27.0	108	6020A
Beryllium				25.00	24.77	99	24.92	100	6020A
Cadmium				25.0	26.4	106	26.5	106	6020A
Calcium				10000	9967	100	9987	100	6010C
Calcium				500	497	99	498	100	6010C
Chromium				25.0	27.3	109	27.1	108	6020A
Cobalt				25.0	26.9	108	26.5	106	6020A
Copper				250	247	99	248	99	6010C
Iron				25.0	26.9	108	27.5	110	6020A
Lead				25.0	26.6	106	26.6	106	6020A
Magnesium				10000	9731	97	9808	98	6010C
Magnesium				250	252	101	250	100	6010C
Manganese				250	253	101	250	100	6010C
Nickel				25.0	27.0	108	27.2	109	6020A
Potassium				10000	10050	100	10100	101	6010C
Selenium				25.0	26.5	106	26.0	104	6020A
Silver				25.0	26.5	106	25.5	102	6020A
Sodium				10000	9944	99	10010	100	6010C
Thallium				25.0	26.5	106	26.4	106	6020A
Vanadium				25.0	27.1	108	26.9	108	6020A
Zinc				250	251	100	249	100	6010C

- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

	Initial Calibration			Continuing Calibration					
Analyte	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	Method
Arsenic	25.0	25.5	102	25.0	25.0	100	25.0	100	6020A

- 2a -

Continuing Calibration Source: ALS MIXEDPage 71 of 135

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University **SDG No.:** K1700168
Contract: _____ **Lab Code:** ALSK **Case No.:** _____ **SAS No.:** _____
Initial Calibration Source: Inorganic Ventures
Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLCCVT2									
	Aluminum	4.509	4.000	113	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Antimony	0.130	0.100	130	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Arsenic	1.126	1.000	113	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Barium	0.105	0.100	105	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Beryllium	0.039	0.040	98	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Cadmium	0.047	0.040	118	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Chromium	0.456	0.400	114	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Cobalt	0.041	0.040	102	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Iron	2.528	2.000	126	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Lead	0.046	0.040	115	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Nickel	0.420	0.400	105	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Selenium	2.408	2.000	120	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Silver	0.046	0.040	115	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Thallium	0.044	0.040	110	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Vanadium	0.424	0.400	106	70.0 - 130.0	MS	1/31/2017	00:23	013017a
LLCCVT3									
	Aluminum	4.372	4.000	109	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Antimony	0.127	0.100	127	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Arsenic	1.195	1.000	120	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Barium	0.109	0.100	109	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Beryllium	0.035	0.040	88	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Cadmium	0.044	0.040	110	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Chromium	0.484	0.400	121	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Cobalt	0.046	0.040	115	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Iron	2.362	2.000	118	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Lead	0.046	0.040	115	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Nickel	0.409	0.400	102	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Selenium	2.441	2.000	122	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Silver	0.044	0.040	110	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Thallium	0.045	0.040	112	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Vanadium	0.450	0.400	112	70.0 - 130.0	MS	1/31/2017	03:26	013017a

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University **SDG No.:** K1700168
Contract: _____ **Lab Code:** ALSK **Case No.:** _____ **SAS No.:** _____
Initial Calibration Source: Inorganic Ventures
Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLICV1									
	Calcium	21.3	20.0	106	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
	Copper	4.60	5.0	92	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
	Magnesium	5.8	5.0	116	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
	Potassium	205.3	200.0	103	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
	Sodium	192.3	200.0	96	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
	Zinc	4.3	4.0	108	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
LLICV1									
	Manganese	1.19	1.0	119	70.0 - 130.0	P	1/31/2017	10:34	013117AICP
LLCCV1									
	Calcium	20.7	20.0	104	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Copper	4.80	5.0	96	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Magnesium	5.3	5.0	106	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Manganese	1.01	1.0	101	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Potassium	224.0	200.0	112	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Sodium	222.8	200.0	111	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Zinc	4.3	4.0	108	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
LLCCV2									
	Calcium	20.7	20.0	104	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Copper	4.70	5.0	94	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Magnesium	5.4	5.0	108	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Manganese	1.10	1.0	110	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Potassium	234.7	200.0	117	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Sodium	203.5	200.0	102	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Zinc	4.6	4.0	115	70.0 - 130.0	P	1/31/2017	15:19	013117AICP

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATIONClient: Oregon State UniversitySDG No.: K1700168Contract: _____ Lab Code: ALSK

Case No.: _____ SAS No.: _____

Initial Calibration Source: Inorganic VenturesContinuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLCCV3									
	Calcium	21.2	20.0	106	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Copper	4.80	5.0	96	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Magnesium	5.2	5.0	104	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Manganese	0.98	1.0	98	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Potassium	218.2	200.0	109	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Sodium	211.2	200.0	106	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Zinc	4.4	4.0	110	70.0 - 130.0	P	1/31/2017	17:01	013117AICP

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION**Client:** Oregon State University**SDG No.:** K1700168**Contract:** _____ **Lab Code:** ALSK**Case No.:** _____ **SAS No.:** _____**Initial Calibration Source:** Inorganic Ventures**Continuing Calibration Source:** ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLICVT1	Arsenic	0.986	1.000	99	70.0 - 130.0	MS	1/31/2017	12:56	013117a
LLCCVT1	Arsenic	1.075	1.000	108	70.0 - 130.0	MS	1/31/2017	13:22	013117a

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Antimony	0.009	J	-0.006	J	0.005	J	-0.006	J	6020A
Arsenic	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Barium	0.010	U	0.010	U	0.010	U	0.010	U	6020A
Beryllium	0.006	U	0.006	U	0.006	U	0.006	U	6020A
Cadmium	0.004	U	0.004	U	0.004	U	0.004	U	6020A
Calcium	20.0	U	20.0	U	20.0	U	20.0	U	6010C
Chromium	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Cobalt	0.006	U	0.006	U	0.006	U	0.006	U	6020A
Copper	0.90	U	0.90	U	0.90	U	1.30	J	6010C
Iron	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Lead	-0.0017	J	-0.0016	J	-0.0016	J	-0.0022	J	6020A
Magnesium	5.0	U	5.0	U	5.0	U	5.0	U	6010C
Manganese	0.200	U	0.200	U	0.200	U	0.200	U	6010C
Nickel	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Potassium	40.0	U	40.0	U	40.0	U	40.0	U	6010C
Selenium	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Silver	0.012	U	0.012	U	0.012	U	0.012	U	6020A
Sodium	20.0	U	20.0	U	20.0	U	20.0	U	6010C
Thallium	-0.0021	J	-0.0022	J	-0.0032	J	-0.0030	J	6020A
Vanadium	0.014	U	0.014	U	0.014	U	0.014	U	6020A
Zinc	0.600	U	0.600	U	0.600	U	1.500	J	6010C

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.006	J	-0.007	J	0.008	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.018	J	0.004	U	0.004	U	6020A
Calcium			20.0	U	20.0	U	20.0	U	6010C
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			0.90	U	0.90	U	0.90	U	6010C
Iron			1.0	J	0.4	U	0.4	U	6020A
Lead			-0.0021	J	-0.0018	J	-0.0012	J	6020A
Magnesium			5.0	U	5.0	U	5.0	U	6010C
Manganese			0.200	U	0.200	U	0.200	U	6010C
Nickel			0.04	U	0.04	U	0.04	U	6020A
Potassium			40.0	U	40.0	U	40.0	U	6010C
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.015	J	0.012	U	0.012	U	6020A
Sodium			20.0	U	20.0	U	20.0	U	6010C
Thallium			-0.0031	J	-0.0031	J	-0.0027	J	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A
Zinc			1.000	J	0.900	J	0.700	J	6010C

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.008	J	0.007	J	0.013	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.004	U	0.004	U	0.004	U	6020A
Calcium			20.0	U	20.0	U	20.0	U	6010C
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			1.00	J	1.10	J	1.00	J	6010C
Iron			0.4	U	0.4	U	0.4	U	6020A
Lead			-0.0015	J	-0.0019	J	-0.0011	J	6020A
Magnesium			5.0	U	5.0	U	5.0	U	6010C
Manganese			0.200	U	0.200	U	0.280	J	6010C
Nickel			0.04	U	0.04	U	0.04	U	6020A
Potassium			61.1	J	51.6	J	41.5	J	6010C
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.012	U	0.012	U	0.012	U	6020A
Sodium			20.0	U	20.0	U	20.0	U	6010C
Thallium			-0.0023	J	-0.0027	J	0.0018	U	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A
Zinc			0.600	U	0.600	U	1.200	J	6010C

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.013	J	0.014	J	0.010	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.004	U	0.004	U	0.004	U	6020A
Calcium			20.0	U	20.0	U	20.0	U	6010C
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			1.40	J	1.10	J	1.90	J	6010C
Iron			0.4	U	0.4	U	0.4	U	6020A
Lead			0.0010	U	-0.0012	J	0.0010	U	6020A
Magnesium			5.0	U	5.0	U	5.0	U	6010C
Manganese			0.200	U	0.200	U	0.200	U	6010C
Nickel			0.04	U	0.04	U	0.04	U	6020A
Potassium			40.0	U	40.0	U	52.4	J	6010C
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.012	U	0.012	U	0.012	U	6020A
Sodium			20.0	U	20.0	U	20.0	U	6010C
Thallium			-0.0022	J	-0.0021	J	-0.0018	J	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A
Zinc			0.600	U	0.600	U	0.600	J	6010C

Metals

- 3 -
 BLANKS

Client: Oregon State University Service Request: K1700168
 Project No.: NA
 Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Arsenic	0.04	U	0.04	U	0.04	U			6020A

Metals

- 4 -

ICP INTERFERENCE CHECK SAMPLE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

ICS Source: Inorganic Ventures

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Calcium	500000.0	500000.0	486500.0	488100.0	98			
Copper	0.0	500.0	-0.8	453.0	91			
Magnesium	500000.0	500000.0	521700.0	520800.0	104			
Manganese	0.0	500.0	0.1	496.6	99			
Potassium	0.0		-81.2	-35.2				
Sodium	0.0		8.1	1.6				
Zinc	0.0	1000.0	0.8	947.6	95			

Metals

- 4 -

ICP INTERFERENCE CHECK SAMPLE
Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-MS-04

ICS Source: Inorganic Ventures

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Aluminum			19072.5	18965.1				
Antimony			0.0	0.0				
Arsenic		25	0.1	24.6	98			
Barium			1.0	1.0				
Beryllium			0.0	0.0				
Cadmium		25	0.0	26.1	104			
Chromium		50	0.7	54.6	109			
Cobalt		50	0.7	51.8	104			
Iron			49292.8	47560.4				
Lead			0.2	0.1				
Nickel		50	0.5	48.9	98			
Selenium		25	0.3	24.0	96			
Silver		13	0.0	12.39	99			
Thallium			0.0	0.0				
Vanadium		50	0.0	55.9	112			

- 4 -

Service Request: K1700168

Project Name: Avian Tissue Project

ICS Source: Inorganic Ventures

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Arsenic		25	0.1	26.5	106			

Metals
- 5A -
SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Bird No. 16-10 Kidneys

Lab Code: K1700168-010S

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum	75 - 125	189.9		13.5		187.5	94		6020A
Antimony	75 - 125	48.903		0.019	J	46.875	104		6020A
Arsenic	75 - 125	21.03		0.02	U	15.66	134	N	6020A
Barium	75 - 125	95.903		0.390		93.750	102		6020A
Beryllium	75 - 125	4.897		0.003	U	4.688	104		6020A
Cadmium	75 - 125	8.962		3.733		4.688	112		6020A
Calcium	75 - 125	716		565		156.28	97		6010C
Chromium	75 - 125	20.12		0.26		18.75	106		6020A
Cobalt	75 - 125	49.473		0.307		46.875	105		6020A
Copper	75 - 125	40.1		16.7		23.44	100		6010C
Iron	75 - 125	389.1		293.2		93.8	102		6020A
Lead	75 - 125	46.8217		0.1574		46.8750	100		6020A
Magnesium	75 - 125	542		374		156.28	107		6010C
Manganese	75 - 125	114		69.6		46.88	95		6010C
Nickel	75 - 125	49.57		0.27		46.88	105		6020A
Potassium		4610		4460		156.28	96		6010C
Selenium	75 - 125	25.4		2.6		15.7	145	N	6020A
Silver	75 - 125	4.848		0.006	U	4.688	103		6020A
Sodium		2110		1920		156.28	122		6010C
Thallium	75 - 125	3.4392		0.0010	J	3.1219	110		6020A
Vanadium	75 - 125	49.729		0.019	J	46.875	106		6020A
Zinc		429		378		46.88	109		6010C

An empty field in the Control Limit column indicates the control limit is not applicable

Metals
- 5A -
SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Batch QC1S

Lab Code: K1700171-024S

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum		1417.7		1064.7		185.8	190		6020A
Antimony	75 - 125	46.955		0.007	J	46.440	101		6020A
Arsenic	75 - 125	18.04		0.28	J	15.51	115		6020A
Barium	75 - 125	124.334		14.231		92.879	119		6020A
Beryllium	75 - 125	5.188		0.180		4.644	108		6020A
Cadmium	75 - 125	7.387		1.906		4.644	118		6020A
Calcium	75 - 125	597		399		154.83	128	N	6010C
Chromium		144.66		118.51		18.58	141		6020A
Cobalt	75 - 125	52.474		1.827		46.440	109		6020A
Copper		133		108		23.22	108		6010C
Iron		1215.7		1080.2		92.9	146		6020A
Lead	75 - 125	49.7155		0.3088		46.4396	106		6020A
Magnesium	75 - 125	730		581		154.83	96		6010C
Manganese	75 - 125	154		101		46.44	114		6010C
Nickel	75 - 125	101.77		49.33		46.44	113		6020A
Potassium		6540		6250		154.83	187		6010C
Selenium	75 - 125	20.2		1.9		15.5	118		6020A
Silver	75 - 125	5.203		0.008	J	4.644	112		6020A
Sodium		2780		2610		154.83	110		6010C
Thallium	75 - 125	3.6309		0.0008	U	3.0929	117		6020A
Vanadium	75 - 125	52.074		1.219		46.440	110		6020A
Zinc		695		595		46.44	215		6010C

An empty field in the Control Limit column indicates the control limit is not applicable

Metals

- 5B -

POST SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Basis: DRY

Matrix: WATER

Sample Name: Bird No. 16-10 KidneyA

Lab Code: K1700168-010A

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum	80 - 120	75.9		28.8		50.0	94		6020A
Antimony	80 - 120	56.836		0.040		50.0	114		6020A
Arsenic	80 - 120	59.37		0.04		50.0	119		6020A
Barium	80 - 120	53.129		0.833		50.0	105		6020A
Beryllium	80 - 120	53.040		0.006		50.0	106		6020A
Cadmium	80 - 120	64.227		7.964		50.0	113		6020A
Chromium	80 - 120	53.77		0.56		50.0	106		6020A
Cobalt	80 - 120	53.381		0.654		50.0	105		6020A
Iron	80 - 120	828.9		625.4		200.0	102		6020A
Lead	80 - 120	52.6500		0.3359		50.0	105		6020A
Nickel	80 - 120	53.14		0.58		50.0	105		6020A
Selenium	80 - 120	65.1		5.5		50.0	119		6020A
Silver	80 - 120	9.762		0.012		10.0	98		6020A
Thallium	80 - 120	51.0467		0.0021		50.0	102		6020A
Vanadium	80 - 120	53.710		0.039		50.0	107		6020A

Metals

- 5B -

POST SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Basis: DRY

Matrix: WATER

Sample Name: Batch QC1A

Lab Code: K1700171-024A

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Antimony	80 - 120	58.400		0.014		50.0	117		6020A
Arsenic	80 - 120	51.20		0.60		50.0	101		6020A
Barium	80 - 120	84.149		30.076		50.0	108		6020A
Beryllium	80 - 120	54.259		0.380		50.0	108		6020A
Cadmium	80 - 120	60.807		4.027		50.0	114		6020A
Calcium	80 - 120	23890.0		4214.0		20800	95		6010C
Chromium	80 - 120	307.21		250.46		50.0	114		6020A
Cobalt	80 - 120	57.724		3.862		50.0	108		6020A
Copper	80 - 120	2072.0		1136.0		1040	90		6010C
Iron	80 - 120	2492.6		2282.9		200.0	105		6020A
Lead	80 - 120	53.5096		0.6526		50.0	106		6020A
Magnesium	80 - 120	26410.0		6141.0		20800	97		6010C
Manganese	80 - 120	2973.10		1068.30		2080	92		6010C
Nickel	80 - 120	158.67		104.25		50.0	109		6020A
Potassium	80 - 120	84530.0		66080.0		20800	89		6010C
Selenium	80 - 120	53.4		4.0		50.0	99		6020A
Silver	80 - 120	10.085		0.017		10.0	101		6020A
Sodium	80 - 120	47570.0		27600.0		20800	96		6010C
Thallium	80 - 120	52.1276		0.0018		50.0	104		6020A
Vanadium	80 - 120	58.440		2.576		50.0	112		6020A
Zinc	80 - 120	7948.00		6282.00		2080	80		6010C

Metals
- 6 -
DUPLICATES

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Bird No. 16-10 KidneyD

Lab Code: K1700168-010D

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Aluminum	20	13.5		15.6		14.4		6020A
Antimony		0.019	J	0.002	U	200.0		6020A
Arsenic		0.02	U	0.02	U			6020A
Barium	20	0.390		0.413		5.7		6020A
Beryllium		0.003	U	0.003	U			6020A
Cadmium	20	3.733		3.918		4.8		6020A
Calcium	20	565		587		3.8		6010C
Chromium		0.26		0.29		10.9		6020A
Cobalt	20	0.307		0.305		0.7		6020A
Copper	20	16.7		17.1		2.4		6010C
Iron	20	293.2		302.1		3.0		6020A
Lead	20	0.1574		0.1684		6.8		6020A
Magnesium	20	374		388		3.7		6010C
Manganese	20	69.6		70.6		1.4		6010C
Nickel		0.27		0.37		31.2		6020A
Potassium	20	4460		4620		3.5		6010C
Selenium		2.6		2.4		8.0		6020A
Silver		0.006	U	0.006	U			6020A
Sodium	20	1920		1990		3.6		6010C
Thallium		0.0010	J	0.0013	J	26.1		6020A
Vanadium		0.019	J	0.021	J	10.0		6020A
Zinc	20	378		384		1.6		6010C

An empty field in the Control Limit column indicates the control limit is not applicable.

Metals
- 6 -
DUPLICATES

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Batch QC1D

Lab Code: K1700171-024D

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Aluminum	20	1064.7		1127.8		5.8		6020A
Antimony		0.007	J	0.007	J	0.0		6020A
Arsenic		0.28	J	0.29	J	3.5		6020A
Barium	20	14.231		15.693		9.8		6020A
Beryllium	20	0.180		0.203		12.0		6020A
Cadmium	20	1.906		1.941		1.8		6020A
Calcium	20	399		441		10.0		6010C
Chromium	20	118.51		125.78		6.0		6020A
Cobalt	20	1.827		1.891		3.4		6020A
Copper	20	108		108		0.0		6010C
Iron	20	1080.2		1113.8		3.1		6020A
Lead	20	0.3088		0.3149		2.0		6020A
Magnesium	20	581		553		4.9		6010C
Manganese	20	101		101		0.0		6010C
Nickel	20	49.33		52.54		6.3		6020A
Potassium	20	6250		6220		0.5		6010C
Selenium		1.9		1.7		11.1		6020A
Silver		0.008	J	0.005	U	200.0		6020A
Sodium	20	2610		2600		0.4		6010C
Thallium		0.0009	U	0.0014	J	200.0		6020A
Vanadium	20	1.219		1.452		17.4		6020A
Zinc	20	595		610		2.5		6010C

An empty field in the Control Limit column indicates the control limit is not applicable.

Metals

- 7 -

LABORATORY CONTROL SAMPLE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

Aqueous LCS Source: ALS MIXED

Solid LCS Source:

Analyte	Aqueous (ug/L)			Solid (mg/kg)				
	True	Found	%R	True	Found	C	Limits	%R
Aluminum	2000	1872	94					
Antimony	500	501	100					
Arsenic	167	193	116					
Barium	1000	1020	102					
Beryllium	50.0	50.3	101					
Cadmium	50.0	53.0	106					
Calcium	1667	1880	113					
Chromium	200	216	108					
Cobalt	500	527	105					
Copper	250	249	100					
Iron	1000	1049	105					
Lead	500	513	103					
Magnesium	1667	1870	112					
Manganese	500	493	99					
Nickel	500	516	103					
Potassium	1667	1910	115					
Selenium	167	186	111					
Silver	50.0	50.7	101					
Sodium	1667	1860	112					
Thallium	33	37	111					
Vanadium	500	526	105					
Zinc	500	501	100					

Metals

- 7 -

LABORATORY CONTROL SAMPLE

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

Aqueous LCS Source: ALS MIXED

Solid LCS Source:

Analyte	Aqueous (ug/L)			Solid (mg/kg)				
	True	Found	%R	True	Found	C	Limits	%R
Aluminum	2000	1941	97					
Antimony	500	525	105					
Arsenic	167	189	113					
Barium	1000	1066	107					
Beryllium	50.0	51.1	102					
Cadmium	50.0	55.0	110					
Calcium	1667	1870	112					
Chromium	200	220	110					
Cobalt	500	545	109					
Copper	250	250	100					
Iron	1000	1081	108					
Lead	500	528	106					
Magnesium	1667	1870	112					
Manganese	500	495	99					
Nickel	500	537	107					
Potassium	1667	1890	113					
Selenium	167	191	114					
Silver	50.0	52.7	105					
Sodium	1667	1880	113					
Thallium	33	39	117					
Vanadium	500	546	109					
Zinc	500	505	101					

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700168
Date Collected: NA
Date Received: NA
Date Extracted: 01/29/17
Date Analyzed: 01/30-31/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700168-SRM1
Test Notes: Dorm-4 Solids = 94.5%
Source: N.R.C.C. Dorm-4

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	6.8	7.6	112	4.93-8.93	
Cadmium	PSEP Tissue	6020A	0.306	0.346	113	0.233 - 0.385	
Chromium	PSEP Tissue	6020A	1.87	1.85	99	1.37-2.44	
Copper	PSEP Tissue	6010C	15.9	15.1	95	12.0 - 20.2	
Iron	PSEP Tissue	6020A	341	358	105	251-442	
Lead	PSEP Tissue	6020A	0.416	0.386	93	0.290 - 0.563	
Nickel	PSEP Tissue	6020A	1.36	1.27	93	0.912-1.9	
Selenium	PSEP Tissue	6020A	3.56	4.23	119	2.58 - 4.68	
Zinc	PSEP Tissue	6010C	52.20	52.3	100	39.2 - 66.5	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700168
Date Collected: NA
Date Received: NA
Date Extracted: 01/29/17
Date Analyzed: 01/30-31/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700168-SRM2
Test Notes: Tort-3 Solids = 99.1%
Source: N.R.C.C. Tort-3

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	59.5	68.3	115	44.6-76.0	
Cadmium	PSEP Tissue	6020A	42.3	44.4	105	32.4-52.9	
Chromium	PSEP Tissue	6020A	1.95	2.00	103	1.37-2.63	
Copper	PSEP Tissue	6010C	497	447	90	380-623	
Iron	PSEP Tissue	6020A	179	172	96	137-224	
Lead	PSEP Tissue	6020A	0.225	0.193	86	0.166-0.292	
Manganese	PSEP Tissue	6010C	15.6	14.6	94	11.7-19.9	
Nickel	PSEP Tissue	6020A	5.3	5.2	98	4.05-6.65	
Selenium	PSEP Tissue	6020A	10.9	11.0	101	7.9-14.3	
Vanadium	PSEP Tissue	6020A	9.1	9.3	102	7.0-11.4	
Zinc	PSEP Tissue	6010C	136	135	99	104-170	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700168
Date Collected: NA
Date Received: NA
Date Extracted: 01/29/17
Date Analyzed: 01/30-31/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700168-SRM3
Test Notes: Dorm-4 Solids = 94.5%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Dorm-4

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	6.8	7.8	115	4.93-8.93	
Cadmium	PSEP Tissue	6020A	0.306	0.324	106	0.233 - 0.385	
Chromium	PSEP Tissue	6020A	1.87	1.91	102	1.37-2.44	
Copper	PSEP Tissue	6010C	15.9	15.4	97	12.0 - 20.2	
Iron	PSEP Tissue	6020A	341	365	107	251-442	
Lead	PSEP Tissue	6020A	0.416	0.367	88	0.290 - 0.563	
Nickel	PSEP Tissue	6020A	1.36	1.33	98	0.912-1.9	
Selenium	PSEP Tissue	6020A	3.56	4.25	119	2.58 - 4.68	
Zinc	PSEP Tissue	6010C	52.20	53.3	102	39.2 - 66.5	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700168
Date Collected: NA
Date Received: NA
Date Extracted: 01/29/17
Date Analyzed: 01/30-31/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700168-SRM4
Test Notes: Tort-3 Solids = 99.1%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Tort-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	59.5	68.6	115	44.6-76.0	
Cadmium	PSEP Tissue	6020A	42.3	45.2	107	32.4-52.9	
Chromium	PSEP Tissue	6020A	1.95	1.94	99	1.37-2.63	
Copper	PSEP Tissue	6010C	497	427	86	380-623	
Iron	PSEP Tissue	6020A	179	176	98	137-224	
Lead	PSEP Tissue	6020A	0.225	0.203	90	0.166-0.292	
Manganese	PSEP Tissue	6010C	15.6	14.2	91	11.7-19.9	
Nickel	PSEP Tissue	6020A	5.3	5.3	100	4.05-6.65	
Selenium	PSEP Tissue	6020A	10.9	11.6	106	7.9-14.3	
Vanadium	PSEP Tissue	6020A	9.1	9.6	105	7.0-11.4	
Zinc	PSEP Tissue	6010C	136	132	97	104-170	

Metals

- 9 -

ICP SERIAL DILUTIONS
Client: Oregon State University

Service Request: K1700168

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Sample Name: Bird No. 16-10 KidneyL

Lab Code: K1700168-010L

Analyte	Initial Sample Result (I)		Serial Dilution Result (S)		% Differ- ence	Q	M
Aluminum	28.8		31.0		8		MS
Antimony	0.040	J	0.020	U	100.0		MS
Arsenic	0.04	U	0.20	U			MS
Barium	0.833		0.823		1		MS
Beryllium	0.006	U	0.030	U			MS
Cadmium	7.964		7.920		1		MS
Calcium	6031.0		6065.0		0.6		P
Chromium	0.56		0.56	J	0		MS
Cobalt	0.654		0.590		10		MS
Copper	178.4		179.0		0.3		P
Iron	625.4		627.1		0		MS
Lead	0.3359		0.3369		0		MS
Magnesium	3987.0		4006.5		0.5		P
Manganese	742.47		747.65		0.7		P
Nickel	0.58		0.72	J	24		MS
Potassium	47620.0		47375.0		0.5		P
Selenium	5.5		3.9	J	29		MS
Silver	0.012	U	0.060	U			MS
Sodium	20530.0		20500.0		0.1		P
Thallium	0.0021	J	0.0090	U	100.0		MS
Vanadium	0.039	J	0.070	U	100.0		MS
Zinc	4029.00		3905.00		3.1		P

Metals

- 9 -

ICP SERIAL DILUTIONS
Client: Oregon State University

Service Request: K1700168

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Sample Name: Batch QC1L

Lab Code: K1700171-024L

Analyte	Initial Sample Result (I) C	Serial Dilution Result (S) C	% Differ- ence	Q	M
Aluminum	2250.0	2210.8	2		MS
Antimony	0.014 J	0.020 U	100.0		MS
Arsenic	0.60 J	0.67 J	12		MS
Barium	30.076	27.978	7		MS
Beryllium	0.380	0.350	8		MS
Cadmium	4.027	3.885	4		MS
Calcium	4214.0	4431.5	5.2		P
Chromium	250.46	243.19	3		MS
Cobalt	3.862	3.830	1		MS
Copper	1136.0	1187.0	4.5		P
Iron	2282.9	2227.8	2		MS
Lead	0.6526	0.6429	1		MS
Magnesium	6141.0	6300.0	2.6		P
Manganese	1068.30	1086.65	1.7		P
Nickel	104.25	101.29	3		MS
Potassium	66080.0	65750.0	0.5		P
Selenium	4.0	5.5 J	38		MS
Silver	0.017 J	0.060 U	100.0		MS
Sodium	27600.0	27460.0	0.5		P
Thallium	0.0018 U	0.0090 U			MS
Vanadium	2.576	2.559	1		MS
Zinc	6282.00	6360.00	1.2		P

- 10 -

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICP/ICP-MS ID #:

GFAA ID #:

AA ID #:

Analyte	Wave-length (nm)	Back-ground	MRL ug/L	MDL ug/L	M
Calcium	393.3		40.0	20.0	P
Copper	327.3		4.0	0.9	P
Magnesium	279.5		10.0	5.0	P
Manganese	257.6		1.00	0.20	P
Potassium	766.5		200.0	40.0	P
Sodium	589.5		200.0	20.0	P
Zinc	206.2		4.00	0.60	P

Comments:

Metals

- 10 -

DETECTION LIMITS**Client:** Oregon State University**Service Request:** K1700168**Project No.:** NA**Project Name:** Avian Tissue Project**ICP/ICP-MS ID #:** K-ICP-MS-04**GFAA ID #:****AA ID #:**

Analyte	Isotope	Back-ground	MRL ug/L	MDL ug/L	M
Aluminum	27		4.0	0.4	MS
Antimony	123		0.100	0.004	MS
Arsenic	75		1.00	0.04	MS
Barium	137		0.100	0.010	MS
Beryllium	9		0.040	0.006	MS
Cadmium	111		0.040	0.004	MS
Chromium	52		0.40	0.04	MS
Cobalt	59		0.040	0.006	MS
Iron	56		2.0	0.4	MS
Lead	208		0.0400	0.0010	MS
Nickel	60		0.40	0.04	MS
Selenium	78		2.0	0.4	MS
Silver	107		0.040	0.012	MS
Thallium	205		0.0400	0.0018	MS
Vanadium	51		0.400	0.014	MS

Comments:

Metals

- 11A -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Al	Ca	Fe	Mg	Ag
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	-0.0001350	0.0000000	0.0000000
Arsenic	189.042	0.0000420	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000070	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	-0.0006190	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000620	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0000150	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	-0.0000970	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000140	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000130	0.0000000	0.0000310	0.0000000

Comments:

- 11A -

ICP INTERELEMENT CORRECTION FACTORS

Service Request: K1700168

Project Name: Avian Tissue Project

K-ICP-AES-03

Vanadium	292.402	0.0000000	0.0000000	-0.0000420	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0001090	0.0000000	0.0000000

Form XI (PART 1) - IN

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		As	B	Ba	Be	Cd
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.042	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	-0.0001240
Cobalt	228.616	0.0000000	0.0000000	-0.0001140	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Co	Cr	Cu	K	Li
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	-0.0004810	0.0000000	0.0000000
Arsenic	189.042	0.0000000	0.0005710	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0025040	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0000520	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0002840	0.0000000	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0003570	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0001760	0.0000000	0.0000000
Nickel	231.604	-0.0001780	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0016430	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	-0.0025430	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0007230	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Mn	Mo	Na	Ni	Pb
	182.034	0.0041380	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	-0.0007310	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.042	-0.0003130	0.0017060	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	-0.0000720	-0.0004190	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	-0.0019530	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	-0.0000310	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	-0.0011810	0.0000000	0.0000990	0.0000000
Copper	327.396	0.0000000	-0.0002870	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	-0.0005980	0.0000000	0.0002670	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0004730	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0123240	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0016500	0.0001830	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	-0.0005630	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0001330	0.0000000

Comments:

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Service Request: K1700168

Project Name: Avian Tissue Project

K-ICP-AES-03

Vanadium	292.402	-0.0002140	0.0000000	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	-0.0001370	0.0000000	0.0060370	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		P	Sb	Se	Si	Sn
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.042	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0001370	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Sr	Ti	Tl	V	Zn
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	0.0000000	0.0023400	0.0000000
Arsenic	189.042	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	0.0000000	-0.0004790	0.0000000
Cadmium	226.502	0.0000000	0.0000240	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0025120	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0001450	0.0000000	-0.0001220	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000820	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0008000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	0.0004600	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	-0.0005560	0.0000000	0.0000000	0.0000000

Comments:

Metals
 -12-
 ICP LINEAR RANGES (QUARTERLY)

Client: Oregon State University Service Request: K1700168
 Project No.: NA
 Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	Method
Calcium	15.000	900000	6010C
Copper	15.000	90000	6010C
Magnesium	15.000	90000	6010C
Manganese	15.000	9000	6010C
Potassium	15.000	450000	6010C
Sodium	15.000	450000	6010C
Zinc	15.000	18000	6010C

Comments:

Metals

-12-

ICP LINEAR RANGES (QUARTERLY)

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-MS-04

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	Method
Aluminum	45.000	18000	6020A
Antimony	45.000	900	6020A
Arsenic	45.000	3000	6020A
Barium	45.000	3000	6020A
Beryllium	45.000	900	6020A
Cadmium	45.000	3000	6020A
Chromium	45.000	3000	6020A
Cobalt	45.000	3000	6020A
Iron	45.000	18000	6020A
Lead	45.000	3000	6020A
Nickel	45.000	3000	6020A
Selenium	45.000	3000	6020A
Silver	45.000	900	6020A
Thallium	45.000	3000	6020A
Vanadium	45.000	3000	6020A

Comments:

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

Method: P

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700168-001	1/29/2017	0.3020	30.0
K1700168-002	1/29/2017	0.3010	30.0
K1700168-003	1/29/2017	0.3040	30.0
K1700168-004	1/29/2017	0.3140	30.0
K1700168-005	1/29/2017	0.3010	30.0
K1700168-006	1/29/2017	0.3140	30.0
K1700168-007	1/29/2017	0.3020	30.0
K1700168-008	1/29/2017	0.3250	30.0
K1700168-009	1/29/2017	0.2010	20.0
K1700168-010	1/29/2017	0.3200	30.0
K1700168-010D	1/29/2017	0.3070	30.0
K1700168-010S	1/29/2017	0.3200	30.0
K1700168-011	1/29/2017	0.3120	30.0
K1700168-012	1/29/2017	0.3120	30.0
K1700168-013	1/29/2017	0.3020	30.0
K1700168-014	1/29/2017	0.3080	30.0
K1700168-015	1/29/2017	0.3040	30.0
K1700168-016	1/29/2017	0.3040	30.0
K1700168-017	1/29/2017	0.3040	30.0
K1700168-018	1/29/2017	0.3270	30.0
K1700168-019	1/29/2017	0.3140	30.0
K1700168-020	1/29/2017	0.2170	20.0
KQ1700679-01	1/29/2017	0.3000	30.0
KQ1700679-02	1/29/2017	30.0	30.0
KQ1700679-03	1/29/2017	0.3140	30.0
KQ1700679-04	1/29/2017	0.3040	30.0

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

Method: P

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700168-021	1/29/2017	0.3060	30.0
K1700168-022	1/29/2017	0.3170	30.0
K1700168-023	1/29/2017	0.2020	20.0
K1700168-024	1/29/2017	0.3040	30.0
K1700168-025	1/29/2017	0.3130	30.0
K1700171-024D	1/29/2017	0.3330	30.0
K1700171-024S	1/29/2017	0.3230	30.0
KQ1700682-01	1/29/2017	0.3000	30.0
KQ1700682-02	1/29/2017	30.0	30.0
KQ1700682-03	1/29/2017	0.3010	30.0
KQ1700682-04	1/29/2017	0.3000	30.0

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

Method: MS

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700168-001	1/29/2017	0.3020	30.0
K1700168-002	1/29/2017	0.3010	30.0
K1700168-003	1/29/2017	0.3040	30.0
K1700168-004	1/29/2017	0.3140	30.0
K1700168-005	1/29/2017	0.3010	30.0
K1700168-006	1/29/2017	0.3140	30.0
K1700168-007	1/29/2017	0.3020	30.0
K1700168-008	1/29/2017	0.3250	30.0
K1700168-009	1/29/2017	0.2010	20.0
K1700168-010	1/29/2017	0.3200	30.0
K1700168-010D	1/29/2017	0.3070	30.0
K1700168-010S	1/29/2017	0.3200	30.0
K1700168-011	1/29/2017	0.3120	30.0
K1700168-012	1/29/2017	0.3120	30.0
K1700168-013	1/29/2017	0.3020	30.0
K1700168-014	1/29/2017	0.3080	30.0
K1700168-015	1/29/2017	0.3040	30.0
K1700168-016	1/29/2017	0.3040	30.0
K1700168-017	1/29/2017	0.3040	30.0
K1700168-018	1/29/2017	0.3270	30.0
K1700168-019	1/29/2017	0.3140	30.0
K1700168-020	1/29/2017	0.2170	20.0
KQ1700679-01	1/29/2017	0.3000	30.0
KQ1700679-02	1/29/2017	30.0	30.0
KQ1700679-03	1/29/2017	0.3140	30.0
KQ1700679-04	1/29/2017	0.3040	30.0

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Project Name: Avian Tissue Project

Method: MS

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700168-021	1/29/2017	0.3060	30.0
K1700168-022	1/29/2017	0.3170	30.0
K1700168-023	1/29/2017	0.2020	20.0
K1700168-024	1/29/2017	0.3040	30.0
K1700168-025	1/29/2017	0.3130	30.0
K1700171-024D	1/29/2017	0.3330	30.0
K1700171-024S	1/29/2017	0.3230	30.0
KQ1700682-01	1/29/2017	0.3000	30.0
KQ1700682-02	1/29/2017	30.0	30.0
KQ1700682-03	1/29/2017	0.3010	30.0
KQ1700682-04	1/29/2017	0.3000	30.0

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K E	S E	A G	N A	T L	V
BLK	1.0	10:15							X			X			X	X			X			X			X
STD A	1.0	10:17							X			X			X	X									X
STD B	1.0	10:20							X						X				X			X			
ICV1	1.0	10:22							X						X										
ICV1	1.0	10:25							X			X			X	X			X			X			X
ICB1	1.0	10:29							X			X			X	X			X			X			X
LLICV1	1.0	10:31							X			X			X				X			X			X
LLICV1	1.0	10:34														X									
ZZZZZZ	1.0	10:37																							
CCV1	1.0	10:39							X						X				X			X			
CCV1	1.0	10:42							X			X			X	X									X
CCB1	1.0	10:44							X			X			X	X			X			X			X
ICS-A1	1.0	10:46							X			X			X	X			X			X			X
ICS-AB1	1.0	10:49							X			X			X	X			X			X			X
ZZZZZZ	1.0	10:52																							
ZZZZZZ	1.0	10:58																							
ZZZZZZ	1.0	11:01																							
ZZZZZZ	1.0	11:03																							
ZZZZZZ	1.0	11:05																							
ZZZZZZ	1.0	11:08																							
ZZZZZZ	1.0	11:10																							
ZZZZZZ	5.0	11:13																							
ZZZZZZ	1.0	11:15																							
ZZZZZZ	1.0	11:17																							
CCV2	1.0	11:20							X						X				X			X			
CCV2	1.0	11:22							X			X			X	X									X
CCB2	1.0	11:25							X			X			X	X			X			X			X
ZZZZZZ	1.0	11:27																							
ZZZZZZ	1.0	11:30																							
ZZZZZZ	1.0	11:32																							
ZZZZZZ	1.0	11:35																							
ZZZZZZ	1.0	11:37																							

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K S	S E	A G	N A	T L	V Z
ZZZZZZ	1.0	11:40																							
ZZZZZZ	1.0	11:42																							
ZZZZZZ	1.0	11:45																							
ZZZZZZ	1.0	11:47																							
ZZZZZZ	1.0	11:50																							
CCV3	1.0	11:52							X						X				X			X			
CCV3	1.0	11:55							X			X			X	X									X
CCB3	1.0	11:57							X			X			X	X			X			X			X
ZZZZZZ	1.0	11:59																							
ZZZZZZ	1.0	12:02																							
ZZZZZZ	1.0	12:04																							
ZZZZZZ	1.0	12:07																							
ZZZZZZ	1.0	12:09																							
ZZZZZZ	1.0	12:11																							
ZZZZZZ	1.0	12:14																							
ZZZZZZ	1.0	12:16																							
KQ1700679-01	1.0	12:19							X			X			X	X			X			X			X
KQ1700679-02	1.0	12:21							X			X			X	X			X			X			X
CCV4	1.0	12:24							X						X				X			X			
CCV4	1.0	12:26							X			X			X	X									X
CCB4	1.0	12:28							X			X			X	X			X			X			X
KQ1700679-03	1.0	12:31																							
KQ1700679-04	1.0	12:33																							
K1700168-010	1.0	12:36							X			X			X	X			X			X			X
K1700168-010D	1.0	12:38							X			X			X	X			X			X			X
K1700168-010L	5.0	12:41							X			X			X	X			X			X			X
K1700168-010S	1.0	12:43							X			X			X	X			X			X			X
K1700168-001	1.0	12:45							X			X			X	X			X			X			
K1700168-002	1.0	12:48							X			X			X	X			X			X			X
K1700168-003	1.0	12:50							X			X			X	X			X			X			X
K1700168-004	1.0	12:53							X			X			X	X			X			X			X
CCV5	1.0	12:55							X						X				X			X			

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																											
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K S	S E	A G	N A	T L	V	Z N	C N				
CCV5	1.0	12:58							X			X			X	X									X						
CCB5	1.0	13:00							X			X			X	X			X			X			X						
K1700168-005	1.0	13:02							X			X			X	X			X			X			X						
K1700168-006	1.0	13:05							X			X			X	X			X			X			X						
K1700168-007	1.0	13:07							X			X			X	X			X			X			X						
K1700168-008	1.0	13:10							X			X			X	X			X			X			X						
K1700168-009	1.0	13:12							X			X			X	X			X			X			X						
K1700168-011	1.0	13:15							X			X			X	X			X			X			X						
K1700168-012	1.0	13:17							X			X			X	X			X			X			X						
K1700168-013	1.0	13:20							X			X			X	X			X			X			X						
K1700168-014	1.0	13:22							X			X			X	X			X			X			X						
K1700168-015	1.0	13:25							X			X			X	X			X			X			X						
CCV6	1.0	13:27							X						X				X			X									
CCV6	1.0	13:30							X			X			X	X									X						
CCB6	1.0	13:32							X			X			X	X			X			X			X						
LLCCV1	1.0	13:35							X			X			X	X			X			X			X						
ZZZZZZ	1.0	13:38																													
K1700168-016	1.0	13:41							X			X			X	X			X			X			X						
K1700168-017	1.0	13:43							X			X			X	X			X			X			X						
K1700168-018	1.0	13:46							X			X			X	X			X			X			X						
K1700168-019	1.0	13:48							X			X			X	X			X			X			X						
K1700168-020	1.0	13:51							X			X			X	X			X			X			X						
ZZZZZZ	1.0	13:53																													
ZZZZZZ	1.0	13:55																													
ZZZZZZ	1.0	13:58																													
ZZZZZZ	1.0	14:00																													
ZZZZZZ	1.0	14:03																													
CCV7	1.0	14:05							X						X				X			X									
CCV7	1.0	14:08							X			X			X	X									X						
CCB7	1.0	14:10							X			X			X	X			X			X			X						
ZZZZZZ	1.0	14:12																													
ZZZZZZ	1.0	14:15																													

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Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
ZZZZZZ	1.0	14:17																							
ZZZZZZ	1.0	14:20																							
ZZZZZZ	1.0	14:22																							
ZZZZZZ	1.0	14:24																							
ZZZZZZ	1.0	14:27																							
ZZZZZZ	5.0	14:29																							
ZZZZZZ	1.0	14:31																							
ZZZZZZ	1.0	14:34																							
CCV8	1.0	14:36							X						X				X			X			
CCV8	1.0	14:39							X			X			X	X								X	
CCB8	1.0	14:41							X			X			X	X			X			X		X	
ZZZZZZ	1.0	14:43																							
ZZZZZZ	1.0	14:46																							
ZZZZZZ	1.0	14:48																							
ZZZZZZ	1.0	14:50																							
ZZZZZZ	1.0	14:53																							
ZZZZZZ	1.0	14:55																							
ZZZZZZ	1.0	14:58																							
ZZZZZZ	1.0	15:00																							
ZZZZZZ	1.0	15:02																							
ZZZZZZ	1.0	15:05																							
CCV9	1.0	15:08							X						X				X			X			
CCV9	1.0	15:10							X			X			X	X								X	
CCB9	1.0	15:12							X			X			X	X			X			X		X	
ZZZZZZ	1.0	15:15																							
LLCCV2	1.0	15:19							X			X			X	X			X			X		X	
ZZZZZZ	1.0	15:22																							
ZZZZZZ	1.0	15:24																							
ZZZZZZ	1.0	15:27																							
KQ1700682-01	1.0	15:29							X			X			X	X			X			X		X	
KQ1700682-02	1.0	15:32							X			X			X	X			X			X		X	
KQ1700682-03	1.0	15:34																							

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Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
KQ1700682-04	1.0	15:36																							
ZZZZZZ	1.0	15:39																							
ZZZZZZ	1.0	15:41																							
ZZZZZZ	1.0	15:44																							
ZZZZZZ	1.0	15:46																							
CCV10	1.0	15:48							X						X				X			X			
CCV10	1.0	15:51							X			X			X	X									X
CCB10	1.0	15:53							X			X			X	X			X			X			X
ZZZZZZ	1.0	15:56																							
K1700168-021	1.0	15:58							X			X			X	X			X			X			X
K1700168-022	1.0	16:01							X			X			X	X			X			X			X
K1700168-023	1.0	16:03							X			X			X	X			X			X			X
K1700168-024	1.0	16:06							X			X			X	X			X			X			X
K1700168-025	1.0	16:08							X			X			X	X			X			X			X
ZZZZZZ	1.0	16:10																							
ZZZZZZ	1.0	16:13																							
ZZZZZZ	1.0	16:15																							
ZZZZZZ	1.0	16:17																							
CCV11	1.0	16:20							X						X				X			X			
CCV11	1.0	16:22							X			X			X	X									X
CCB11	1.0	16:25							X			X			X	X			X			X			X
K1700171-024D	1.0	16:27							X			X			X	X			X			X			X
K1700171-024L	5.0	16:30							X			X			X	X			X			X			X
K1700171-024S	1.0	16:32							X			X			X	X			X			X			X
ZZZZZZ	1.0	16:34																							
ZZZZZZ	10.0	16:37																							
ZZZZZZ	1.0	16:39																							
K1700168-001	10.0	16:42																							X
K1700171-024A	1.0	16:44							X			X			X	X			X			X			X
CCV12	1.0	16:46							X						X				X			X			
CCV12	1.0	16:49							X			X			X	X									X
ZZZZZZ	1.0	16:51																							

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
CCB12	1.0	16:54								X			X			X	X			X			X		X
ZZZZZZ	1.0	16:56																							
ZZZZZZ	1.0	16:59																							
LLCCV3	1.0	17:01								X			X			X	X			X			X		X

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Run Number: 013017a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/30/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
Blank	1.0	16:14		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
Standard 1	1.0	16:19		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ICV1	1.0	16:23		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCV1	1.0	16:28		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ICB1	1.0	16:32		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB1	1.0	16:37		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
LLICVT1	1.0	16:41		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ICS-A1	1.0	16:46		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ICS-AB1	1.0	16:50		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	16:55																							
ZZZZZZ	5.0	16:59																							
ZZZZZZ	5.0	17:04																							
ZZZZZZ	5.0	17:08																							
ZZZZZZ	5.0	17:13																							
ZZZZZZ	5.0	17:17																							
ZZZZZZ	5.0	17:22																							
ZZZZZZ	5.0	17:26																							
CCV2	1.0	17:31		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB2	1.0	17:35		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	17:40																							
ZZZZZZ	5.0	17:44																							
ZZZZZZ	5.0	17:49																							
ZZZZZZ	5.0	17:53																							
ZZZZZZ	5.0	17:58																							
ZZZZZZ	5.0	18:02																							
ZZZZZZ	5.0	18:07																							
ZZZZZZ	5.0	18:11																							
ZZZZZZ	5.0	18:16																							
ZZZZZZ	5.0	18:20																							
CCV3	1.0	18:25		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	18:29																							
CCB3	1.0	18:33		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Run Number: 013017a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/30/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
ZZZZZZ	5.0	18:38																							
ZZZZZZ	5.0	18:42																							
ZZZZZZ	5.0	18:47																							
ZZZZZZ	5.0	18:51																							
ZZZZZZ	5.0	18:56																							
ZZZZZZ	5.0	19:00																							
ZZZZZZ	5.0	19:05																							
ZZZZZZ	5.0	19:09																							
ZZZZZZ	5.0	19:14																							
ZZZZZZ	5.0	19:18																							
CCV4	1.0	19:23		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB4	1.0	19:27		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	19:32																							
KQ1700679-01	5.0	19:36		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
KQ1700679-02	5.0	19:41		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
KQ1700679-03	5.0	19:45																							
KQ1700679-04	5.0	19:50																							
K1700168-001	5.0	19:54		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-002	5.0	19:59		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-003	5.0	20:03		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-004	5.0	20:08		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-005	5.0	20:12		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCV5	1.0	20:17		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	20:21																							
CCB5	1.0	20:25		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
LLCCVT1	1.0	20:30		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	20:34																							
K1700168-006	5.0	20:39		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-007	5.0	20:43		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-008	5.0	20:48		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-009	5.0	20:52		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-010	5.0	20:57		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X

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Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Run Number: 013017a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/30/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
K1700168-010D	5.0	21:01		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-010L	5.0	21:06		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-010A	5.0	21:10		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-010S	5.0	21:15		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-011	5.0	21:19		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCV6	1.0	21:24		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB6	1.0	21:28		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-012	5.0	21:33		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-013	5.0	21:37		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-014	5.0	21:42		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-015	5.0	21:46		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-016	5.0	21:51		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-017	5.0	21:55		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-018	5.0	22:00		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-019	5.0	22:04		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-020	5.0	22:09		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	22:13																							
CCV7	1.0	22:18		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB7	1.0	22:22		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	22:27																							
ZZZZZZ	5.0	22:31																							
ZZZZZZ	5.0	22:36																							
ZZZZZZ	5.0	22:40																							
ZZZZZZ	5.0	22:45																							
ZZZZZZ	5.0	22:49																							
ZZZZZZ	5.0	22:54																							
ZZZZZZ	5.0	22:58																							
ZZZZZZ	5.0	23:03																							
ZZZZZZ	5.0	23:07																							
CCV8	1.0	23:12		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB8	1.0	23:16		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	23:21																							

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Run Number: 013017a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/30/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
ZZZZZZ	5.0	23:25																							
ZZZZZZ	5.0	23:29																							
ZZZZZZ	5.0	23:34																							
ZZZZZZ	5.0	23:38																							
ZZZZZZ	5.0	23:43																							
ZZZZZZ	5.0	23:47																							
ZZZZZZ	5.0	23:52																							
ZZZZZZ	5.0	23:56																							
ZZZZZZ	5.0	00:01																							
ZZZZZZ	1.0	00:05																							
CCV9	1.0	00:10		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB9	1.0	00:14		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	00:19																							
LLCCVT2	1.0	00:23		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	00:28																							
ZZZZZZ	5.0	00:32																							
ZZZZZZ	5.0	00:37																							
ZZZZZZ	5.0	00:41																							
ZZZZZZ	5.0	00:45																							
ZZZZZZ	5.0	00:50																							
ZZZZZZ	5.0	00:54																							
KQ1700682-01	5.0	00:59		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
KQ1700682-02	5.0	01:03		X	X		X	X	X		X	X		X	X				X		X	X		X	X
KQ1700682-03	5.0	01:08																							
CCV10	1.0	01:12		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	01:17																							
CCB10	1.0	01:21		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
KQ1700682-04	5.0	01:26																							
ZZZZZZ	5.0	01:30																							
ZZZZZZ	5.0	01:35																							
ZZZZZZ	5.0	01:39																							
ZZZZZZ	5.0	01:44																							

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Run Number: 013017a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/30/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
ZZZZZZ	5.0	01:48																							
K1700168-021	5.0	01:53		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-022	5.0	01:57		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-023	5.0	02:02		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-024	5.0	02:06		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	02:11																							
CCV11	1.0	02:15		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB11	1.0	02:19		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700168-025	5.0	02:24		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	02:28																							
ZZZZZZ	5.0	02:33																							
ZZZZZZ	5.0	02:37																							
ZZZZZZ	5.0	02:42																							
K1700171-024D	5.0	02:46		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-024L	5.0	02:51		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-024A	5.0	02:55			X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-024S	5.0	03:00		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	03:04																							
CCV12	1.0	03:09									X	X												X	
CCV12	1.0	03:13		X	X	X	X	X	X					X	X				X		X	X		X	
CCB12	1.0	03:18		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	03:22																							
LLCCVT3	1.0	03:26		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700168

Project No.: NA

Run Number: 013117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
Blank	1.0	12:41				X																			
Standard 1	1.0	12:43				X																			
ICV2	1.0	12:46				X																			
CCV1	1.0	12:48				X																			
ICB2	1.0	12:51				X																			
CCB1	1.0	12:54				X																			
LLICVT1	1.0	12:56				X																			
ICS-A1	1.0	12:59				X																			
ICS-AB1	1.0	13:01				X																			
ZZZZZZ	1.0	13:04																							
ZZZZZZ	5.0	13:06																							
ZZZZZZ	5.0	13:09																							
ZZZZZZ	5.0	13:12																							
KQ1700682-02	5.0	13:14				X																			
CCV2	1.0	13:17				X																			
CCB2	1.0	13:19				X																			
LLCCVT1	1.0	13:22				X																			

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700168

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 01/30/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element Ge72 KED Q	Element Y89 KED2 Q	Element Sc45 KED1 Q	Element Rh103 KED2Q	Element In115 KED1Q	Element Lu175 KED1Q				
Blank	Blank	1614	100	100	100	100	100	100				
Standard 1	Standard 1	1619	100	98	100	95	99	99				
ICV1	ICV	1623	98	97	101	95	99	100				
CCV1	CCV	1628	99	97	101	94	99	99				
ICB1	ICB	1632	99	97	100	97	99	99				
CCB1	CCB	1637	100	96	101	95	100	99				
LLICVT1	LLICVT1	1641	99	94	99	93	97	99				
ICS-A1	ICSA	1646	91	97	98	85	91	96				
ICS-AB1	ICSAB	1650	94	97	101	86	92	97				
ZZZZZZ	ZZZZZZ	1655										
ZZZZZZ	ZZZZZZ	1659										
ZZZZZZ	ZZZZZZ	1704										
ZZZZZZ	ZZZZZZ	1708										
ZZZZZZ	ZZZZZZ	1713										
ZZZZZZ	ZZZZZZ	1717										
ZZZZZZ	ZZZZZZ	1722										
ZZZZZZ	ZZZZZZ	1726										
CCV2	CCV	1731	99	99	106	96	104	101				
CCB2	CCB	1735	99	100	105	98	101	102				
ZZZZZZ	ZZZZZZ	1740										
ZZZZZZ	ZZZZZZ	1744										
ZZZZZZ	ZZZZZZ	1749										
ZZZZZZ	ZZZZZZ	1753										
ZZZZZZ	ZZZZZZ	1758										
ZZZZZZ	ZZZZZZ	1802										
ZZZZZZ	ZZZZZZ	1807										
ZZZZZZ	ZZZZZZ	1811										
ZZZZZZ	ZZZZZZ	1816										
ZZZZZZ	ZZZZZZ	1820										
CCV3	CCV	1825	97	96	109	95	104	102				
ZZZZZZ	ZZZZZZ	1829										
CCB3	CCB	1833	96	98	104	97	102	100				
ZZZZZZ	ZZZZZZ	1838										
ZZZZZZ	ZZZZZZ	1842										
ZZZZZZ	ZZZZZZ	1847										
ZZZZZZ	ZZZZZZ	1851										
ZZZZZZ	ZZZZZZ	1856										
ZZZZZZ	ZZZZZZ	1900										
ZZZZZZ	ZZZZZZ	1905										
ZZZZZZ	ZZZZZZ	1909										
ZZZZZZ	ZZZZZZ	1914										
ZZZZZZ	ZZZZZZ	1918										
CCV4	CCV	1923	97	95	111	93	106	102				
CCB4	CCB	1927	95	99	105	96	102	99				

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700168

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 01/30/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:																
			Element		Element		Element		Element		Element		Element						
			Ge72	KED	Q	Y89	KED	Q	Sc45	KED	Q	Rh103	KED	Q	In115	KED	Q	Lu175	KED
ZZZZZZ	ZZZZZZ	1932																	
KQ1700679-01	Method Blank	1936	95		95		106		94		104		101						
KQ1700679-02	Lab Control	1941	96		100		107		97		104		101						
KQ1700679-03	K1700168-SRM1	1945	98		98		113		91		101		103						
KQ1700679-04	K1700168-SRM2	1950	96		106		109		92		101		102						
K1700168-001	Bird No. 16-1	1954	100		97		111		91		103		104						
K1700168-002	Bird No. 16-2	1959	102		106		114		102		108		108						
K1700168-003	Bird No. 16-3	2003	98		96		111		93		102		103						
K1700168-004	Bird No. 16-4	2008	101		103		112		96		107		106						
K1700168-005	Bird No. 16-5	2012	99		105		111		98		105		106						
CCV5	CCV	2017	98		97		109		94		105		102						
ZZZZZZ	ZZZZZZ	2021																	
CCB5	CCB	2025	96		94		107		94		101		99						
LLCCVT1	LLCCVT1	2030	96		96		107		96		103		102						
ZZZZZZ	ZZZZZZ	2034																	
K1700168-006	Bird No. 16-6	2039	99		100		108		94		103		102						
K1700168-007	Bird No. 16-7	2043	98		102		110		97		105		103						
K1700168-008	Bird No. 16-8	2048	99		103		109		99		103		103						
K1700168-009	Bird No. 16-9	2052	95		96		108		93		103		103						
K1700168-010	Bird No. 16-10	2057	99		98		111		97		105		103						
K1700168-010D	Bird No. 16-10	2101	99		98		111		92		106		105						
K1700168-010L	Bird No. 16-10	2106	99		99		108		95		105		103						
K1700168-010A	Bird No. 16-10	2110	99		102		110		97		105		102						
K1700168-010S	Bird No. 16-10	2115	100		97		109		95		106		105						
K1700168-011	Bird No. 16-11	2119	97		98		112		94		104		103						
CCV6	CCV	2124	95		91		102		92		99		97						
CCB6	CCB	2128	93		92		101		92		100		98						
K1700168-012	Bird No. 16-12	2133	98		94		106		91		101		101						
K1700168-013	Bird No. 16-13	2137	96		96		106		92		101		102						
K1700168-014	Bird No. 16-14	2142	99		100		110		94		104		103						
K1700168-015	Bird No. 16-15	2146	96		98		106		91		100		103						
K1700168-016	Bird No. 16-16	2151	96		97		109		94		103		102						
K1700168-017	Bird No. 16-17	2155	96		97		110		91		102		101						
K1700168-018	Bird No. 16-18	2200	98		98		109		93		102		102						
K1700168-019	Bird No. 16-19	2204	96		100		108		94		101		101						
K1700168-020	Bird No. 16-20	2209	96		97		109		93		102		101						
ZZZZZZ	ZZZZZZ	2213																	
CCV7	CCV	2218	92		94		102		92		98		95						
CCB7	CCB	2222	92		95		102		92		99		96						
ZZZZZZ	ZZZZZZ	2227																	
ZZZZZZ	ZZZZZZ	2231																	
ZZZZZZ	ZZZZZZ	2236																	
ZZZZZZ	ZZZZZZ	2240																	
ZZZZZZ	ZZZZZZ	2245																	

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700168

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 01/30/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element Ge72 KED Q	Element Y89 KED2 Q	Element Sc45 KED1 Q	Element Rh103 KED2Q	Element In115 KED1Q	Element Lu175 KED1Q				
ZZZZZZ	ZZZZZZ	2249										
ZZZZZZ	ZZZZZZ	2254										
ZZZZZZ	ZZZZZZ	2258										
ZZZZZZ	ZZZZZZ	2303										
ZZZZZZ	ZZZZZZ	2307										
CCV8	CCV	2312	93	94	105	93	99	98				
CCB8	CCB	2316	92	92	102	90	97	97				
ZZZZZZ	ZZZZZZ	2321										
ZZZZZZ	ZZZZZZ	2325										
ZZZZZZ	ZZZZZZ	2329										
ZZZZZZ	ZZZZZZ	2334										
ZZZZZZ	ZZZZZZ	2338										
ZZZZZZ	ZZZZZZ	2343										
ZZZZZZ	ZZZZZZ	2347										
ZZZZZZ	ZZZZZZ	2352										
ZZZZZZ	ZZZZZZ	2356										
ZZZZZZ	ZZZZZZ	0001										
ZZZZZZ	ZZZZZZ	0005										
CCV9	CCV	0010	92	90	102	87	99	97				
CCB9	CCB	0014	92	89	100	89	95	96				
ZZZZZZ	ZZZZZZ	0019										
LLCCVT2	LLCCVT2	0023	91	89	100	87	96	95				
ZZZZZZ	ZZZZZZ	0028										
ZZZZZZ	ZZZZZZ	0032										
ZZZZZZ	ZZZZZZ	0037										
ZZZZZZ	ZZZZZZ	0041										
ZZZZZZ	ZZZZZZ	0045										
ZZZZZZ	ZZZZZZ	0050										
ZZZZZZ	ZZZZZZ	0054										
KQ1700682-01	Method Blank	0059	90	88	99	90	95	93				
KQ1700682-02	Lab Control	0103	90	92	100	90	95	95				
KQ1700682-03	K1700168-SRM3	0108	92	93	106	85	95	97				
CCV10	CCV	0112	92	91	101	89	97	97				
ZZZZZZ	ZZZZZZ	0117										
CCB10	CCB	0121	89	88	99	89	94	93				
KQ1700682-04	K1700168-SRM4	0126	89	96	99	84	91	94				
ZZZZZZ	ZZZZZZ	0130										
ZZZZZZ	ZZZZZZ	0135										
ZZZZZZ	ZZZZZZ	0139										
ZZZZZZ	ZZZZZZ	0144										
ZZZZZZ	ZZZZZZ	0148										
K1700168-021	Bird No. 16-21	0153	91	93	105	88	99	99				
K1700168-022	Bird No. 16-22	0157	93	93	107	88	100	99				
K1700168-023	Bird No. 16-23	0202	90	89	102	87	97	94				

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700168

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 01/30/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element Ge72 KED1 Q	Element Y89 KED2 Q	Element Sc45 KED1 Q	Element Rh103 KED2 Q	Element In115 KED1 Q	Element Lu175 KED1 Q				
K1700168-024	Bird No. 16-24	0206	91	90	105	88	98	98				
ZZZZZZ	ZZZZZZ	0211										
CCV11	CCV	0215	89	89	101	87	97	94				
CCB11	CCB	0219	89	88	100	87	95	93				
K1700168-025	Bird No. 16-25	0224	91	92	101	87	96	96				
ZZZZZZ	ZZZZZZ	0228										
ZZZZZZ	ZZZZZZ	0233										
ZZZZZZ	ZZZZZZ	0237										
ZZZZZZ	ZZZZZZ	0242										
K1700171-024D	Batch QC1D	0246	90	107	104	85	96	99				
K1700171-024L	Batch QC1L	0251	89	92	101	85	97	95				
K1700171-024A	Batch QC1A	0255	89	107	103	88	95	95				
K1700171-024S	Batch QC1S	0300	91	105	105	83	96	96				
ZZZZZZ	ZZZZZZ	0304										
CCV12	CCV	0309	88	87	95	84	91	90				
CCV12	CCV	0313	87	86	98	86	93	91				
CCB12	CCB	0318	86	87	95	87	92	91				
ZZZZZZ	ZZZZZZ	0322										
LLCCVT3	LLCCVT3	0326	86	82	95	84	91	89				

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____
 Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700168
 ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 01/31/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:											
			Element Ge72 KED	Q	Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
Blank	Blank	1241	100											
Standard 1	Standard 1	1243	101											
ICV2	ICV	1246	102											
CCV1	CCV	1248	102											
ICB2	ICB	1251	101											
CCB1	CCB	1254	101											
LLICVT1	LLICVT1	1256	100											
ICS-A1	ICSA	1259	93											
ICS-AB1	ICSAB	1301	92											
ZZZZZZ	ZZZZZZ	1304												
ZZZZZZ	ZZZZZZ	1306												
ZZZZZZ	ZZZZZZ	1309												
ZZZZZZ	ZZZZZZ	1312												
KQ1700682-02	Lab Control	1314	104											
CCV2	CCV	1317	103											
CCB2	CCB	1319	102											
LLCCVT1	LLCCVT1	1322	101											

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____
 Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700168
 ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 01/31/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:											
			Element Ge72 KED	Q	Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
Blank	Blank	1241	100											
Standard 1	Standard 1	1243	101											
ICV2	ICV	1246	102											
CCV1	CCV	1248	102											
ICB2	ICB	1251	101											
CCB1	CCB	1254	101											
LLICVT1	LLICVT1	1256	100											
ICS-A1	ICSA	1259	93											
ICS-AB1	ICSAB	1301	92											
ZZZZZZ	ZZZZZZ	1304												
ZZZZZZ	ZZZZZZ	1306												
ZZZZZZ	ZZZZZZ	1309												
ZZZZZZ	ZZZZZZ	1312												
KQ1700682-02	Lab Control	1314	104											
CCV2	CCV	1317	103											
CCB2	CCB	1319	102											
LLCCVT1	LLCCVT1	1322	101											



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February 27, 2017

Analytical Report for Service Request No: K1700171

Bill Stubblefield
Oregon State University
Wiegand Hall 421
3051 Campus Way
Corvallis, OR 97331

RE: Avian Tissue Project

Dear Bill,

Enclosed are the results of the sample(s) submitted to our laboratory December 29, 2016
For your reference, these analyses have been assigned our service request number **K1700171**.

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

Please contact me if you have any questions. My extension is 3356. You may also contact me via email at Kurt.Clarkson@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kurt Clarkson
Client Services
Manager



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Table of Contents

Acronyms

Qualifiers

State Certifications, Accreditations, And Licenses

Case Narrative

Chain of Custody

Total Solids

General Chemistry

Metals

Acronyms

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

Inorganic Data Qualifiers

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

Metals Data Qualifiers

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

Organic Data Qualifiers

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

Additional Petroleum Hydrocarbon Specific Qualifiers

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

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

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

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

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



Case Narrative

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ALS ENVIRONMENTAL

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request No.: K1700171
Date Received: 12/29/16

Case Narrative

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

Sample Receipt

Twenty animal tissue samples were received for analysis at ALS Environmental on 12/29/16. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were frozen at -20°C upon receipt at the laboratory.

General Chemistry Parameters

Total Cyanide by EPA Method 9012B:

Samples 1-4 and 20-25 were received past holding time. The analysis was performed as soon as possible after receipt by the laboratory. The data was flagged to indicate the holding time violation.

The upper control criterion was exceeded in Laboratory Control Samples (LCS) 1, 4 & 5. The error associated with elevated recovery indicated a high bias. The sample data was not significantly affected. Additional analysis of the associated field samples were not performed because the results were within manufacturer's acceptance limits. No further corrective action was appropriate.

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

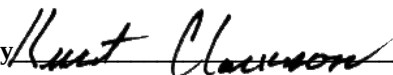
Total Metals

Matrix Spike Recovery Exceptions:

The control criteria for matrix spike recovery of Copper, Iron, Magnesium, Manganese, Potassium, Sodium and Zinc for sample Bird No. 16-7 GI Tract were not applicable. The analyzed concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

The matrix spike recovery of Aluminum for sample Bird No. 16-7 GI Tract was outside control criteria. However, the analyzed concentration in this sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicates the analytical batch was in control. No further corrective action was appropriate.

The control criteria for matrix spike recovery of Aluminum, Chromium, Copper, Iron, Potassium, Sodium and Zinc for sample Bird No. 16-24 GI were not applicable. The analyzed concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

Approved by  _____

The matrix spike recovery of Calcium for sample Bird No. 16-24 GI was outside control criteria. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. No further corrective action was appropriate.

Relative Percent Difference Exceptions:

The Relative Percent Difference (RPD) for the replicate analysis of Barium in sample Bird No. 16-7 GI Tract was outside the Method control limits. The variability in the results was attributed to the heterogeneous distribution of Barium in the sample. Freeze drying, grinding in combination with standard mixing techniques were used, but were not sufficient for complete homogenization of this sample.

Standard Reference Material Exceptions:

The recovery of Chromium in the Standard Reference Material (SRM1) N.R.C.C. Dorm-4 was above the normal ALS/Kelso control limit. The associated QA/QC results (e.g. SRM N.R.C.C. Tort-3, LCS, matrix spike, method blank, calibration standards, etc.) indicate the analysis was in control. No further corrective action was appropriate.

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

Approved by

A handwritten signature in black ink, appearing to read "Kurt Clarkson", is written over a horizontal line.



Chain of Custody

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1C1700171

Running number	ID	Weight (g)	Sex (m/f)	Liver	Kidney	GI tract	GI contents	Breast muscle	Thigh muscle	Bone (including marrow)
1	16-1	1772	m	x	x	x	x	x	x	x
2	16-2	2475	m	x	x	x	x	x	x	x
3	16-3	1964	m	x	x	x	x	x	x	x
4	16-4	2419	m	x	x	x	x	x	x	x
5	16-5	2887	m	x	x	x	x	x	x	x
6	16-6	1893	m	x	x	x	x	x	x	x
7	16-7	2317	f	x	x	x	x	x	x	x
8	16-8	2518	m	x	x	x	x	x	x	x
9	16-9	2274	f	x	x	x	x	x	x	x
10	16-10	2521	m	x	x	x	x	x	x	x
11	16-11	2152	m	x	x	x	x	x	x	x
12	16-12	1864	f	x	x	x	x	x	x	x
13	16-13	2170	f	x	x	x	x	x	x	x
14	16-14	1941	f	x	x	x	x	x	x	x
15	16-15	1973	m	x	x	x	x	x	x	x
16	16-16	2532	f	x	x	x	x	x	x	x
17	16-17	2624	m	x	x	x	x	x	x	x
18	16-18	2445	m	x	x	x	x	x	x	x
19	16-19	2418	f	x	x	x	x	x	x	x
20	16-20	2197	m	x	x	x	x	x	x	x
21	16-21	1537	f	x	x	x	x	x	x	x
22	16-22	1741	m	x	x	x	x	x	x	x
23	16-23	1853	f	x	x	x	x	x	x	x
24	16-24	1795	m	x	x	x	x	x	x	x
25	16-25	1838	m	x	x	x	x	x	x	x



Cooler Receipt and Preservation Form

PC GSClient OSU USFWService Request K1700171Received: 12-29-16 Opened: 12-29-16 By: eg Unloaded: 12-29-16 By: eg

1. Samples were received via? Mail Fed Ex UPS DHL PDX Courier Hand Delivered
2. Samples were received in: (circle) Cooler Box Envelope Other NA
3. Were custody seals on coolers? NA Y N If yes, how many and where? NA
- If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID	Tracking Number	NA	Filed
-16.8	-10.8	-	-	Q	361	NA	12 788 146 01 4816	NA	144

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

Sample ID on Bottle	Sample ID on COC	Identified by:

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

Notes, Discrepancies, & Resolutions:

Page ____ of ____



Total Solids

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue
Analysis Method: Freeze Dry
Prep Method: None

Service Request: K1700171
Date Collected: 12/08/16 - 12/19/16
Date Received: 12/29/16
Units: Percent
Basis: Wet

Total Solids

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
Bird No. 16-1 GI Tract	K1700171-001	28.8	-	-	1	01/17/17 11:40	
Bird No. 16-2 GI Tract	K1700171-002	30.7	-	-	1	01/17/17 11:40	
Bird No. 16-3 GI Tract	K1700171-003	35.1	-	-	1	01/17/17 11:40	
Bird No. 16-4 GI Tract	K1700171-004	30.6	-	-	1	01/17/17 11:40	
Bird No. 16-5 GI Tract	K1700171-005	30.5	-	-	1	01/17/17 11:40	
Bird No. 16-6 GI Tract	K1700171-006	37.6	-	-	1	01/17/17 11:40	
Bird No. 16-7 GI Tract	K1700171-007	30.1	-	-	1	01/17/17 11:40	
Bird No. 16-8 GI Tract	K1700171-008	32.1	-	-	1	01/17/17 11:40	
Bird No. 16-9 GI Tract	K1700171-009	30.9	-	-	1	01/17/17 11:40	
Bird No. 16-10 GI Tract	K1700171-010	34.3	-	-	1	01/17/17 11:40	
Bird No. 16-11 GI Tract	K1700171-011	34.4	-	-	1	01/17/17 11:40	
Bird No. 16-12 GI Tract	K1700171-012	32.0	-	-	1	01/17/17 11:40	
Bird No. 16-13 GI Tract	K1700171-013	32.3	-	-	1	01/17/17 11:40	
Bird No. 16-14 GI Tract	K1700171-014	43.0	-	-	1	01/17/17 11:40	
Bird No. 16-15 GI Tract	K1700171-015	37.9	-	-	1	01/17/17 11:40	
Bird No. 16-16 GI Tract	K1700171-016	32.8	-	-	1	01/17/17 11:40	
Bird No. 16-17 GI Tract	K1700171-017	32.9	-	-	1	01/17/17 11:40	
Bird No. 16-18 GI Tract	K1700171-018	31.3	-	-	1	01/17/17 11:40	
Bird No. 16-19 GI Tract	K1700171-019	30.8	-	-	1	01/17/17 11:40	
Bird No. 16-20 GI Tract	K1700171-020	33.0	-	-	1	01/17/17 11:40	
Bird No. 16-21 GI Tract	K1700171-021	29.8	-	-	1	01/17/17 11:40	
Bird No. 16-22 GI Tract	K1700171-022	42.2	-	-	1	01/17/17 11:40	
Bird No. 16-23 GI Tract	K1700171-023	32.8	-	-	1	01/17/17 11:40	
Bird No. 16-24 GI Tract	K1700171-024	37.0	-	-	1	01/17/17 11:40	
Bird No. 16-25 GI Tract	K1700171-025	35.8	-	-	1	01/17/17 11:40	



General Chemistry

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue
Analysis Method: 9012B
Prep Method: EPA 9010B

Service Request: K1700171
Date Collected: 12/08/16 - 12/19/16
Date Received: 12/29/16
Units: mg/Kg
Basis: Wet

Cyanide, Total

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Bird No. 16-1 GI Tract	K1700171-001	1.85	0.10	-	1	02/03/17 12:45	1/31/17	**
Bird No. 16-2 GI Tract	K1700171-002	2.49	0.10	-	1	02/03/17 12:45	1/31/17	**
Bird No. 16-3 GI Tract	K1700171-003	0.91	0.10	-	1	02/03/17 12:45	1/31/17	**
Bird No. 16-4 GI Tract	K1700171-004	2.41	0.10	-	1	02/03/17 12:45	1/31/17	**
Bird No. 16-5 GI Tract	K1700171-005	2.13	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-6 GI Tract	K1700171-006	1.59	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-7 GI Tract	K1700171-007	2.76	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-8 GI Tract	K1700171-008	1.87	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-9 GI Tract	K1700171-009	1.94	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-10 GI Tract	K1700171-010	1.84	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-11 GI Tract	K1700171-011	1.97	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-12 GI Tract	K1700171-012	1.97	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-13 GI Tract	K1700171-013	1.78	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-14 GI Tract	K1700171-014	1.00	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-15 GI Tract	K1700171-015	1.94	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-16 GI Tract	K1700171-016	1.96	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-17 GI Tract	K1700171-017	1.85	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-18 GI Tract	K1700171-018	2.58	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-19 GI Tract	K1700171-019	1.94	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-20 GI Tract	K1700171-020	1.79	0.10	-	1	02/03/17 12:45	1/31/17	**
Bird No. 16-21 GI Tract	K1700171-021	1.27	0.10	-	1	01/31/17 14:36	1/30/17	**
Bird No. 16-22 GI Tract	K1700171-022	1.05	0.10	-	1	01/31/17 14:36	1/30/17	**
Bird No. 16-23 GI Tract	K1700171-023	1.79	0.10	-	1	01/31/17 14:36	1/30/17	**
Bird No. 16-24 GI Tract	K1700171-024	1.70	0.10	-	1	01/31/17 14:36	1/30/17	**
Bird No. 16-25 GI Tract	K1700171-025	1.53	0.10	-	1	01/31/17 14:36	1/30/17	**
Method Blank	K1700171-MB1	ND U	0.10	-	1	01/31/17 14:36	1/30/17	
Method Blank	K1700171-MB2	ND U	0.10	-	1	02/03/17 12:45	1/31/17	

ALS Group USA, Corp.

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QA/QC Report

Client: Oregon State University
Project Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request:K1700171
Date Collected:12/19/16
Date Received:12/29/16

Analysis Method: 9012B
Prep Method: EPA 9010B

Units:mg/Kg
Basis:Wet

Replicate Sample Summary
Cyanide, Total

Sample Name:	Lab Code:	MRL	MDL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Bird No. 16-7 GI Tract	K1700171-007DUP	0.10	-	2.76	2.89	2.82	4	20	02/03/17
Bird No. 16-24 GI Tract	K1700171-024DUP	0.10	-	1.70	1.48	1.59	14	20	01/31/17

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

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

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

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700171
Date Collected: N/A
Date Received: 12/29/16
Date Analyzed: 02/3/17
Date Extracted: 01/31/17

Duplicate Matrix Spike Summary
Cyanide, Total

Sample Name: Bird No. 16-7 GI Tract
Lab Code: K1700171-007
Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet

Analyte Name	Sample Result	Matrix Spike K1700171-007MS			Duplicate Matrix Spike K1700171-007DMS			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Cyanide, Total	2.76	4.91	4.73	45	5.18	4.96	49	10-171	5	20

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

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

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

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700171
Date Collected: 12/19/16
Date Received: 12/29/16
Date Analyzed: 01/31/17
Date Extracted: 01/30/17

Duplicate Matrix Spike Summary
Cyanide, Total

Sample Name: Bird No. 16-24 GI Tract
Lab Code: K1700171-024
Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet

Analyte Name	Matrix Spike					Duplicate Matrix Spike				
	Sample Result	Result	K1700171-024MS		Result	K1700171-024DMS		% Rec Limits	RPD	RPD Limit
			Spike Amount	% Rec		Spike Amount	% Rec			
Cyanide, Total	1.70	4.55	4.89	58	4.75	4.86	63	10-171	4	20

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

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

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

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700171
Date Analyzed: 01/31/17
Date Extracted: 01/30/17

Lab Control Sample Summary
Cyanide, Total

Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet
Analysis Lot: 533083

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1700171-LCS1	96.8	70.3	138 *	62-128
Lab Control Sample	K1700171-LCS2	83.5	70.3	119	62-128
Lab Control Sample	K1700171-LCS3	79.8	70.3	113	62-128
Lab Control Sample	K1700171-LCS4	93.3	70.3	133 *	62-128

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700171
Date Analyzed: 02/03/17
Date Extracted: 01/31/17

Lab Control Sample Summary
Cyanide, Total

Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet
Analysis Lot: 533091

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1700171-LCS5	106	70.3	151 *	62-128

Client: Oregon State University
Project: Avian Tissue Project

Service Request: K1700171

Continuing Calibration Verification (CCV) Summary

Cyanide, Total

Analysis Method: 9012B

Units: ug/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	533083	KQ1701041-04	01/31/17 14:36	100	103	103	90-110
CCV2	533083	KQ1701041-05	01/31/17 14:36	100	104	104	90-110
CCV3	533083	KQ1701041-06	01/31/17 14:36	100	104	104	90-110
CCV4	533083	KQ1701041-07	01/31/17 14:36	100	103	103	90-110
CCV5	533091	KQ1701162-10	02/03/17 12:45	100	103	103	90-110
CCV6	533091	KQ1701162-11	02/03/17 12:45	100	104	104	90-110
CCV7	533091	KQ1701162-12	02/03/17 12:45	100	103	103	90-110
CCV8	533091	KQ1701162-13	02/03/17 12:45	100	103	103	90-110

Client: Oregon State University
Project: Avian Tissue Project

Service Request:K1700171

Continuing Calibration Blank (CCB) Summary
Cyanide, Total

Analysis Method: 9012B

Units:mg/Kg

	Analysis Lot	Lab Code	Date Analyzed	MRL	MDL	Result	Q
CCB1	533083	KQ1701041-01	01/31/17 14:36	0.10		ND	U
CCB2	533083	KQ1701041-02	01/31/17 14:36	0.10		ND	U
CCB3	533083	KQ1701041-03	01/31/17 14:36	0.10		ND	U
CCB4	533083	KQ1701041-08	01/31/17 14:36	0.10		ND	U
CCB5	533091	KQ1701162-06	02/03/17 12:45	0.10		ND	U
CCB6	533091	KQ1701162-07	02/03/17 12:45	0.10		ND	U
CCB7	533091	KQ1701162-08	02/03/17 12:45	0.10		ND	U
CCB8	533091	KQ1701162-09	02/03/17 12:45	0.10		ND	U



Metals

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
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ALS Group USA, Corp.

dba ALS Environmental

Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700171
Date Collected: 12/08-19/16
Date Received: 12/29/16

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/g
Basis: Dry

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Bird No. 16-1 GI Tract	K1700171-001	1.0	0.06	1	01/30/17	01/31/17	3.80	
Bird No. 16-2 GI Tract	K1700171-002	0.9	0.06	1	01/30/17	01/31/17	8.08	
Bird No. 16-3 GI Tract	K1700171-003	1.0	0.06	1	01/30/17	01/31/17	2.03	
Bird No. 16-4 GI Tract	K1700171-004	0.9	0.06	1	01/30/17	01/31/17	4.18	
Bird No. 16-5 GI Tract	K1700171-005	1.0	0.06	1	01/30/17	01/31/17	4.25	
Bird No. 16-6 GI Tract	K1700171-006	1.0	0.06	1	01/30/17	01/31/17	3.24	
Bird No. 16-7 GI Tract	K1700171-007	1.0	0.06	1	01/30/17	01/31/17	3.07	
Bird No. 16-8 GI Tract	K1700171-008	0.9	0.06	1	01/30/17	01/31/17	2.98	
Bird No. 16-9 GI Tract	K1700171-009	0.9	0.06	1	01/30/17	01/31/17	2.27	
Bird No. 16-10 GI Tract	K1700171-010	0.9	0.06	1	01/30/17	01/31/17	2.10	
Bird No. 16-11 GI Tract	K1700171-011	1.0	0.06	1	01/30/17	01/31/17	3.07	
Bird No. 16-12 GI Tract	K1700171-012	0.9	0.06	1	01/30/17	01/31/17	2.25	
Bird No. 16-13 GI Tract	K1700171-013	1.0	0.06	1	01/30/17	01/31/17	1.91	
Bird No. 16-14 GI Tract	K1700171-014	1.0	0.06	1	01/30/17	01/31/17	2.01	
Bird No. 16-15 GI Tract	K1700171-015	1.0	0.06	1	01/30/17	01/31/17	1.86	
Bird No. 16-16 GI Tract	K1700171-016	1.0	0.06	1	01/30/17	01/31/17	3.27	
Bird No. 16-17 GI Tract	K1700171-017	1.0	0.06	1	01/30/17	01/31/17	2.47	
Bird No. 16-18 GI Tract	K1700171-018	1.0	0.06	1	01/30/17	01/31/17	2.75	
Bird No. 16-19 GI Tract	K1700171-019	1.0	0.06	1	01/30/17	01/31/17	2.02	
Bird No. 16-20 GI Tract	K1700171-020	1.0	0.06	1	01/30/17	01/31/17	2.96	
Method Blank 1	K1700171-MB1	1.0	0.06	1	01/30/17	01/31/17	ND	
Method Blank 2	K1700171-MB2	1.0	0.06	1	01/30/17	01/31/17	ND	
Method Blank 3	K1700171-MB3	1.0	0.06	1	01/30/17	01/31/17	ND	

ALS Group USA, Corp.
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Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700171
Date Collected: 12/19/16
Date Received: 12/29/16

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/g
Basis: Dry

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Bird No. 16-21 GI Tract	K1700171-021	1.0	0.06	1	01/30/17	01/31/17	2.38	
Bird No. 16-22 GI Tract	K1700171-022	1.0	0.06	1	01/30/17	01/31/17	3.41	
Bird No. 16-23 GI Tract	K1700171-023	1.0	0.06	1	01/30/17	01/31/17	1.97	
Bird No. 16-24 GI Tract	K1700171-024	1.0	0.06	1	01/30/17	01/31/17	1.72	
Bird No. 16-25 GI Tract	K1700171-025	1.0	0.06	1	01/30/17	01/31/17	2.47	
Method Blank 1	K1700171-MB1	1.0	0.06	1	01/30/17	01/31/17	ND	
Method Blank 2	K1700171-MB2	1.0	0.06	1	01/30/17	01/31/17	ND	
Method Blank 3	K1700171-MB3	1.0	0.06	1	01/30/17	01/31/17	ND	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700171
Date Collected: 12/08/16
Date Received: 12/29/16
Date Extracted: 01/30/17
Date Analyzed: 01/31/17

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name: Bird No. 16-1 GI Tract Units: ng/g
Lab Code: K1700171-001S, K1700171-001SD Basis: Dry
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Percent Recovery										Result Notes
				Spike Level		Sample Result	Spike Result		ALS Acceptance		Relative Percent Difference			
				MS	DMS		MS	DMS	Limits					
Mercury	METHOD	1631E	4.7	248	236	3.80	267	249	106	104	70-130	7		

ALS Group USA, Corp.

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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700171
Date Collected: NA
Date Received: 12/29/16
Date Extracted: 01/30/17
Date Analyzed: 01/31/17

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name: Bird No. 16-11 GI Tract Units: ng/g
Lab Code: K1700171-011S, K1700171-011SD Basis: Dry
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		ALS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Mercury	METHOD	1631E	4.7	239	237	3.07	242	240	100	100	70-130	<1	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700171
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 01/31/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Initial) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	5.22	104	70-130	

ALS Group USA, Corp.

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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700171**Date Collected:** NA**Date Received:** NA**Date Extracted:** NA**Date Analyzed:** 01/31/17

Ongoing Precision and Recovery (OPR) Sample Summary

Total Metals

Sample Name: Ongoing Precision and Recovery (Final)**Units:** ng/g**Basis:** NA**Test Notes:**

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	4.99	100	70-130	

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Animal tissue

Service Request: K1700171
Date Collected: NA
Date Received: NA
Date Extracted: 01/30/17
Date Analyzed: 01/31/17

Quality Control Sample (QCS) Summary
Total Metals

Sample Name: Quality Control Sample
Lab Code:
Test Notes:

Units: ng/g
Basis: Dry

Source: TORT-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	292	275	94	70-130	

ALS Group USA, Corp.

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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700171
Date Collected: 12/19/16
Date Received: 12/29/16
Date Extracted: 01/30/17
Date Analyzed: 01/31/17

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name: Bird No. 16-21 GI Tract Units: ng/g
Lab Code: K1700171-021S, K1700171-021SD Basis: Dry
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		ALS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Mercury	METHOD	1631E	4.7	238	236	2.38	242	238	101	100	70-130	2	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700171
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 01/31/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Initial) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	4.97	99	70-130	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700171
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 01/31/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	4.94	99	70-130	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Animal tissue

Service Request: K1700171
Date Collected: NA
Date Received: NA
Date Extracted: 01/30/17
Date Analyzed: 01/31/17

Quality Control Sample (QCS) Summary
Total Metals

Sample Name: Quality Control Sample
Lab Code:
Test Notes:

Units: ng/g
Basis: Dry

Source: TORT-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	292	271	93	70-130	

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-1 GI Tract

Lab Code: K1700171-001

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	464		N
Antimony	6020A	0.046	0.002	5.0	01/29/17	01/30/17	0.049		
Arsenic	6020A	0.46	0.02	5.0	01/29/17	01/30/17	0.18	J	
Barium	6020A	0.046	0.005	5.0	01/29/17	01/30/17	3.81		*
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.085		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	2.40		
Calcium	6010C	3.7	1.9	1.0	01/29/17	01/31/17	591		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	48.1		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	1.82		
Copper	6010C	0.37	0.08	1.0	01/29/17	01/31/17	57.0		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	534		
Lead	6020A	0.0185	0.0005	5.0	01/29/17	01/30/17	0.160		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	861		
Manganese	6010C	0.09	0.02	1.0	01/29/17	01/31/17	133		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	22.0		
Potassium	6010C	19	3.7	1.0	01/29/17	01/31/17	8310		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	1.6		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.016	J	
Sodium	6010C	18.5	1.9	1.0	01/29/17	01/31/17	2540		
Thallium	6020A	0.0185	0.0008	5.0	01/29/17	01/30/17	0.0008	U	
Vanadium	6020A	0.185	0.006	5.0	01/29/17	01/30/17	0.649		
Zinc	6010C	0.37	0.06	1.0	01/29/17	01/31/17	644		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-2 GI Tract

Lab Code: K1700171-002

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	387		N
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/30/17	0.253		
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.22	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/30/17	8.96		*
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.084		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	2.16		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	505		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	31.9		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	1.53		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	81.4		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	503		
Lead	6020A	0.0193	0.0005	5.0	01/29/17	01/30/17	0.188		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	814		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	143		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	14.1		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	8920		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	1.3		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.007	J	
Sodium	6010C	19.3	1.9	1.0	01/29/17	01/31/17	2410		
Thallium	6020A	0.0193	0.0009	5.0	01/29/17	01/30/17	0.0014	J	
Vanadium	6020A	0.193	0.007	5.0	01/29/17	01/30/17	0.484		
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	618		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-3 GI Tract

Lab Code: K1700171-003

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	208		N
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/30/17	0.467		
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/30/17	0.12	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/30/17	2.61		*
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.047		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	1.55		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	343		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	49.2		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	1.04		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	33.3		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	654		
Lead	6020A	0.0191	0.0005	5.0	01/29/17	01/30/17	0.503		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	481		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	34.6		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	25.3		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	6880		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	2.0		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.1	1.9	1.0	01/29/17	01/31/17	2800		
Thallium	6020A	0.0191	0.0009	5.0	01/29/17	01/30/17	0.0009	U	
Vanadium	6020A	0.191	0.007	5.0	01/29/17	01/30/17	0.570		
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	416		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-4 GI Tract

Lab Code: K1700171-004

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	819		N
Antimony	6020A	0.046	0.002	5.0	01/29/17	01/30/17	0.002	U	
Arsenic	6020A	0.46	0.02	5.0	01/29/17	01/30/17	0.26	J	
Barium	6020A	0.046	0.005	5.0	01/29/17	01/30/17	5.21		*
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.168		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	2.75		
Calcium	6010C	3.7	1.9	1.0	01/29/17	01/31/17	614		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	28.3		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	1.87		
Copper	6010C	0.37	0.08	1.0	01/29/17	01/31/17	154		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	539		
Lead	6020A	0.0186	0.0005	5.0	01/29/17	01/30/17	0.381		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	887		
Manganese	6010C	0.09	0.02	1.0	01/29/17	01/31/17	210		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	13.0		
Potassium	6010C	19	3.7	1.0	01/29/17	01/31/17	8070		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	1.8		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.006	J	
Sodium	6010C	18.6	1.9	1.0	01/29/17	01/31/17	1760		
Thallium	6020A	0.0186	0.0008	5.0	01/29/17	01/30/17	0.0101	J	
Vanadium	6020A	0.186	0.007	5.0	01/29/17	01/30/17	0.554		
Zinc	6010C	0.37	0.06	1.0	01/29/17	01/31/17	791		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-5 GI Tract

Lab Code: K1700171-005

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	999		N
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/30/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/30/17	0.17	J	
Barium	6020A	0.050	0.005	5.0	01/29/17	01/30/17	2.91		*
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.233		
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	3.79		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	846		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	21.6		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	2.09		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	135		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	519		
Lead	6020A	0.0199	0.0005	5.0	01/29/17	01/30/17	0.409		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	969		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	287		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	10.3		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	7710		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	1.9		
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.9	2.0	1.0	01/29/17	01/31/17	2640		
Thallium	6020A	0.0199	0.0009	5.0	01/29/17	01/30/17	0.0011	J	
Vanadium	6020A	0.199	0.007	5.0	01/29/17	01/30/17	0.469		
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	1080		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-6 GI Tract

Lab Code: K1700171-006

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	678		N
Antimony	6020A	0.047	0.002	5.0	01/29/17	01/30/17	0.002	U	
Arsenic	6020A	0.47	0.02	5.0	01/29/17	01/30/17	0.16	J	
Barium	6020A	0.047	0.005	5.0	01/29/17	01/30/17	4.11		*
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.174		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	3.77		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	942		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	22.8		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	1.63		
Copper	6010C	0.38	0.08	1.0	01/29/17	01/31/17	130		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	547		
Lead	6020A	0.0188	0.0005	5.0	01/29/17	01/30/17	1.79		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	667		
Manganese	6010C	0.09	0.02	1.0	01/29/17	01/31/17	245		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	10.4		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	5970		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	1.7		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.012	J	
Sodium	6010C	18.8	1.9	1.0	01/29/17	01/31/17	2050		
Thallium	6020A	0.0188	0.0008	5.0	01/29/17	01/30/17	0.0008	U	
Vanadium	6020A	0.188	0.007	5.0	01/29/17	01/30/17	0.254		
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	903		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-7 GI Tract

Lab Code: K1700171-007

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	775		N
Antimony	6020A	0.049	0.002	5.0	01/29/17	01/30/17	0.002	U	
Arsenic	6020A	0.49	0.02	5.0	01/29/17	01/30/17	0.13	J	
Barium	6020A	0.049	0.005	5.0	01/29/17	01/30/17	2.25		*
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.165		
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	2.91		
Calcium	6010C	3.9	2.0	1.0	01/29/17	01/31/17	515		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	36.8		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	1.89		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	124		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	510		
Lead	6020A	0.0197	0.0005	5.0	01/29/17	01/30/17	0.281		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	853		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	210		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	16.1		
Potassium	6010C	20	3.9	1.0	01/29/17	01/31/17	8210		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	1.2		
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.7	2.0	1.0	01/29/17	01/31/17	2630		
Thallium	6020A	0.0197	0.0009	5.0	01/29/17	01/30/17	0.0009	U	
Vanadium	6020A	0.197	0.007	5.0	01/29/17	01/30/17	0.390		
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	756		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-8 GI Tract

Lab Code: K1700171-008

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	582		N
Antimony	6020A	0.049	0.002	5.0	01/29/17	01/30/17	0.006	J	
Arsenic	6020A	0.49	0.02	5.0	01/29/17	01/30/17	0.43	J	
Barium	6020A	0.049	0.005	5.0	01/29/17	01/30/17	13.0		*
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.105		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	1.86		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	560		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	66.7		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	2.01		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	81.7		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	876		
Lead	6020A	0.0194	0.0005	5.0	01/29/17	01/30/17	0.306		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	964		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	174		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	29.1		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	6790		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	1.5		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.013	J	
Sodium	6010C	19.4	1.9	1.0	01/29/17	01/31/17	1880		
Thallium	6020A	0.0194	0.0009	5.0	01/29/17	01/30/17	0.0023	J	
Vanadium	6020A	0.194	0.007	5.0	01/29/17	01/30/17	1.64		
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	554		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-9 GI Tract

Lab Code: K1700171-009

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	752		N
Antimony	6020A	0.047	0.002	5.0	01/29/17	01/30/17	0.002	J	
Arsenic	6020A	0.47	0.02	5.0	01/29/17	01/30/17	0.18	J	
Barium	6020A	0.047	0.005	5.0	01/29/17	01/30/17	2.84		*
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.145		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	2.95		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	516		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	37.0		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	1.96		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	119		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	488		
Lead	6020A	0.0188	0.0005	5.0	01/29/17	01/30/17	0.734		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	891		
Manganese	6010C	0.09	0.02	1.0	01/29/17	01/31/17	217		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	16.6		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	8200		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	1.8		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.008	J	
Sodium	6010C	18.8	1.9	1.0	01/29/17	01/31/17	2010		
Thallium	6020A	0.0188	0.0008	5.0	01/29/17	01/30/17	0.0008	U	
Vanadium	6020A	0.188	0.007	5.0	01/29/17	01/30/17	0.418		
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	750		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-10 GI Tract

Lab Code: K1700171-010

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	667		N
Antimony	6020A	0.047	0.002	5.0	01/29/17	01/30/17	0.002	U	
Arsenic	6020A	0.47	0.02	5.0	01/29/17	01/30/17	0.12	J	
Barium	6020A	0.047	0.005	5.0	01/29/17	01/30/17	2.49		*
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.151		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	3.34		
Calcium	6010C	3.7	1.9	1.0	01/29/17	01/31/17	435		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	23.7		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	1.14		
Copper	6010C	0.37	0.08	1.0	01/29/17	01/31/17	65.4		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	468		
Lead	6020A	0.0186	0.0005	5.0	01/29/17	01/30/17	0.295		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	630		
Manganese	6010C	0.09	0.02	1.0	01/29/17	01/31/17	147		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	10.4		
Potassium	6010C	19	3.7	1.0	01/29/17	01/31/17	6850		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	1.8		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	18.6	1.9	1.0	01/29/17	01/31/17	2410		
Thallium	6020A	0.0186	0.0008	5.0	01/29/17	01/30/17	0.0008	U	
Vanadium	6020A	0.186	0.007	5.0	01/29/17	01/30/17	0.507		
Zinc	6010C	0.37	0.06	1.0	01/29/17	01/31/17	762		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-11 GI Tract

Lab Code: K1700171-011

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/30/17	715		N
Antimony	6020A	0.047	0.002	5.0	01/29/17	01/30/17	0.008	J	
Arsenic	6020A	0.47	0.02	5.0	01/29/17	01/30/17	0.23	J	
Barium	6020A	0.047	0.005	5.0	01/29/17	01/30/17	7.47		*
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/30/17	0.159		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/30/17	4.66		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	660		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/30/17	90.2		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/30/17	2.60		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	133		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/30/17	794		
Lead	6020A	0.0189	0.0005	5.0	01/29/17	01/30/17	0.288		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	727		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	242		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/30/17	38.6		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	5350		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/30/17	1.7		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	18.9	1.9	1.0	01/29/17	01/31/17	2950		
Thallium	6020A	0.0189	0.0009	5.0	01/29/17	01/30/17	0.0037	J	
Vanadium	6020A	0.189	0.007	5.0	01/29/17	01/30/17	1.12		
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	954		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-12 GI Tract

Lab Code: K1700171-012

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	1770		N
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/30/17	0.003	J	
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/31/17	0.30	J	
Barium	6020A	0.050	0.005	5.0	01/29/17	01/30/17	3.29		*
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.448		
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	6.13		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	699		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	51.6		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	2.81		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	225		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	624		
Lead	6020A	0.0199	0.0005	5.0	01/29/17	01/30/17	0.407		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	933		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	354		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	22.8		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	6070		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	2.0		
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	19.9	2.0	1.0	01/29/17	01/31/17	2620		
Thallium	6020A	0.0199	0.0009	5.0	01/29/17	01/30/17	0.0033	J	
Vanadium	6020A	0.199	0.007	5.0	01/29/17	01/30/17	0.628		
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	1760		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-13 GI Tract

Lab Code: K1700171-013

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/31/17	837		N
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/31/17	0.011	J	
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/31/17	0.16	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/31/17	4.05		*
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.194		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/31/17	2.91		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	595		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/31/17	45.2		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/31/17	2.20		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	116		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	547		
Lead	6020A	0.0192	0.0005	5.0	01/29/17	01/31/17	0.284		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	1010		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	267		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/31/17	20.3		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	7290		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	1.5		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/31/17	0.010	J	
Sodium	6010C	19.2	1.9	1.0	01/29/17	01/31/17	2560		
Thallium	6020A	0.0192	0.0009	5.0	01/29/17	01/31/17	0.0010	J	
Vanadium	6020A	0.192	0.007	5.0	01/29/17	01/31/17	0.686		
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	906		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-14 GI Tract

Lab Code: K1700171-014

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/31/17	269		N
Antimony	6020A	0.049	0.002	5.0	01/29/17	01/31/17	0.012	J	
Arsenic	6020A	0.49	0.02	5.0	01/29/17	01/31/17	0.62		
Barium	6020A	0.049	0.005	5.0	01/29/17	01/31/17	6.39		*
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.047		
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/31/17	1.00		
Calcium	6010C	3.9	2.0	1.0	01/29/17	01/31/17	350		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/31/17	34.6		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.886		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	40.4		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	697		
Lead	6020A	0.0197	0.0005	5.0	01/29/17	01/31/17	0.379		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	476		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	68.7		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/31/17	14.7		
Potassium	6010C	20	3.9	1.0	01/29/17	01/31/17	4680		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	1.2		
Silver	6020A	0.020	0.006	5.0	01/29/17	01/31/17	0.017	J	
Sodium	6010C	19.7	2.0	1.0	01/29/17	01/31/17	1360		
Thallium	6020A	0.0197	0.0009	5.0	01/29/17	01/31/17	0.0028	J	
Vanadium	6020A	0.197	0.007	5.0	01/29/17	01/31/17	1.64		
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	277		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-15 GI Tract

Lab Code: K1700171-015

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/31/17	871		N
Antimony	6020A	0.049	0.002	5.0	01/29/17	01/31/17	0.010	J	
Arsenic	6020A	0.49	0.02	5.0	01/29/17	01/31/17	0.47	J	
Barium	6020A	0.049	0.005	5.0	01/29/17	01/31/17	12.1		*
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.268		
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/31/17	3.71		
Calcium	6010C	3.9	2.0	1.0	01/29/17	01/31/17	547		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/31/17	123		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/31/17	2.38		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	96.8		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	1230		
Lead	6020A	0.0196	0.0005	5.0	01/29/17	01/31/17	0.818		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	575		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	160		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/31/17	51.5		
Potassium	6010C	20	3.9	1.0	01/29/17	01/31/17	5460		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	1.6		
Silver	6020A	0.020	0.006	5.0	01/29/17	01/31/17	0.012	J	
Sodium	6010C	19.6	2.0	1.0	01/29/17	01/31/17	2100		
Thallium	6020A	0.0196	0.0009	5.0	01/29/17	01/31/17	0.0026	J	
Vanadium	6020A	0.196	0.007	5.0	01/29/17	01/31/17	1.70		
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	1010		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-16 GI Tract

Lab Code: K1700171-016

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/31/17	914		N
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/31/17	0.007	J	
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/31/17	0.51		
Barium	6020A	0.048	0.005	5.0	01/29/17	01/31/17	2.17		*
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.201		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/31/17	3.11		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	541		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/31/17	26.9		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/31/17	1.84		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	149		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	496		
Lead	6020A	0.0192	0.0005	5.0	01/29/17	01/31/17	0.447		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	887		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	233		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/31/17	12.4		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	7180		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	1.5		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/31/17	0.008	J	
Sodium	6010C	19.2	1.9	1.0	01/29/17	01/31/17	1860		
Thallium	6020A	0.0192	0.0009	5.0	01/29/17	01/31/17	0.0017	J	
Vanadium	6020A	0.192	0.007	5.0	01/29/17	01/31/17	0.509		
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	860		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-17 GI Tract

Lab Code: K1700171-017

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/31/17	968		N
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/31/17	0.030	J	
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/31/17	0.59		
Barium	6020A	0.048	0.005	5.0	01/29/17	01/31/17	12.0		*
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.192		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/31/17	2.93		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	689		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/31/17	96.3		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/31/17	2.90		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	136		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	921		
Lead	6020A	0.0194	0.0005	5.0	01/29/17	01/31/17	1.56		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	1130		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	257		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/31/17	41.6		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	7430		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	1.8		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/31/17	0.018	J	
Sodium	6010C	19.4	1.9	1.0	01/29/17	01/31/17	1800		
Thallium	6020A	0.0194	0.0009	5.0	01/29/17	01/31/17	0.0021	J	
Vanadium	6020A	0.194	0.007	5.0	01/29/17	01/31/17	1.74		
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	787		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-18 GI Tract

Lab Code: K1700171-018

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/31/17	1140		N
Antimony	6020A	0.046	0.002	5.0	01/29/17	01/31/17	0.019	J	
Arsenic	6020A	0.46	0.02	5.0	01/29/17	01/31/17	0.29	J	
Barium	6020A	0.046	0.005	5.0	01/29/17	01/31/17	4.26		*
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.261		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/31/17	5.01		
Calcium	6010C	3.7	1.9	1.0	01/29/17	01/31/17	841		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/31/17	77.0		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/31/17	3.30		
Copper	6010C	0.37	0.08	1.0	01/29/17	01/31/17	155		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/31/17	837		
Lead	6020A	0.0185	0.0005	5.0	01/29/17	01/31/17	0.629		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	1050		
Manganese	6010C	0.09	0.02	1.0	01/29/17	01/31/17	355		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/31/17	33.7		
Potassium	6010C	19	3.7	1.0	01/29/17	01/31/17	7890		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/31/17	1.5		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/31/17	0.006	J	
Sodium	6010C	18.5	1.9	1.0	01/29/17	01/31/17	2360		
Thallium	6020A	0.0185	0.0008	5.0	01/29/17	01/31/17	0.0026	J	
Vanadium	6020A	0.185	0.006	5.0	01/29/17	01/31/17	1.15		
Zinc	6010C	0.37	0.06	1.0	01/29/17	01/31/17	1280		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-19 GI Tract

Lab Code: K1700171-019

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/31/17	850		N
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/31/17	0.003	J	
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/31/17	0.16	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/31/17	15.7		*
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.182		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/31/17	2.57		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	477		
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/31/17	50.4		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/31/17	1.92		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	135		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	604		
Lead	6020A	0.0192	0.0005	5.0	01/29/17	01/31/17	0.342		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	853		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	183		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/31/17	22.0		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	8800		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	1.9		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/31/17	0.006	U	
Sodium	6010C	19.2	1.9	1.0	01/29/17	01/31/17	2190		
Thallium	6020A	0.0192	0.0009	5.0	01/29/17	01/31/17	0.0018	J	
Vanadium	6020A	0.192	0.007	5.0	01/29/17	01/31/17	0.535		
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	747		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-20 GI Tract

Lab Code: K1700171-020

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/31/17	642		N
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/31/17	0.002	J	
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/31/17	0.24	J	
Barium	6020A	0.050	0.005	5.0	01/29/17	01/31/17	5.90		*
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.171		
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/31/17	3.38		
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	686		
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/31/17	62.7		
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/31/17	1.95		
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	109		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	712		
Lead	6020A	0.0198	0.0005	5.0	01/29/17	01/31/17	0.289		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	875		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	215		
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/31/17	27.3		
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	7330		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	1.1		
Silver	6020A	0.020	0.006	5.0	01/29/17	01/31/17	0.006	U	
Sodium	6010C	19.8	2.0	1.0	01/29/17	01/31/17	2340		
Thallium	6020A	0.0198	0.0009	5.0	01/29/17	01/31/17	0.0027	J	
Vanadium	6020A	0.198	0.007	5.0	01/29/17	01/31/17	0.890		
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	1040		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-21 GI Tract

Lab Code: K1700171-021

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/31/17	1940		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/31/17	0.026	J	
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/31/17	0.26	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/31/17	5.14		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.471		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/31/17	5.68		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	790		N
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/31/17	45.9		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/31/17	2.26		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	196		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	584		
Lead	6020A	0.0193	0.0005	5.0	01/29/17	01/31/17	0.539		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	843		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	335		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/31/17	20.0		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	7940		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	1.6		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/31/17	0.007	J	
Sodium	6010C	19.3	1.9	1.0	01/29/17	01/31/17	2960		
Thallium	6020A	0.0193	0.0009	5.0	01/29/17	01/31/17	0.0017	J	
Vanadium	6020A	0.193	0.007	5.0	01/29/17	01/31/17	0.496		
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	1620		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-22 GI Tract

Lab Code: K1700171-022

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/31/17	346		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/31/17	0.007	J	
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/31/17	0.26	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/31/17	4.97		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.057		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/31/17	1.27		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	549		N
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/31/17	55.9		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/31/17	1.05		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	33.9		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	1030		
Lead	6020A	0.0191	0.0005	5.0	01/29/17	01/31/17	0.663		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	556		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	85.3		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/31/17	23.5		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	5980		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	1.2		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/31/17	0.006	U	
Sodium	6010C	19.1	1.9	1.0	01/29/17	01/31/17	1880		
Thallium	6020A	0.0191	0.0009	5.0	01/29/17	01/31/17	0.0035	J	
Vanadium	6020A	0.191	0.007	5.0	01/29/17	01/31/17	0.940		
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	376		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-23 GI Tract

Lab Code: K1700171-023

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/31/17	1170		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/31/17	0.008	J	
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/31/17	0.35	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/31/17	13.8		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.268		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/31/17	2.60		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	567		N
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/31/17	126		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/31/17	1.81		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	118		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	1090		
Lead	6020A	0.0191	0.0005	5.0	01/29/17	01/31/17	0.448		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	432		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	75.7		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/31/17	53.0		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	5360		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	1.3		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/31/17	0.006	U	
Sodium	6010C	19.1	1.9	1.0	01/29/17	01/31/17	2420		
Thallium	6020A	0.0191	0.0009	5.0	01/29/17	01/31/17	0.0031	J	
Vanadium	6020A	0.191	0.007	5.0	01/29/17	01/31/17	1.24		
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	714		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-24 GI Tract

Lab Code: K1700171-024

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/31/17	1060		
Antimony	6020A	0.047	0.002	5.0	01/29/17	01/31/17	0.007	J	
Arsenic	6020A	0.47	0.02	5.0	01/29/17	01/31/17	0.28	J	
Barium	6020A	0.047	0.005	5.0	01/29/17	01/31/17	14.2		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.180		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/31/17	1.91		
Calcium	6010C	3.8	1.9	1.0	01/29/17	01/31/17	399		N
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/31/17	119		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/31/17	1.83		
Copper	6010C	0.38	0.09	1.0	01/29/17	01/31/17	108		
Iron	6020A	0.9	0.2	5.0	01/29/17	01/31/17	1080		
Lead	6020A	0.0189	0.0005	5.0	01/29/17	01/31/17	0.309		
Magnesium	6010C	0.9	0.5	1.0	01/29/17	01/31/17	581		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	101		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/31/17	49.3		
Potassium	6010C	19	3.8	1.0	01/29/17	01/31/17	6250		
Selenium	6020A	0.9	0.2	5.0	01/29/17	01/31/17	1.9		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/31/17	0.008	J	
Sodium	6010C	18.9	1.9	1.0	01/29/17	01/31/17	2610		
Thallium	6020A	0.0189	0.0009	5.0	01/29/17	01/31/17	0.0009	U	
Vanadium	6020A	0.189	0.007	5.0	01/29/17	01/31/17	1.22		
Zinc	6010C	0.38	0.06	1.0	01/29/17	01/31/17	595		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-25 GI Tract

Lab Code: K1700171-025

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/29/17	01/31/17	2310		
Antimony	6020A	0.048	0.002	5.0	01/29/17	01/31/17	0.013	J	
Arsenic	6020A	0.48	0.02	5.0	01/29/17	01/31/17	0.36	J	
Barium	6020A	0.048	0.005	5.0	01/29/17	01/31/17	14.3		
Beryllium	6020A	0.019	0.003	5.0	01/29/17	01/31/17	0.054		
Cadmium	6020A	0.019	0.002	5.0	01/29/17	01/31/17	0.756		
Calcium	6010C	3.9	1.9	1.0	01/29/17	01/31/17	1030		N
Chromium	6020A	0.19	0.02	5.0	01/29/17	01/31/17	209		
Cobalt	6020A	0.019	0.003	5.0	01/29/17	01/31/17	2.43		
Copper	6010C	0.39	0.09	1.0	01/29/17	01/31/17	38.5		
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	1360		
Lead	6020A	0.0192	0.0005	5.0	01/29/17	01/31/17	0.296		
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	426		
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	30.1		
Nickel	6020A	0.19	0.02	5.0	01/29/17	01/31/17	87.9		
Potassium	6010C	19	3.9	1.0	01/29/17	01/31/17	4960		
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	1.4		
Silver	6020A	0.019	0.006	5.0	01/29/17	01/31/17	0.360		
Sodium	6010C	19.2	1.9	1.0	01/29/17	01/31/17	2630		
Thallium	6020A	0.0192	0.0009	5.0	01/29/17	01/31/17	0.0033	J	
Vanadium	6020A	0.192	0.007	5.0	01/29/17	01/31/17	2.17		
Zinc	6010C	0.39	0.06	1.0	01/29/17	01/31/17	291		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received:

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Method Blank

Lab Code: KQ1700681-01

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/30/17	0.2	U	N
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/30/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/30/17	0.02	U	
Barium	6020A	0.050	0.005	5.0	01/29/17	01/30/17	0.005	U	*
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/30/17	0.002	U	
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	2.0	U	
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.02	U	
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/30/17	0.003	U	
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	0.14	J	
Iron	6020A	1.0	0.2	5.0	01/29/17	01/30/17	0.2	U	
Lead	6020A	0.0200	0.0005	5.0	01/29/17	01/30/17	0.0005	U	
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	0.5	U	
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	0.02	J	
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/30/17	0.02	U	
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	7.8	J	
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/30/17	0.2	U	
Silver	6020A	0.020	0.006	5.0	01/29/17	01/30/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/29/17	01/31/17	2.0	U	
Thallium	6020A	0.0200	0.0009	5.0	01/29/17	01/30/17	0.0009	U	
Vanadium	6020A	0.200	0.007	5.0	01/29/17	01/30/17	0.007	U	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	0.06	U	

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received:

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Method Blank

Lab Code: KQ1700682-01

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/29/17	01/31/17	0.4	J	
Antimony	6020A	0.050	0.002	5.0	01/29/17	01/31/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/29/17	01/31/17	0.02	U	
Barium	6020A	0.050	0.005	5.0	01/29/17	01/31/17	0.005	U	
Beryllium	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/29/17	01/31/17	0.003	J	
Calcium	6010C	4.0	2.0	1.0	01/29/17	01/31/17	2.1	J	N
Chromium	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.02	U	
Cobalt	6020A	0.020	0.003	5.0	01/29/17	01/31/17	0.003	U	
Copper	6010C	0.40	0.09	1.0	01/29/17	01/31/17	0.18	J	
Iron	6020A	1.0	0.2	5.0	01/29/17	01/31/17	0.2	U	
Lead	6020A	0.0200	0.0005	5.0	01/29/17	01/31/17	0.0005	U	
Magnesium	6010C	1.0	0.5	1.0	01/29/17	01/31/17	0.5	U	
Manganese	6010C	0.10	0.02	1.0	01/29/17	01/31/17	0.03	J	
Nickel	6020A	0.20	0.02	5.0	01/29/17	01/31/17	0.02	U	
Potassium	6010C	20	4.0	1.0	01/29/17	01/31/17	7.7	J	
Selenium	6020A	1.0	0.2	5.0	01/29/17	01/31/17	0.3	J	
Silver	6020A	0.020	0.006	5.0	01/29/17	01/31/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/29/17	01/31/17	2.0	U	
Thallium	6020A	0.0200	0.0009	5.0	01/29/17	01/31/17	0.0009	U	
Vanadium	6020A	0.200	0.007	5.0	01/29/17	01/31/17	0.007	U	
Zinc	6010C	0.40	0.06	1.0	01/29/17	01/31/17	0.11	J	

Comments:

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum	100.0	91.5	92	25.0	25.0	100	24.9	100	6020A
Antimony	25.0	25.8	103	25.0	25.1	100	25.1	100	6020A
Arsenic	25.0	25.6	102	25.0	25.5	102	25.1	100	6020A
Barium	100.0	103.0	103	25.0	25.0	100	24.8	99	6020A
Beryllium	2.50	2.52	101	25.00	24.96	100	24.23	97	6020A
Cadmium	12.5	12.9	103	25.0	25.6	102	25.4	102	6020A
Calcium	5000	4972	99	500	500	100	501	100	6010C
Calcium	12500	12510	100	10000	10020	100	10020	100	6010C
Chromium	10.0	10.3	103	25.0	24.9	100	25.4	102	6020A
Cobalt	25.0	25.5	102	25.0	24.7	99	24.8	99	6020A
Copper	625	607	97	250	252	101	251	100	6010C
Iron	50.0	55.0	110	25.0	24.7	99	25.0	100	6020A
Lead	25.0	25.0	100	25.0	24.8	99	24.8	99	6020A
Magnesium	12500	12220	98	10000	10100	101	9985	100	6010C
Magnesium	5000	4969	99	250	252	101	254	102	6010C
Manganese	1250	1231	98	250	249	100	252	101	6010C
Nickel	25.0	25.6	102	25.0	24.4	98	24.9	100	6020A
Potassium	12500	12520	100	10000	10160	102	10120	101	6010C
Selenium	25.0	24.9	100	25.0	24.2	97	24.9	100	6020A
Silver	12.5	13.0	104	25.0	25.3	101	25.6	102	6020A
Sodium	12500	12460	100	10000	10170	102	10120	101	6010C
Thallium	25.0	24.7	99	25.0	24.7	99	24.8	99	6020A
Vanadium	25.0	25.8	103	25.0	24.8	99	25.1	100	6020A
Zinc	1250	1237	99	250	249	100	249	100	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	24.7	99	25.0	100	6020A
Antimony				25.0	25.2	101	25.3	101	6020A
Arsenic				25.0	25.7	103	26.1	104	6020A
Barium				25.0	24.9	100	24.6	98	6020A
Beryllium				25.00	23.96	96	23.54	94	6020A
Cadmium				25.0	25.4	102	25.5	102	6020A
Calcium				10000	9960	100	9978	100	6010C
Calcium				500	499	100	496	99	6010C
Chromium				25.0	25.7	103	25.8	103	6020A
Cobalt				25.0	25.2	101	25.4	102	6020A
Copper				250	251	100	255	102	6010C
Iron				25.0	25.2	101	25.0	100	6020A
Lead				25.0	24.8	99	25.0	100	6020A
Magnesium				10000	9947	99	9934	99	6010C
Magnesium				250	256	102	254	102	6010C
Manganese				250	252	101	252	101	6010C
Nickel				25.0	25.3	101	25.2	101	6020A
Potassium				10000	10110	101	10070	101	6010C
Selenium				25.0	25.3	101	26.2	105	6020A
Silver				25.0	24.2	97	25.1	100	6020A
Sodium				10000	10090	101	10080	101	6010C
Thallium				25.0	24.8	99	25.0	100	6020A
Vanadium				25.0	25.5	102	25.4	102	6020A
Zinc				250	251	100	253	101	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.3	101	25.4	102	6020A
Antimony				25.0	25.5	102	25.9	104	6020A
Arsenic				25.0	25.4	102	26.5	106	6020A
Barium				25.0	24.9	100	25.5	102	6020A
Beryllium				25.00	23.86	95	24.60	98	6020A
Cadmium				25.0	25.4	102	25.7	103	6020A
Calcium				10000	9872	99	10030	100	6010C
Calcium				500	498	100	497	99	6010C
Chromium				25.0	25.1	100	26.4	106	6020A
Cobalt				25.0	25.2	101	25.4	102	6020A
Copper				250	253	101	252	101	6010C
Iron				25.0	25.6	102	25.8	103	6020A
Lead				25.0	25.2	101	25.2	101	6020A
Magnesium				10000	9914	99	9716	97	6010C
Magnesium				250	255	102	254	102	6010C
Manganese				250	249	100	251	100	6010C
Nickel				25.0	25.3	101	25.6	102	6020A
Potassium				10000	10110	101	10130	101	6010C
Selenium				25.0	25.7	103	26.2	105	6020A
Silver				25.0	25.3	101	25.1	100	6020A
Sodium				10000	10150	102	9947	99	6010C
Thallium				25.0	25.2	101	25.4	102	6020A
Vanadium				25.0	25.8	103	26.5	106	6020A
Zinc				250	249	100	252	101	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.6	102	25.8	103	6020A
Antimony				25.0	26.7	107	26.5	106	6020A
Arsenic				25.0	25.9	104	26.5	106	6020A
Barium				25.0	26.0	104	26.1	104	6020A
Beryllium				25.00	24.45	98	24.13	97	6020A
Cadmium				25.0	25.8	103	25.5	102	6020A
Calcium				10000	10020	100	9980	100	6010C
Calcium				500	497	99	494	99	6010C
Chromium				25.0	26.5	106	26.6	106	6020A
Cobalt				25.0	25.8	103	26.0	104	6020A
Copper				250	253	101	249	100	6010C
Iron				25.0	25.2	101	26.5	106	6020A
Lead				25.0	25.9	104	25.7	103	6020A
Magnesium				10000	9798	98	9719	97	6010C
Magnesium				250	253	101	252	101	6010C
Manganese				250	249	100	250	100	6010C
Nickel				25.0	25.9	104	25.8	103	6020A
Potassium				10000	10110	101	10010	100	6010C
Selenium				25.0	25.1	100	25.4	102	6020A
Silver				25.0	24.1	96	25.0	100	6020A
Sodium				10000	10040	100	9957	100	6010C
Thallium				25.0	25.9	104	25.5	102	6020A
Vanadium				25.0	26.2	105	26.6	106	6020A
Zinc				250	251	100	251	100	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	26.3	105	26.5	106	6020A
Antimony				25.0	26.4	106	26.6	106	6020A
Arsenic				25.0	27.3	109	26.6	106	6020A
Barium				25.0	26.1	104	26.4	106	6020A
Beryllium				25.00	24.98	100	25.19	101	6020A
Cadmium				25.0	27.6	110	26.9	108	6020A
Calcium				10000	10030	100	9927	99	6010C
Calcium				500	496	99	496	99	6010C
Chromium				25.0	27.1	108	26.3	105	6020A
Cobalt				25.0	26.4	106	26.1	104	6020A
Copper				250	248	99	251	100	6010C
Iron				25.0	26.4	106	25.8	103	6020A
Lead				25.0	25.8	103	25.6	102	6020A
Magnesium				10000	9512	95	9755	98	6010C
Magnesium				250	254	102	252	101	6010C
Manganese				250	252	101	249	100	6010C
Nickel				25.0	26.1	104	26.0	104	6020A
Potassium				10000	9933	99	10120	101	6010C
Selenium				25.0	26.4	106	26.6	106	6020A
Silver				25.0	27.3	109	25.6	102	6020A
Sodium				10000	9763	98	10030	100	6010C
Thallium				25.0	25.7	103	25.6	102	6020A
Vanadium				25.0	27.1	108	26.3	105	6020A
Zinc				250	253	101	251	100	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	26.6	106	26.5	106	6020A
Antimony				25.0	27.0	108	27.4	110	6020A
Arsenic				25.0	26.7	107	27.0	108	6020A
Barium				25.0	26.4	106	27.0	108	6020A
Beryllium				25.00	24.77	99	24.92	100	6020A
Cadmium				25.0	26.4	106	26.5	106	6020A
Calcium				10000	9967	100	9987	100	6010C
Calcium				500	497	99	498	100	6010C
Chromium				25.0	27.3	109	27.1	108	6020A
Cobalt				25.0	26.9	108	26.5	106	6020A
Copper				250	247	99	248	99	6010C
Iron				25.0	26.9	108	27.5	110	6020A
Lead				25.0	26.6	106	26.6	106	6020A
Magnesium				10000	9731	97	9808	98	6010C
Magnesium				250	252	101	250	100	6010C
Manganese				250	253	101	250	100	6010C
Nickel				25.0	27.0	108	27.2	109	6020A
Potassium				10000	10050	100	10100	101	6010C
Selenium				25.0	26.5	106	26.0	104	6020A
Silver				25.0	26.5	106	25.5	102	6020A
Sodium				10000	9944	99	10010	100	6010C
Thallium				25.0	26.5	106	26.4	106	6020A
Vanadium				25.0	27.1	108	26.9	108	6020A
Zinc				250	251	100	249	100	6010C

- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Arsenic	25.0	25.5	102	25.0	25.0	100	25.0	100	6020A
Selenium	25.0	25.4	102	25.0	25.5	102	26.5	106	6020A

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University **SDG No.:** K1700171
Contract: _____ **Lab Code:** ALSK **Case No.:** _____ **SAS No.:** _____
Initial Calibration Source: Inorganic Ventures
Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLICVT1									
	Aluminum	4.123	4.000	103	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Antimony	0.118	0.100	118	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Arsenic	1.125	1.000	112	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Barium	0.101	0.100	101	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Beryllium	0.034	0.040	85	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Cadmium	0.052	0.040	130	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Chromium	0.414	0.400	104	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Cobalt	0.037	0.040	92	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Iron	1.999	2.000	100	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Lead	0.043	0.040	108	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Nickel	0.393	0.400	98	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Selenium	2.379	2.000	119	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Silver	0.048	0.040	120	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Thallium	0.041	0.040	102	70.0 - 130.0	MS	1/30/2017	16:41	013017a
	Vanadium	0.416	0.400	104	70.0 - 130.0	MS	1/30/2017	16:41	013017a
LLCCVT1									
	Aluminum	4.080	4.000	102	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Antimony	0.122	0.100	122	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Arsenic	1.051	1.000	105	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Barium	0.092	0.100	92	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Beryllium	0.035	0.040	88	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Cadmium	0.038	0.040	95	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Chromium	0.464	0.400	116	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Cobalt	0.039	0.040	98	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Iron	2.031	2.000	102	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Lead	0.038	0.040	95	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Nickel	0.422	0.400	106	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Selenium	2.140	2.000	107	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Silver	0.039	0.040	98	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Thallium	0.039	0.040	98	70.0 - 130.0	MS	1/30/2017	20:30	013017a
	Vanadium	0.420	0.400	105	70.0 - 130.0	MS	1/30/2017	20:30	013017a

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION

 Client: Oregon State University

 SDG No.: K1700171

 Contract: _____ Lab Code: ALSK

Case No.: _____ SAS No.: _____

 Initial Calibration Source: Inorganic Ventures

 Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLCCVT2									
	Aluminum	4.509	4.000	113	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Antimony	0.130	0.100	130	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Arsenic	1.126	1.000	113	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Barium	0.105	0.100	105	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Beryllium	0.039	0.040	98	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Cadmium	0.047	0.040	118	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Chromium	0.456	0.400	114	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Cobalt	0.041	0.040	102	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Iron	2.528	2.000	126	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Lead	0.046	0.040	115	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Nickel	0.420	0.400	105	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Selenium	2.408	2.000	120	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Silver	0.046	0.040	115	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Thallium	0.044	0.040	110	70.0 - 130.0	MS	1/31/2017	00:23	013017a
	Vanadium	0.424	0.400	106	70.0 - 130.0	MS	1/31/2017	00:23	013017a
LLCCVT3									
	Aluminum	4.372	4.000	109	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Antimony	0.127	0.100	127	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Arsenic	1.195	1.000	120	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Barium	0.109	0.100	109	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Beryllium	0.035	0.040	88	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Cadmium	0.044	0.040	110	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Chromium	0.484	0.400	121	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Cobalt	0.046	0.040	115	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Iron	2.362	2.000	118	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Lead	0.046	0.040	115	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Nickel	0.409	0.400	102	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Selenium	2.441	2.000	122	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Silver	0.044	0.040	110	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Thallium	0.045	0.040	112	70.0 - 130.0	MS	1/31/2017	03:26	013017a
	Vanadium	0.450	0.400	112	70.0 - 130.0	MS	1/31/2017	03:26	013017a

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University **SDG No.:** K1700171
Contract: _____ **Lab Code:** ALSK **Case No.:** _____ **SAS No.:** _____
Initial Calibration Source: Inorganic Ventures
Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLICV1									
	Calcium	21.3	20.0	106	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
	Copper	4.60	5.0	92	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
	Magnesium	5.8	5.0	116	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
	Potassium	205.3	200.0	103	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
	Sodium	192.3	200.0	96	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
	Zinc	4.3	4.0	108	70.0 - 130.0	P	1/31/2017	10:31	013117AICP
LLICV1									
	Manganese	1.19	1.0	119	70.0 - 130.0	P	1/31/2017	10:34	013117AICP
LLCCV1									
	Calcium	20.7	20.0	104	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Copper	4.80	5.0	96	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Magnesium	5.3	5.0	106	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Manganese	1.01	1.0	101	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Potassium	224.0	200.0	112	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Sodium	222.8	200.0	111	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
	Zinc	4.3	4.0	108	70.0 - 130.0	P	1/31/2017	13:35	013117AICP
LLCCV2									
	Calcium	20.7	20.0	104	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Copper	4.70	5.0	94	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Magnesium	5.4	5.0	108	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Manganese	1.10	1.0	110	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Potassium	234.7	200.0	117	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Sodium	203.5	200.0	102	70.0 - 130.0	P	1/31/2017	15:19	013117AICP
	Zinc	4.6	4.0	115	70.0 - 130.0	P	1/31/2017	15:19	013117AICP

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION**Client:** Oregon State University**SDG No.:** K1700171**Contract:** _____ **Lab Code:** ALSK**Case No.:** _____ **SAS No.:** _____**Initial Calibration Source:** Inorganic Ventures**Continuing Calibration Source:** ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLCCV3									
	Calcium	21.2	20.0	106	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Copper	4.80	5.0	96	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Magnesium	5.2	5.0	104	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Manganese	0.98	1.0	98	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Potassium	218.2	200.0	109	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Sodium	211.2	200.0	106	70.0 - 130.0	P	1/31/2017	17:01	013117AICP
	Zinc	4.4	4.0	110	70.0 - 130.0	P	1/31/2017	17:01	013117AICP

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATIONClient: Oregon State UniversitySDG No.: K1700171Contract: _____ Lab Code: ALSK

Case No.: _____ SAS No.: _____

Initial Calibration Source: Inorganic VenturesContinuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLICVT1									
	Arsenic	0.986	1.000	99	70.0 - 130.0	MS	1/31/2017	12:56	013117a
	Selenium	2.006	2.000	100	70.0 - 130.0	MS	1/31/2017	12:56	013117a
LLCCVT1									
	Arsenic	1.075	1.000	108	70.0 - 130.0	MS	1/31/2017	13:22	013117a
	Selenium	2.019	2.000	101	70.0 - 130.0	MS	1/31/2017	13:22	013117a

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Antimony	0.009	J	-0.006	J	0.005	J	-0.006	J	6020A
Arsenic	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Barium	0.010	U	0.010	U	0.010	U	0.010	U	6020A
Beryllium	0.006	U	0.006	U	0.006	U	0.006	U	6020A
Cadmium	0.004	U	0.004	U	0.004	U	0.004	U	6020A
Calcium	20.0	U	20.0	U	20.0	U	20.0	U	6010C
Chromium	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Cobalt	0.006	U	0.006	U	0.006	U	0.006	U	6020A
Copper	0.90	U	0.90	U	0.90	U	1.30	J	6010C
Iron	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Lead	-0.0017	J	-0.0016	J	-0.0016	J	-0.0022	J	6020A
Magnesium	5.0	U	5.0	U	5.0	U	5.0	U	6010C
Manganese	0.200	U	0.200	U	0.200	U	0.200	U	6010C
Nickel	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Potassium	40.0	U	40.0	U	40.0	U	40.0	U	6010C
Selenium	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Silver	0.012	U	0.012	U	0.012	U	0.012	U	6020A
Sodium	20.0	U	20.0	U	20.0	U	20.0	U	6010C
Thallium	-0.0021	J	-0.0022	J	-0.0032	J	-0.0030	J	6020A
Vanadium	0.014	U	0.014	U	0.014	U	0.014	U	6020A
Zinc	0.600	U	0.600	U	0.600	U	1.500	J	6010C

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.006	J	-0.007	J	0.008	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.018	J	0.004	U	0.004	U	6020A
Calcium			20.0	U	20.0	U	20.0	U	6010C
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			0.90	U	0.90	U	0.90	U	6010C
Iron			1.0	J	0.4	U	0.4	U	6020A
Lead			-0.0021	J	-0.0018	J	-0.0012	J	6020A
Magnesium			5.0	U	5.0	U	5.0	U	6010C
Manganese			0.200	U	0.200	U	0.200	U	6010C
Nickel			0.04	U	0.04	U	0.04	U	6020A
Potassium			40.0	U	40.0	U	40.0	U	6010C
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.015	J	0.012	U	0.012	U	6020A
Sodium			20.0	U	20.0	U	20.0	U	6010C
Thallium			-0.0031	J	-0.0031	J	-0.0027	J	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A
Zinc			1.000	J	0.900	J	0.700	J	6010C

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.008	J	0.007	J	0.013	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.004	U	0.004	U	0.004	U	6020A
Calcium			20.0	U	20.0	U	20.0	U	6010C
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			1.00	J	1.10	J	1.00	J	6010C
Iron			0.4	U	0.4	U	0.4	U	6020A
Lead			-0.0015	J	-0.0019	J	-0.0011	J	6020A
Magnesium			5.0	U	5.0	U	5.0	U	6010C
Manganese			0.200	U	0.200	U	0.280	J	6010C
Nickel			0.04	U	0.04	U	0.04	U	6020A
Potassium			61.1	J	51.6	J	41.5	J	6010C
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.012	U	0.012	U	0.012	U	6020A
Sodium			20.0	U	20.0	U	20.0	U	6010C
Thallium			-0.0023	J	-0.0027	J	0.0018	U	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A
Zinc			0.600	U	0.600	U	1.200	J	6010C

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.013	J	0.014	J	0.010	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.004	U	0.004	U	0.004	U	6020A
Calcium			20.0	U	20.0	U	20.0	U	6010C
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			1.40	J	1.10	J	1.90	J	6010C
Iron			0.4	U	0.4	U	0.4	U	6020A
Lead			0.0010	U	-0.0012	J	0.0010	U	6020A
Magnesium			5.0	U	5.0	U	5.0	U	6010C
Manganese			0.200	U	0.200	U	0.200	U	6010C
Nickel			0.04	U	0.04	U	0.04	U	6020A
Potassium			40.0	U	40.0	U	52.4	J	6010C
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.012	U	0.012	U	0.012	U	6020A
Sodium			20.0	U	20.0	U	20.0	U	6010C
Thallium			-0.0022	J	-0.0021	J	-0.0018	J	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A
Zinc			0.600	U	0.600	U	0.600	J	6010C

Metals

- 3 -
 BLANKS

Client: Oregon State University **Service Request:** K1700171
Project No.: NA
Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): **WATER**

Preparation Blank Concentration Units (ug/L or mg/kg): **ug/L**

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Arsenic	0.04	U	0.04	U	0.04	U			6020A
Selenium	0.4	U	0.4	U	0.4	U			6020A

Metals

- 4 -

ICP INTERFERENCE CHECK SAMPLE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

ICS Source: Inorganic Ventures

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Calcium	500000.0	500000.0	486500.0	488100.0	98			
Copper	0.0	500.0	-0.8	453.0	91			
Magnesium	500000.0	500000.0	521700.0	520800.0	104			
Manganese	0.0	500.0	0.1	496.6	99			
Potassium	0.0		-81.2	-35.2				
Sodium	0.0		8.1	1.6				
Zinc	0.0	1000.0	0.8	947.6	95			

Metals

- 4 -

ICP INTERFERENCE CHECK SAMPLE
Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-MS-04

ICS Source: Inorganic Ventures

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Aluminum			19072.5	18965.1				
Antimony			0.0	0.0				
Arsenic		25	0.1	24.6	98			
Barium			1.0	1.0				
Beryllium			0.0	0.0				
Cadmium		25	0.0	26.1	104			
Chromium		50	0.7	54.6	109			
Cobalt		50	0.7	51.8	104			
Iron			49292.8	47560.4				
Lead			0.2	0.1				
Nickel		50	0.5	48.9	98			
Selenium		25	0.3	24.0	96			
Silver		13	0.0	12.39	99			
Thallium			0.0	0.0				
Vanadium		50	0.0	55.9	112			

- 4 -

Service Request: K1700171

Project Name: Avian Tissue Project

ICS Source: Inorganic Ventures

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Arsenic		25	0.1	26.5	106			
Selenium		25	0.2	25.2	101			

Metals
- 5A -
SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Bird No. 16-7 GI Tracts

Lab Code: K1700171-007S

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum	75 - 125	893.4		774.8		195.4	61	N	6020A
Antimony	75 - 125	50.246		0.002	U	48.860	103		6020A
Arsenic	75 - 125	18.80		0.13	J	16.32	114		6020A
Barium	75 - 125	104.386		2.250		97.720	105		6020A
Beryllium	75 - 125	5.232		0.165		4.886	104		6020A
Cadmium	75 - 125	8.032		2.908		4.886	105		6020A
Calcium	75 - 125	667		515		162.90	93		6010C
Chromium	75 - 125	56.14		36.84		19.54	99		6020A
Cobalt	75 - 125	53.384		1.888		48.860	105		6020A
Copper		139		124		24.43	61		6010C
Iron		571.8		509.7		97.7	64		6020A
Lead	75 - 125	49.5571		0.2810		48.8599	101		6020A
Magnesium		1010		853		162.90	96		6010C
Manganese		247		210		48.86	76		6010C
Nickel	75 - 125	66.69		16.14		48.86	103		6020A
Potassium		8180		8210		162.90	-18		6010C
Selenium	75 - 125	20.1		1.2		16.3	116		6020A
Silver	75 - 125	5.192		0.006	U	4.886	106		6020A
Sodium		2760		2630		162.90	80		6010C
Thallium	75 - 125	3.6993		0.0009	U	3.2541	114		6020A
Vanadium	75 - 125	53.318		0.390		48.860	108		6020A
Zinc		769		756		48.86	27		6010C

An empty field in the Control Limit column indicates the control limit is not applicable

Metals
- 5A -
SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Bird No. 16-24 GI Tracts

Lab Code: K1700171-024S

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum		1417.7		1064.7		185.8	190		6020A
Antimony	75 - 125	46.955		0.007	J	46.440	101		6020A
Arsenic	75 - 125	18.04		0.28	J	15.51	115		6020A
Barium	75 - 125	124.334		14.231		92.879	119		6020A
Beryllium	75 - 125	5.188		0.180		4.644	108		6020A
Cadmium	75 - 125	7.387		1.906		4.644	118		6020A
Calcium	75 - 125	597		399		154.83	128	N	6010C
Chromium		144.66		118.51		18.58	141		6020A
Cobalt	75 - 125	52.474		1.827		46.440	109		6020A
Copper		133		108		23.22	108		6010C
Iron		1215.7		1080.2		92.9	146		6020A
Lead	75 - 125	49.7155		0.3088		46.4396	106		6020A
Magnesium	75 - 125	730		581		154.83	96		6010C
Manganese	75 - 125	154		101		46.44	114		6010C
Nickel	75 - 125	101.77		49.33		46.44	113		6020A
Potassium		6540		6250		154.83	187		6010C
Selenium	75 - 125	20.2		1.9		15.5	118		6020A
Silver	75 - 125	5.203		0.008	J	4.644	112		6020A
Sodium		2780		2610		154.83	110		6010C
Thallium	75 - 125	3.6309		0.0008	U	3.0929	117		6020A
Vanadium	75 - 125	52.074		1.219		46.440	110		6020A
Zinc		695		595		46.44	215		6010C

An empty field in the Control Limit column indicates the control limit is not applicable

Metals

- 5B -

POST SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Basis: DRY

Matrix: WATER

Sample Name: Bird No. 16-7 GI TractA

Lab Code: K1700171-007A

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Antimony	80 - 120	57.424		0.004		50.0	115		6020A
Arsenic	80 - 120	53.74		0.27		50.0	107		6020A
Barium	80 - 120	58.568		4.575		50.0	108		6020A
Beryllium	80 - 120	53.971		0.335		50.0	107		6020A
Cadmium	80 - 120	62.032		5.913		50.0	112		6020A
Chromium	80 - 120	126.25		74.90		50.0	103		6020A
Cobalt	80 - 120	56.550		3.839		50.0	105		6020A
Iron	80 - 120	1233.3		1036.3		200.0	98		6020A
Lead	80 - 120	51.9793		0.5713		50.0	103		6020A
Nickel	80 - 120	85.02		32.81		50.0	104		6020A
Selenium	80 - 120	57.7		2.5		50.0	110		6020A
Silver	80 - 120	10.341		0.012		10.0	103		6020A
Thallium	80 - 120	50.7352		0.0018		50.0	101		6020A
Vanadium	80 - 120	54.888		0.792		50.0	108		6020A

Metals

- 5B -

POST SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Basis: DRY

Matrix: WATER

Sample Name: Bird No. 16-24 GI TractA

Lab Code: K1700171-024A

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Antimony	80 - 120	58.400		0.014		50.0	117		6020A
Arsenic	80 - 120	51.20		0.60		50.0	101		6020A
Barium	80 - 120	84.149		30.076		50.0	108		6020A
Beryllium	80 - 120	54.259		0.380		50.0	108		6020A
Cadmium	80 - 120	60.807		4.027		50.0	114		6020A
Calcium	80 - 120	23890.0		4214.0		20800	95		6010C
Chromium	80 - 120	307.21		250.46		50.0	114		6020A
Cobalt	80 - 120	57.724		3.862		50.0	108		6020A
Copper	80 - 120	2072.0		1136.0		1040	90		6010C
Iron	80 - 120	2492.6		2282.9		200.0	105		6020A
Lead	80 - 120	53.5096		0.6526		50.0	106		6020A
Magnesium	80 - 120	26410.0		6141.0		20800	97		6010C
Manganese	80 - 120	2973.10		1068.30		2080	92		6010C
Nickel	80 - 120	158.67		104.25		50.0	109		6020A
Potassium	80 - 120	84530.0		66080.0		20800	89		6010C
Selenium	80 - 120	53.4		4.0		50.0	99		6020A
Silver	80 - 120	10.085		0.017		10.0	101		6020A
Sodium	80 - 120	47570.0		27600.0		20800	96		6010C
Thallium	80 - 120	52.1276		0.0018		50.0	104		6020A
Vanadium	80 - 120	58.440		2.576		50.0	112		6020A
Zinc	80 - 120	7948.00		6282.00		2080	80		6010C

Metals
- 6 -
DUPLICATES

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Bird No. 16-7 GI TractD

Lab Code: K1700171-007D

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Aluminum	20	774.8		779.2		0.6		6020A
Antimony		0.002	U	0.002	U			6020A
Arsenic		0.13	J	0.15	J	14.3		6020A
Barium	20	2.250		2.894		25.0	*	6020A
Beryllium	20	0.165		0.171		3.6		6020A
Cadmium	20	2.908		3.014		3.6		6020A
Calcium	20	515		515		0.0		6010C
Chromium	20	36.84		37.83		2.7		6020A
Cobalt	20	1.888		1.900		0.6		6020A
Copper	20	124		128		3.2		6010C
Iron	20	509.7		504.5		1.0		6020A
Lead	20	0.2810		0.2643		6.1		6020A
Magnesium	20	853		855		0.2		6010C
Manganese	20	210		209		0.5		6010C
Nickel	20	16.14		16.89		4.5		6020A
Potassium	20	8210		8160		0.6		6010C
Selenium		1.2		1.3		8.0		6020A
Silver		0.006	U	0.006	U			6020A
Sodium	20	2630		2630		0.0		6010C
Thallium		0.0009	U	0.0009	U			6020A
Vanadium		0.390		0.357		8.8		6020A
Zinc	20	756		760		0.5		6010C

An empty field in the Control Limit column indicates the control limit is not applicable.

Metals
- 6 -
DUPLICATES

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Bird No. 16-24 GI TractD

Lab Code: K1700171-024D

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Aluminum	20	1064.7		1127.8		5.8		6020A
Antimony		0.007	J	0.007	J	0.0		6020A
Arsenic		0.28	J	0.29	J	3.5		6020A
Barium	20	14.231		15.693		9.8		6020A
Beryllium	20	0.180		0.203		12.0		6020A
Cadmium	20	1.906		1.941		1.8		6020A
Calcium	20	399		441		10.0		6010C
Chromium	20	118.51		125.78		6.0		6020A
Cobalt	20	1.827		1.891		3.4		6020A
Copper	20	108		108		0.0		6010C
Iron	20	1080.2		1113.8		3.1		6020A
Lead	20	0.3088		0.3149		2.0		6020A
Magnesium	20	581		553		4.9		6010C
Manganese	20	101		101		0.0		6010C
Nickel	20	49.33		52.54		6.3		6020A
Potassium	20	6250		6220		0.5		6010C
Selenium		1.9		1.7		11.1		6020A
Silver		0.008	J	0.005	U	200.0		6020A
Sodium	20	2610		2600		0.4		6010C
Thallium		0.0009	U	0.0014	J	200.0		6020A
Vanadium	20	1.219		1.452		17.4		6020A
Zinc	20	595		610		2.5		6010C

An empty field in the Control Limit column indicates the control limit is not applicable.

Metals

- 7 -

LABORATORY CONTROL SAMPLE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

Aqueous LCS Source: ALS MIXED

Solid LCS Source:

Analyte	Aqueous (ug/L)			Solid (mg/kg)					
	True	Found	%R	True	Found	C	Limits	%R	
Aluminum	2000	1898	95						
Antimony	500	506	101						
Arsenic	167	199	119						
Barium	1000	1025	102						
Beryllium	50.0	50.3	101						
Cadmium	50.0	54.1	108						
Calcium	1667	1860	112						
Chromium	200	213	106						
Cobalt	500	518	104						
Copper	250	250	100						
Iron	1000	1022	102						
Lead	500	514	103						
Magnesium	1667	1840	110						
Manganese	500	488	98						
Nickel	500	522	104						
Potassium	1667	1910	115						
Selenium	167	188	113						
Silver	50.0	54.4	109						
Sodium	1667	1920	115						
Thallium	33	37	111						
Vanadium	500	529	106						
Zinc	500	499	100						

Metals

- 7 -

LABORATORY CONTROL SAMPLE

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

Aqueous LCS Source: ALS MIXED

Solid LCS Source:

Analyte	Aqueous (ug/L)			Solid (mg/kg)				
	True	Found	%R	True	Found	C	Limits	%R
Aluminum	2000	1941	97					
Antimony	500	525	105					
Arsenic	167	189	113					
Barium	1000	1066	107					
Beryllium	50.0	51.1	102					
Cadmium	50.0	55.0	110					
Calcium	1667	1870	112					
Chromium	200	220	110					
Cobalt	500	545	109					
Copper	250	250	100					
Iron	1000	1081	108					
Lead	500	528	106					
Magnesium	1667	1870	112					
Manganese	500	495	99					
Nickel	500	537	107					
Potassium	1667	1890	113					
Selenium	167	191	114					
Silver	50.0	52.7	105					
Sodium	1667	1880	113					
Thallium	33	39	117					
Vanadium	500	546	109					
Zinc	500	505	101					

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700171
Date Collected: NA
Date Received: NA
Date Extracted: 01/29/17
Date Analyzed: 01/30-31/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700171-SRM1
Test Notes: Dorm-4 Solids = 94.5%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Dorm-4

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	6.8	7.5	110	4.93-8.93	
Cadmium	PSEP Tissue	6020A	0.306	0.354	116	0.233 - 0.385	
Chromium	PSEP Tissue	6020A	1.87	2.68	143	1.37-2.44	X
Copper	PSEP Tissue	6010C	15.9	15.1	95	12.0 - 20.2	
Iron	PSEP Tissue	6020A	341	363	106	251-442	
Lead	PSEP Tissue	6020A	0.416	0.354	85	0.290 - 0.563	
Nickel	PSEP Tissue	6020A	1.36	1.72	126	0.912-1.9	
Selenium	PSEP Tissue	6020A	3.56	4.35	122	2.58 - 4.68	
Zinc	PSEP Tissue	6010C	52.20	52.7	101	39.2 - 66.5	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700171
Date Collected: NA
Date Received: NA
Date Extracted: 01/29/17
Date Analyzed: 01/30-31/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700171-SRM2
Test Notes: Tort-3 Solids = 99.1%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Tort-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	59.5	69.3	116	44.6-76.0	
Cadmium	PSEP Tissue	6020A	42.3	44.2	104	32.4-52.9	
Chromium	PSEP Tissue	6020A	1.95	1.94	99	1.37-2.63	
Copper	PSEP Tissue	6010C	497	430	87	380-623	
Iron	PSEP Tissue	6020A	179	170	95	137-224	
Lead	PSEP Tissue	6020A	0.225	0.190	84	0.166-0.292	
Manganese	PSEP Tissue	6010C	15.6	14.4	92	11.7-19.9	
Nickel	PSEP Tissue	6020A	5.3	5.1	96	4.05-6.65	
Selenium	PSEP Tissue	6020A	10.9	11.8	108	7.9-14.3	
Vanadium	PSEP Tissue	6020A	9.1	9.2	101	7.0-11.4	
Zinc	PSEP Tissue	6010C	136	133	98	104-170	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700171
Date Collected: NA
Date Received: NA
Date Extracted: 01/29/17
Date Analyzed: 01/30-31/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700171-SRM3
Test Notes: Dorm-4 Solids = 94.5%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Dorm-4

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	6.8	7.8	115	4.93-8.93	
Cadmium	PSEP Tissue	6020A	0.306	0.324	106	0.233 - 0.385	
Chromium	PSEP Tissue	6020A	1.87	1.91	102	1.37-2.44	
Copper	PSEP Tissue	6010C	15.9	15.4	97	12.0 - 20.2	
Iron	PSEP Tissue	6020A	341	365	107	251-442	
Lead	PSEP Tissue	6020A	0.416	0.367	88	0.290 - 0.563	
Nickel	PSEP Tissue	6020A	1.36	1.33	98	0.912-1.9	
Selenium	PSEP Tissue	6020A	3.56	4.25	119	2.58 - 4.68	
Zinc	PSEP Tissue	6010C	52.20	53.3	102	39.2 - 66.5	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700171
Date Collected: NA
Date Received: NA
Date Extracted: 01/29/17
Date Analyzed: 01/30-31/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700171-SRM4
Test Notes: Tort-3 Solids = 99.1%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Tort-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	59.5	68.6	115	44.6-76.0	
Cadmium	PSEP Tissue	6020A	42.3	45.2	107	32.4-52.9	
Chromium	PSEP Tissue	6020A	1.95	1.94	99	1.37-2.63	
Copper	PSEP Tissue	6010C	497	427	86	380-623	
Iron	PSEP Tissue	6020A	179	176	98	137-224	
Lead	PSEP Tissue	6020A	0.225	0.203	90	0.166-0.292	
Manganese	PSEP Tissue	6010C	15.6	14.2	91	11.7-19.9	
Nickel	PSEP Tissue	6020A	5.3	5.3	100	4.05-6.65	
Selenium	PSEP Tissue	6020A	10.9	11.6	106	7.9-14.3	
Vanadium	PSEP Tissue	6020A	9.1	9.6	105	7.0-11.4	
Zinc	PSEP Tissue	6010C	136	132	97	104-170	

Metals

- 9 -

ICP SERIAL DILUTIONS
Client: Oregon State University

Service Request: K1700171

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Sample Name: Bird No. 16-7 GI TractL

Lab Code: K1700171-007L

Analyte	Initial Sample Result (I) C	Serial Dilution Result (S) C	% Differ- ence	Q	M
Aluminum	1575.3	1633.3	4		MS
Antimony	0.004 U	0.020 U			MS
Arsenic	0.27 J	0.33 J	22		MS
Barium	4.575	4.509	1		MS
Beryllium	0.335	0.333	1		MS
Cadmium	5.913	5.616	5		MS
Calcium	5236.0	5420.0	3.5		P
Chromium	74.90	74.29	1		MS
Cobalt	3.839	3.795	1		MS
Copper	1264.0	1320.5	4.5		P
Iron	1036.3	1020.4	2		MS
Lead	0.5713	0.5505	4		MS
Magnesium	8429.0	8670.0	2.9		P
Manganese	2133.70	2172.65	1.8		P
Nickel	32.81	33.98	4		MS
Potassium	83510.0	84550.0	1.2		P
Selenium	2.5	2.7 J	8		MS
Silver	0.012 U	0.060 U			MS
Sodium	26780.0	27105.0	1.2		P
Thallium	0.0018 U	0.0090 U			MS
Vanadium	0.792	0.715 J	10		MS
Zinc	7690.00	7740.00	0.7		P

Metals

- 9 -

ICP SERIAL DILUTIONS
Client: Oregon State University

Service Request: K1700171

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Sample Name: Bird No. 16-24 GI TractL

Lab Code: K1700171-024L

Analyte	Initial Sample Result (I) C	Serial Dilution Result (S) C	% Differ- ence	Q	M
Aluminum	2250.0	2210.8	2		MS
Antimony	0.014 J	0.020 U	100.0		MS
Arsenic	0.60 J	0.67 J	12		MS
Barium	30.076	27.978	7		MS
Beryllium	0.380	0.350	8		MS
Cadmium	4.027	3.885	4		MS
Calcium	4214.0	4431.5	5.2		P
Chromium	250.46	243.19	3		MS
Cobalt	3.862	3.830	1		MS
Copper	1136.0	1187.0	4.5		P
Iron	2282.9	2227.8	2		MS
Lead	0.6526	0.6429	1		MS
Magnesium	6141.0	6300.0	2.6		P
Manganese	1068.30	1086.65	1.7		P
Nickel	104.25	101.29	3		MS
Potassium	66080.0	65750.0	0.5		P
Selenium	4.0	5.5 J	38		MS
Silver	0.017 J	0.060 U	100.0		MS
Sodium	27600.0	27460.0	0.5		P
Thallium	0.0018 U	0.0090 U			MS
Vanadium	2.576	2.559	1		MS
Zinc	6282.00	6360.00	1.2		P

- 10 -

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP/ICP-MS ID #:

GFAA ID #:

AA ID #:

Analyte	Wave-length (nm)	Back-ground	MRL ug/L	MDL ug/L	M
Calcium	393.3		40.0	20.0	P
Copper	327.3		4.0	0.9	P
Magnesium	279.5		10.0	5.0	P
Manganese	257.6		1.00	0.20	P
Potassium	766.5		200.0	40.0	P
Sodium	589.5		200.0	20.0	P
Zinc	206.2		4.00	0.60	P

Comments:

Metals

- 10 -

DETECTION LIMITS**Client:** Oregon State University**Service Request:** K1700171**Project No.:** NA**Project Name:** Avian Tissue Project**ICP/ICP-MS ID #:** K-ICP-MS-04**GFAA ID #:****AA ID #:**

Analyte	Isotope	Back-ground	MRL ug/L	MDL ug/L	M
Aluminum	27		4.0	0.4	MS
Antimony	123		0.100	0.004	MS
Arsenic	75		1.00	0.04	MS
Barium	137		0.100	0.010	MS
Beryllium	9		0.040	0.006	MS
Cadmium	111		0.040	0.004	MS
Chromium	52		0.40	0.04	MS
Cobalt	59		0.040	0.006	MS
Iron	56		2.0	0.4	MS
Lead	208		0.0400	0.0010	MS
Nickel	60		0.40	0.04	MS
Selenium	78		2.0	0.4	MS
Silver	107		0.040	0.012	MS
Thallium	205		0.0400	0.0018	MS
Vanadium	51		0.400	0.014	MS

Comments:

Metals

- 11A -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Al	Ca	Fe	Mg	Ag
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	-0.0001350	0.0000000	0.0000000
Arsenic	189.042	0.0000420	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000070	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	-0.0006190	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000620	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0000150	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	-0.0000970	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000140	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000130	0.0000000	0.0000310	0.0000000

Comments:

Metals

- 11A -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	0.0000000	-0.0000420	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0001090	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		As	B	Ba	Be	Cd
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.042	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	-0.0001240
Cobalt	228.616	0.0000000	0.0000000	-0.0001140	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Co	Cr	Cu	K	Li
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	-0.0004810	0.0000000	0.0000000
Arsenic	189.042	0.0000000	0.0005710	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0025040	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0000520	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0002840	0.0000000	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0003570	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0001760	0.0000000	0.0000000
Nickel	231.604	-0.0001780	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0016430	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	-0.0025430	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0007230	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Mn	Mo	Na	Ni	Pb
	182.034	0.0041380	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	-0.0007310	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.042	-0.0003130	0.0017060	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	-0.0000720	-0.0004190	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	-0.0019530	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	-0.0000310	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	-0.0011810	0.0000000	0.0000990	0.0000000
Copper	327.396	0.0000000	-0.0002870	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	-0.0005980	0.0000000	0.0002670	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0004730	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0123240	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0016500	0.0001830	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	-0.0005630	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0001330	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Vanadium	292.402	-0.0002140	0.0000000	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	-0.0001370	0.0000000	0.0060370	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		P	Sb	Se	Si	Sn
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.042	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0001370	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Sr	Ti	Tl	V	Zn
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	0.0000000	0.0023400	0.0000000
Arsenic	189.042	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	0.0000000	-0.0004790	0.0000000
Cadmium	226.502	0.0000000	0.0000240	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0025120	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0001450	0.0000000	-0.0001220	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000820	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0008000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	0.0004600	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	-0.0005560	0.0000000	0.0000000	0.0000000

Comments:

Metals
 -12-
 ICP LINEAR RANGES (QUARTERLY)

Client: Oregon State University Service Request: K1700171
 Project No.: NA
 Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	Method
Calcium	15.000	900000	6010C
Copper	15.000	90000	6010C
Magnesium	15.000	90000	6010C
Manganese	15.000	9000	6010C
Potassium	15.000	450000	6010C
Sodium	15.000	450000	6010C
Zinc	15.000	18000	6010C

Comments:

Metals

-12-

ICP LINEAR RANGES (QUARTERLY)

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-MS-04

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	Method
Aluminum	45.000	18000	6020A
Antimony	45.000	900	6020A
Arsenic	45.000	3000	6020A
Barium	45.000	3000	6020A
Beryllium	45.000	900	6020A
Cadmium	45.000	3000	6020A
Chromium	45.000	3000	6020A
Cobalt	45.000	3000	6020A
Iron	45.000	18000	6020A
Lead	45.000	3000	6020A
Nickel	45.000	3000	6020A
Selenium	45.000	3000	6020A
Silver	45.000	900	6020A
Thallium	45.000	3000	6020A
Vanadium	45.000	3000	6020A

Comments:

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

Method: P

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700171-001	1/29/2017	0.3240	30.0
K1700171-002	1/29/2017	0.3110	30.0
K1700171-003	1/29/2017	0.3140	30.0
K1700171-004	1/29/2017	0.3230	30.0
K1700171-005	1/29/2017	0.3010	30.0
K1700171-006	1/29/2017	0.3200	30.0
K1700171-007	1/29/2017	0.3050	30.0
K1700171-007D	1/29/2017	0.3150	30.0
K1700171-007S	1/29/2017	0.3070	30.0
K1700171-008	1/29/2017	0.3090	30.0
K1700171-009	1/29/2017	0.3190	30.0
K1700171-010	1/29/2017	0.3220	30.0
K1700171-011	1/29/2017	0.3170	30.0
K1700171-012	1/29/2017	0.3020	30.0
K1700171-013	1/29/2017	0.3120	30.0
K1700171-014	1/29/2017	0.3050	30.0
K1700171-015	1/29/2017	0.3060	30.0
K1700171-016	1/29/2017	0.3120	30.0
K1700171-017	1/29/2017	0.3100	30.0
K1700171-018	1/29/2017	0.3240	30.0
K1700171-019	1/29/2017	0.3120	30.0
K1700171-020	1/29/2017	0.3030	30.0
KQ1700681-01	1/29/2017	0.3000	30.0
KQ1700681-02	1/29/2017	30.0	30.0
KQ1700681-03	1/29/2017	0.3060	30.0
KQ1700681-04	1/29/2017	0.3040	30.0

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

Method: P

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700171-021	1/29/2017	0.3110	30.0
K1700171-022	1/29/2017	0.3140	30.0
K1700171-023	1/29/2017	0.3140	30.0
K1700171-024	1/29/2017	0.3170	30.0
K1700171-024D	1/29/2017	0.3330	30.0
K1700171-024S	1/29/2017	0.3230	30.0
K1700171-025	1/29/2017	0.3120	30.0
KQ1700682-01	1/29/2017	0.3000	30.0
KQ1700682-02	1/29/2017	30.0	30.0
KQ1700682-03	1/29/2017	0.3010	30.0
KQ1700682-04	1/29/2017	0.3000	30.0

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

Method: MS

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700171-001	1/29/2017	0.3240	30.0
K1700171-002	1/29/2017	0.3110	30.0
K1700171-003	1/29/2017	0.3140	30.0
K1700171-004	1/29/2017	0.3230	30.0
K1700171-005	1/29/2017	0.3010	30.0
K1700171-006	1/29/2017	0.3200	30.0
K1700171-007	1/29/2017	0.3050	30.0
K1700171-007D	1/29/2017	0.3150	30.0
K1700171-007S	1/29/2017	0.3070	30.0
K1700171-008	1/29/2017	0.3090	30.0
K1700171-009	1/29/2017	0.3190	30.0
K1700171-010	1/29/2017	0.3220	30.0
K1700171-011	1/29/2017	0.3170	30.0
K1700171-012	1/29/2017	0.3020	30.0
K1700171-013	1/29/2017	0.3120	30.0
K1700171-014	1/29/2017	0.3050	30.0
K1700171-015	1/29/2017	0.3060	30.0
K1700171-016	1/29/2017	0.3120	30.0
K1700171-017	1/29/2017	0.3100	30.0
K1700171-018	1/29/2017	0.3240	30.0
K1700171-019	1/29/2017	0.3120	30.0
K1700171-020	1/29/2017	0.3030	30.0
KQ1700681-01	1/29/2017	0.3000	30.0
KQ1700681-02	1/29/2017	30.0	30.0
KQ1700681-03	1/29/2017	0.3060	30.0
KQ1700681-04	1/29/2017	0.3040	30.0

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Project Name: Avian Tissue Project

Method: MS

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700171-021	1/29/2017	0.3110	30.0
K1700171-022	1/29/2017	0.3140	30.0
K1700171-023	1/29/2017	0.3140	30.0
K1700171-024	1/29/2017	0.3170	30.0
K1700171-024D	1/29/2017	0.3330	30.0
K1700171-024S	1/29/2017	0.3230	30.0
K1700171-025	1/29/2017	0.3120	30.0
KQ1700682-01	1/29/2017	0.3000	30.0
KQ1700682-02	1/29/2017	30.0	30.0
KQ1700682-03	1/29/2017	0.3010	30.0
KQ1700682-04	1/29/2017	0.3000	30.0

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K E	S E	A G	N A	T L	V
BLK	1.0	10:15							X			X			X	X			X			X			X
STD A	1.0	10:17							X			X			X	X									X
STD B	1.0	10:20							X						X				X			X			
ICV1	1.0	10:22							X						X										
ICV1	1.0	10:25							X			X			X	X			X			X			X
ICB1	1.0	10:29							X			X			X	X			X			X			X
LLICV1	1.0	10:31							X			X			X				X			X			X
LLICV1	1.0	10:34														X									
ZZZZZZ	1.0	10:37																							
CCV1	1.0	10:39							X						X				X			X			
CCV1	1.0	10:42							X			X			X	X									X
CCB1	1.0	10:44							X			X			X	X			X			X			X
ICS-A1	1.0	10:46							X			X			X	X			X			X			X
ICS-AB1	1.0	10:49							X			X			X	X			X			X			X
ZZZZZZ	1.0	10:52																							
ZZZZZZ	1.0	10:58																							
ZZZZZZ	1.0	11:01																							
ZZZZZZ	1.0	11:03																							
ZZZZZZ	1.0	11:05																							
ZZZZZZ	1.0	11:08																							
ZZZZZZ	1.0	11:10																							
ZZZZZZ	5.0	11:13																							
ZZZZZZ	1.0	11:15																							
ZZZZZZ	1.0	11:17																							
CCV2	1.0	11:20							X						X				X			X			
CCV2	1.0	11:22							X			X			X	X									X
CCB2	1.0	11:25							X			X			X	X			X			X			X
ZZZZZZ	1.0	11:27																							
ZZZZZZ	1.0	11:30																							
ZZZZZZ	1.0	11:32																							
ZZZZZZ	1.0	11:35																							
ZZZZZZ	1.0	11:37																							

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																											
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K S	S E	A G	N A	T L	V	Z N	C N				
ZZZZZZ	1.0	11:40																													
ZZZZZZ	1.0	11:42																													
ZZZZZZ	1.0	11:45																													
ZZZZZZ	1.0	11:47																													
ZZZZZZ	1.0	11:50																													
CCV3	1.0	11:52							X					X				X			X										
CCV3	1.0	11:55							X			X		X	X										X						
CCB3	1.0	11:57							X			X			X	X			X			X			X						
ZZZZZZ	1.0	11:59																													
ZZZZZZ	1.0	12:02																													
ZZZZZZ	1.0	12:04																													
ZZZZZZ	1.0	12:07																													
ZZZZZZ	1.0	12:09																													
ZZZZZZ	1.0	12:11																													
ZZZZZZ	1.0	12:14																													
ZZZZZZ	1.0	12:16																													
ZZZZZZ	1.0	12:19																													
ZZZZZZ	1.0	12:21																													
CCV4	1.0	12:24							X					X				X			X										
CCV4	1.0	12:26							X			X			X	X									X						
CCB4	1.0	12:28							X			X			X	X			X			X			X						
ZZZZZZ	1.0	12:31																													
ZZZZZZ	1.0	12:33																													
ZZZZZZ	1.0	12:36																													
ZZZZZZ	1.0	12:38																													
ZZZZZZ	5.0	12:41																													
ZZZZZZ	1.0	12:43																													
ZZZZZZ	1.0	12:45																													
ZZZZZZ	1.0	12:48																													
ZZZZZZ	1.0	12:50																													
ZZZZZZ	1.0	12:53																													
CCV5	1.0	12:55							X						X				X			X									

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K S	S E	A G	N A	T L	V
CCV5	1.0	12:58							X			X			X	X								X	
CCB5	1.0	13:00							X			X			X	X			X			X		X	
ZZZZZZ	1.0	13:02																							
ZZZZZZ	1.0	13:05																							
ZZZZZZ	1.0	13:07																							
ZZZZZZ	1.0	13:10																							
ZZZZZZ	1.0	13:12																							
ZZZZZZ	1.0	13:15																							
ZZZZZZ	1.0	13:17																							
ZZZZZZ	1.0	13:20																							
ZZZZZZ	1.0	13:22																							
ZZZZZZ	1.0	13:25																							
CCV6	1.0	13:27							X						X				X			X			
CCV6	1.0	13:30							X			X			X	X									X
CCB6	1.0	13:32							X			X			X	X			X			X			X
LLCCV1	1.0	13:35							X			X			X	X			X			X			X
ZZZZZZ	1.0	13:38																							
ZZZZZZ	1.0	13:41																							
ZZZZZZ	1.0	13:43																							
ZZZZZZ	1.0	13:46																							
ZZZZZZ	1.0	13:48																							
ZZZZZZ	1.0	13:51																							
KQ1700681-01	1.0	13:53							X			X			X	X			X			X			X
KQ1700681-02	1.0	13:55							X			X			X	X			X			X			X
KQ1700681-03	1.0	13:58																							
KQ1700681-04	1.0	14:00																							
K1700171-001	1.0	14:03							X			X			X	X			X			X			X
CCV7	1.0	14:05							X						X				X			X			
CCV7	1.0	14:08							X			X			X	X									X
CCB7	1.0	14:10							X			X			X	X			X			X			X
K1700171-002	1.0	14:12							X			X			X	X			X			X			X
K1700171-003	1.0	14:15							X			X			X	X			X			X			X

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																							
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K S	S E	A G	N A	T L	V	Z N	C N
K1700171-004	1.0	14:17							X			X			X	X			X			X			X		
K1700171-005	1.0	14:20							X			X			X	X			X			X			X		
K1700171-006	1.0	14:22							X			X			X	X			X			X			X		
K1700171-007	1.0	14:24							X			X			X	X			X			X			X		
K1700171-007D	1.0	14:27							X			X			X	X			X			X			X		
K1700171-007L	5.0	14:29							X			X			X	X			X			X			X		
K1700171-007S	1.0	14:31							X			X			X	X			X			X			X		
K1700171-008	1.0	14:34							X			X			X	X			X			X			X		
CCV8	1.0	14:36							X						X				X			X					
CCV8	1.0	14:39							X			X			X	X									X		
CCB8	1.0	14:41							X			X			X	X			X			X			X		
K1700171-009	1.0	14:43							X			X			X	X			X			X			X		
K1700171-010	1.0	14:46							X			X			X	X			X			X			X		
K1700171-011	1.0	14:48							X			X			X	X			X			X			X		
K1700171-012	1.0	14:50							X			X			X	X			X			X			X		
K1700171-013	1.0	14:53							X			X			X	X			X			X			X		
K1700171-014	1.0	14:55							X			X			X	X			X			X			X		
K1700171-015	1.0	14:58							X			X			X	X			X			X			X		
K1700171-016	1.0	15:00							X			X			X	X			X			X			X		
K1700171-017	1.0	15:02							X			X			X	X			X			X			X		
K1700171-018	1.0	15:05							X			X			X	X			X			X			X		
CCV9	1.0	15:08							X						X				X			X					
CCV9	1.0	15:10							X			X			X	X									X		
CCB9	1.0	15:12							X			X			X	X			X			X			X		
ZZZZZZ	1.0	15:15																									
LLCCV2	1.0	15:19							X			X			X	X			X			X			X		
ZZZZZZ	1.0	15:22																									
K1700171-019	1.0	15:24							X			X			X	X			X			X			X		
K1700171-020	1.0	15:27							X			X			X	X			X			X			X		
KQ1700682-01	1.0	15:29							X			X			X	X			X			X			X		
KQ1700682-02	1.0	15:32							X			X			X	X			X			X			X		
KQ1700682-03	1.0	15:34																									

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Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
KQ1700682-04	1.0	15:36																							
ZZZZZZ	1.0	15:39																							
ZZZZZZ	1.0	15:41																							
ZZZZZZ	1.0	15:44																							
ZZZZZZ	1.0	15:46																							
CCV10	1.0	15:48							X						X				X			X			
CCV10	1.0	15:51							X			X			X	X									X
CCB10	1.0	15:53							X			X			X	X			X			X			X
ZZZZZZ	1.0	15:56																							
ZZZZZZ	1.0	15:58																							
ZZZZZZ	1.0	16:01																							
ZZZZZZ	1.0	16:03																							
ZZZZZZ	1.0	16:06																							
ZZZZZZ	1.0	16:08																							
K1700171-021	1.0	16:10							X			X			X	X			X			X			X
K1700171-022	1.0	16:13							X			X			X	X			X			X			X
K1700171-023	1.0	16:15							X			X			X	X			X			X			X
K1700171-024	1.0	16:17							X			X			X	X			X			X			X
CCV11	1.0	16:20							X						X				X			X			
CCV11	1.0	16:22							X			X			X	X									X
CCB11	1.0	16:25							X			X			X	X			X			X			X
K1700171-024D	1.0	16:27							X			X			X	X			X			X			X
K1700171-024L	5.0	16:30							X			X			X	X			X			X			X
K1700171-024S	1.0	16:32							X			X			X	X			X			X			X
K1700171-025	1.0	16:34							X			X			X	X			X			X			X
ZZZZZZ	10.0	16:37																							
ZZZZZZ	1.0	16:39																							
ZZZZZZ	10.0	16:42																							
K1700171-024A	1.0	16:44							X			X			X	X			X			X			X
CCV12	1.0	16:46							X						X				X			X			
CCV12	1.0	16:49							X			X			X	X									X
ZZZZZZ	1.0	16:51																							

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Run Number: 013117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
CCB12	1.0	16:54								X			X			X	X			X			X		X
ZZZZZZ	1.0	16:56																							
ZZZZZZ	1.0	16:59																							
LLCCV3	1.0	17:01								X			X			X	X			X			X		X

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Run Number: 013017a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/30/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
Blank	1.0	16:14		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
Standard 1	1.0	16:19		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ICV1	1.0	16:23		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCV1	1.0	16:28		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ICB1	1.0	16:32		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB1	1.0	16:37		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
LLICVT1	1.0	16:41		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ICS-A1	1.0	16:46		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ICS-AB1	1.0	16:50		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	16:55																							
ZZZZZZ	5.0	16:59																							
ZZZZZZ	5.0	17:04																							
ZZZZZZ	5.0	17:08																							
ZZZZZZ	5.0	17:13																							
ZZZZZZ	5.0	17:17																							
ZZZZZZ	5.0	17:22																							
ZZZZZZ	5.0	17:26																							
CCV2	1.0	17:31		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB2	1.0	17:35		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	17:40																							
ZZZZZZ	5.0	17:44																							
ZZZZZZ	5.0	17:49																							
ZZZZZZ	5.0	17:53																							
ZZZZZZ	5.0	17:58																							
ZZZZZZ	5.0	18:02																							
ZZZZZZ	5.0	18:07																							
ZZZZZZ	5.0	18:11																							
ZZZZZZ	5.0	18:16																							
ZZZZZZ	5.0	18:20																							
CCV3	1.0	18:25		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	18:29																							
CCB3	1.0	18:33		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Run Number: 013017a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/30/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
ZZZZZZ	5.0	18:38																							
ZZZZZZ	5.0	18:42																							
ZZZZZZ	5.0	18:47																							
ZZZZZZ	5.0	18:51																							
ZZZZZZ	5.0	18:56																							
ZZZZZZ	5.0	19:00																							
ZZZZZZ	5.0	19:05																							
ZZZZZZ	5.0	19:09																							
ZZZZZZ	5.0	19:14																							
ZZZZZZ	5.0	19:18																							
CCV4	1.0	19:23		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB4	1.0	19:27		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	19:32																							
ZZZZZZ	5.0	19:36																							
ZZZZZZ	5.0	19:41																							
ZZZZZZ	5.0	19:45																							
ZZZZZZ	5.0	19:50																							
ZZZZZZ	5.0	19:54																							
ZZZZZZ	5.0	19:59																							
ZZZZZZ	5.0	20:03																							
ZZZZZZ	5.0	20:08																							
ZZZZZZ	5.0	20:12																							
CCV5	1.0	20:17		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	20:21																							
CCB5	1.0	20:25		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
LLCCVT1	1.0	20:30		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	20:34																							
ZZZZZZ	5.0	20:39																							
ZZZZZZ	5.0	20:43																							
ZZZZZZ	5.0	20:48																							
ZZZZZZ	5.0	20:52																							
ZZZZZZ	5.0	20:57																							

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Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Run Number: 013017a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/30/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
ZZZZZZ	5.0	21:01																							
ZZZZZZ	5.0	21:06																							
ZZZZZZ	5.0	21:10																							
ZZZZZZ	5.0	21:15																							
ZZZZZZ	5.0	21:19																							
CCV6	1.0	21:24		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB6	1.0	21:28		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	5.0	21:33																							
ZZZZZZ	5.0	21:37																							
ZZZZZZ	5.0	21:42																							
ZZZZZZ	5.0	21:46																							
ZZZZZZ	5.0	21:51																							
ZZZZZZ	5.0	21:55																							
ZZZZZZ	5.0	22:00																							
ZZZZZZ	5.0	22:04																							
ZZZZZZ	5.0	22:09																							
KQ1700681-01	5.0	22:13		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCV7	1.0	22:18		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB7	1.0	22:22		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
KQ1700681-02	5.0	22:27		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
KQ1700681-03	5.0	22:31																							
KQ1700681-04	5.0	22:36																							
K1700171-001	5.0	22:40		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-002	5.0	22:45		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-003	5.0	22:49		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-004	5.0	22:54		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-005	5.0	22:58		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-006	5.0	23:03		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-007	5.0	23:07		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCV8	1.0	23:12		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB8	1.0	23:16		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-007D	5.0	23:21		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Run Number: 013017a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/30/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
K1700171-007L	5.0	23:25		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-007A	5.0	23:29			X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-007S	5.0	23:34		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-008	5.0	23:38		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-009	5.0	23:43		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-010	5.0	23:47		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-011	5.0	23:52		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-012	5.0	23:56		X	X		X	X	X		X	X		X	X				X		X		X	X	
K1700171-013	5.0	00:01		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	00:05																							
CCV9	1.0	00:10		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
CCB9	1.0	00:14		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	00:19																							
LLCCVT2	1.0	00:23		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-014	5.0	00:28		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-015	5.0	00:32		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-016	5.0	00:37		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-017	5.0	00:41		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-018	5.0	00:45		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-019	5.0	00:50		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
K1700171-020	5.0	00:54		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
KQ1700682-01	5.0	00:59		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
KQ1700682-02	5.0	01:03		X	X		X	X	X		X	X		X	X				X		X	X		X	X
KQ1700682-03	5.0	01:08																							
CCV10	1.0	01:12		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
ZZZZZZ	1.0	01:17																							
CCB10	1.0	01:21		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X
KQ1700682-04	5.0	01:26																							
ZZZZZZ	5.0	01:30																							
ZZZZZZ	5.0	01:35																							
ZZZZZZ	5.0	01:39																							
ZZZZZZ	5.0	01:44																							

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Run Number: 013017a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/30/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																							
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V	Z N	C N
ZZZZZZ	5.0	01:48																									
ZZZZZZ	5.0	01:53																									
ZZZZZZ	5.0	01:57																									
ZZZZZZ	5.0	02:02																									
ZZZZZZ	5.0	02:06																									
ZZZZZZ	1.0	02:11																									
CCV11	1.0	02:15		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X		
CCB11	1.0	02:19		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X		
ZZZZZZ	5.0	02:24																									
K1700171-021	5.0	02:28		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X		
K1700171-022	5.0	02:33		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X		
K1700171-023	5.0	02:37		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X		
K1700171-024	5.0	02:42		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X		
K1700171-024D	5.0	02:46		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X		
K1700171-024L	5.0	02:51		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X		
K1700171-024A	5.0	02:55			X	X	X	X	X		X	X		X	X				X		X	X		X	X		
K1700171-024S	5.0	03:00		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X		
K1700171-025	5.0	03:04		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X		
CCV12	1.0	03:09									X	X													X		
CCV12	1.0	03:13		X	X	X	X	X	X					X	X				X		X	X		X			
CCB12	1.0	03:18		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X		
ZZZZZZ	1.0	03:22																									
LLCCVT3	1.0	03:26		X	X	X	X	X	X		X	X		X	X				X		X	X		X	X		

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700171

Project No.: NA

Run Number: 013117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 1/31/2017

End Date: 1/31/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
Blank	1.0	12:41				X															X				
Standard 1	1.0	12:43				X															X				
ICV2	1.0	12:46				X															X				
CCV1	1.0	12:48				X															X				
ICB2	1.0	12:51				X															X				
CCB1	1.0	12:54				X															X				
LLICVT1	1.0	12:56				X															X				
ICS-A1	1.0	12:59				X															X				
ICS-AB1	1.0	13:01				X															X				
ZZZZZZ	1.0	13:04																							
ZZZZZZ	5.0	13:06																							
ZZZZZZ	5.0	13:09																							
K1700171-012	5.0	13:12				X															X				
KQ1700682-02	5.0	13:14				X																			
CCV2	1.0	13:17				X															X				
CCB2	1.0	13:19				X															X				
LLCCVT1	1.0	13:22				X															X				

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700171

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 01/30/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element Ge72 KED Q	Element Y89 KED2 Q	Element Sc45 KED1 Q	Element Rh103 KED2Q	Element In115 KED1Q	Element Lu175 KED1Q	Element Ge72 KED Q	Element Y89 KED2 Q	Element Sc45 KED1 Q	Element Rh103 KED2Q
Blank	Blank	1614	100	100	100	100	100	100				
Standard 1	Standard 1	1619	100	98	100	95	99	99				
ICV1	ICV	1623	98	97	101	95	99	100				
CCV1	CCV	1628	99	97	101	94	99	99				
ICB1	ICB	1632	99	97	100	97	99	99				
CCB1	CCB	1637	100	96	101	95	100	99				
LLICVT1	LLICVT1	1641	99	94	99	93	97	99				
ICS-A1	ICSA	1646	91	97	98	85	91	96				
ICS-AB1	ICSAB	1650	94	97	101	86	92	97				
ZZZZZZ	ZZZZZZ	1655										
ZZZZZZ	ZZZZZZ	1659										
ZZZZZZ	ZZZZZZ	1704										
ZZZZZZ	ZZZZZZ	1708										
ZZZZZZ	ZZZZZZ	1713										
ZZZZZZ	ZZZZZZ	1717										
ZZZZZZ	ZZZZZZ	1722										
ZZZZZZ	ZZZZZZ	1726										
CCV2	CCV	1731	99	99	106	96	104	101				
CCB2	CCB	1735	99	100	105	98	101	102				
ZZZZZZ	ZZZZZZ	1740										
ZZZZZZ	ZZZZZZ	1744										
ZZZZZZ	ZZZZZZ	1749										
ZZZZZZ	ZZZZZZ	1753										
ZZZZZZ	ZZZZZZ	1758										
ZZZZZZ	ZZZZZZ	1802										
ZZZZZZ	ZZZZZZ	1807										
ZZZZZZ	ZZZZZZ	1811										
ZZZZZZ	ZZZZZZ	1816										
ZZZZZZ	ZZZZZZ	1820										
CCV3	CCV	1825	97	96	109	95	104	102				
ZZZZZZ	ZZZZZZ	1829										
CCB3	CCB	1833	96	98	104	97	102	100				
ZZZZZZ	ZZZZZZ	1838										
ZZZZZZ	ZZZZZZ	1842										
ZZZZZZ	ZZZZZZ	1847										
ZZZZZZ	ZZZZZZ	1851										
ZZZZZZ	ZZZZZZ	1856										
ZZZZZZ	ZZZZZZ	1900										
ZZZZZZ	ZZZZZZ	1905										
ZZZZZZ	ZZZZZZ	1909										
ZZZZZZ	ZZZZZZ	1914										
ZZZZZZ	ZZZZZZ	1918										
CCV4	CCV	1923	97	95	111	93	106	102				
CCB4	CCB	1927	95	99	105	96	102	99				

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700171

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 01/30/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:											
			Element Ge72 KED Q	Element Y89 KED2 Q	Element Sc45 KED1 Q	Element Rh103 KED2Q	Element In115 KED1Q	Element Lu175 KED1Q						
ZZZZZZ	ZZZZZZ	1932												
ZZZZZZ	ZZZZZZ	1936												
ZZZZZZ	ZZZZZZ	1941												
ZZZZZZ	ZZZZZZ	1945												
ZZZZZZ	ZZZZZZ	1950												
ZZZZZZ	ZZZZZZ	1954												
ZZZZZZ	ZZZZZZ	1959												
ZZZZZZ	ZZZZZZ	2003												
ZZZZZZ	ZZZZZZ	2008												
ZZZZZZ	ZZZZZZ	2012												
CCV5	CCV	2017	98	97	109	94	105	102						
ZZZZZZ	ZZZZZZ	2021												
CCB5	CCB	2025	96	94	107	94	101	99						
LLCCVT1	LLCCVT1	2030	96	96	107	96	103	102						
ZZZZZZ	ZZZZZZ	2034												
ZZZZZZ	ZZZZZZ	2039												
ZZZZZZ	ZZZZZZ	2043												
ZZZZZZ	ZZZZZZ	2048												
ZZZZZZ	ZZZZZZ	2052												
ZZZZZZ	ZZZZZZ	2057												
ZZZZZZ	ZZZZZZ	2101												
ZZZZZZ	ZZZZZZ	2106												
ZZZZZZ	ZZZZZZ	2110												
ZZZZZZ	ZZZZZZ	2115												
ZZZZZZ	ZZZZZZ	2119												
CCV6	CCV	2124	95	91	102	92	99	97						
CCB6	CCB	2128	93	92	101	92	100	98						
ZZZZZZ	ZZZZZZ	2133												
ZZZZZZ	ZZZZZZ	2137												
ZZZZZZ	ZZZZZZ	2142												
ZZZZZZ	ZZZZZZ	2146												
ZZZZZZ	ZZZZZZ	2151												
ZZZZZZ	ZZZZZZ	2155												
ZZZZZZ	ZZZZZZ	2200												
ZZZZZZ	ZZZZZZ	2204												
ZZZZZZ	ZZZZZZ	2209												
KQ1700681-01	Method Blank	2213	94	92	106	92	100	100						
CCV7	CCV	2218	92	94	102	92	98	95						
CCB7	CCB	2222	92	95	102	92	99	96						
KQ1700681-02	Lab Control	2227	92	93	101	90	98	97						
KQ1700681-03	K1700171-SRM1	2231	93	99	108	89	97	100						
KQ1700681-04	K1700171-SRM2	2236	91	98	103	88	93	97						
K1700171-001	Bird No. 16-1 GI	2240	94	101	106	91	97	99						
K1700171-002	Bird No. 16-2 GI	2245	96	101	107	91	99	101						

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700171

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 01/30/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:																
			Element		Q	Element		Q	Element		Q	Element		Q	Element		Q		
			Ge72	KED		Y89	KED		Sc45	KED		Rh103	KED		In115	KED		Lu175	KED
K1700171-003	Bird No. 16-3 GI	2249	96			100			106			92			100			100	
K1700171-004	Bird No. 16-4 GI	2254	95			109			106			92			99			100	
K1700171-005	Bird No. 16-5 GI	2258	95			118			108			93			101			102	
K1700171-006	Bird No. 16-6 GI	2303	96			114			105			96			100			100	
K1700171-007	Bird No. 16-7 GI	2307	96			112			108			92			102			101	
CCV8	CCV	2312	93			94			105			93			99			98	
CCB8	CCB	2316	92			92			102			90			97			97	
K1700171-007D	Bird No. 16-7 GI	2321	95			111			108			89			99			100	
K1700171-007L	Bird No. 16-7 GI	2325	95			98			106			92			99			100	
K1700171-007A	Bird No. 16-7 GI	2329	96			108			108			91			99			101	
K1700171-007S	Bird No. 16-7 GI	2334	95			106			109			92			101			101	
K1700171-008	Bird No. 16-8 GI	2338	94			104			109			93			101			102	
K1700171-009	Bird No. 16-9 GI	2343	95			109			112			92			102			102	
K1700171-010	Bird No. 16-10	2347	95			110			108			90			99			101	
K1700171-011	Bird No. 16-11	2352	95			106			107			88			99			100	
K1700171-012	Bird No. 16-12	2356	93						107			89			99			101	
K1700171-013	Bird No. 16-13	0001	93			113			106			92			99			102	
ZZZZZZ	ZZZZZZ	0005																	
CCV9	CCV	0010	92			90			102			87			99			97	
CCB9	CCB	0014	92			89			100			89			95			96	
ZZZZZZ	ZZZZZZ	0019																	
LLCCVT2	LLCCVT2	0023	91			89			100			87			96			95	
K1700171-014	Bird No. 16-14	0028	96			98			105			90			99			99	
K1700171-015	Bird No. 16-15	0032	93			108			107			91			101			101	
K1700171-016	Bird No. 16-16	0037	93			111			109			93			102			101	
K1700171-017	Bird No. 16-17	0041	92			106			106			86			99			101	
K1700171-018	Bird No. 16-18	0045	91			112			103			89			96			98	
K1700171-019	Bird No. 16-19	0050	91			110			108			89			101			100	
K1700171-020	Bird No. 16-20	0054	91			104			105			87			98			97	
KQ1700682-01	Method Blank	0059	90			88			99			90			95			93	
KQ1700682-02	Lab Control	0103	90			92			100			90			95			95	
KQ1700682-03	K1700165-SRM3	0108	92			93			106			85			95			97	
CCV10	CCV	0112	92			91			101			89			97			97	
ZZZZZZ	ZZZZZZ	0117																	
CCB10	CCB	0121	89			88			99			89			94			93	
KQ1700682-04	K1700165-SRM4	0126	89			96			99			84			91			94	
ZZZZZZ	ZZZZZZ	0130																	
ZZZZZZ	ZZZZZZ	0135																	
ZZZZZZ	ZZZZZZ	0139																	
ZZZZZZ	ZZZZZZ	0144																	
ZZZZZZ	ZZZZZZ	0148																	
ZZZZZZ	ZZZZZZ	0153																	
ZZZZZZ	ZZZZZZ	0157																	
ZZZZZZ	ZZZZZZ	0202																	

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700171

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 01/30/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:											
			Element Ge72 KED Q	Element Y89 KED2 Q	Element Sc45 KED1 Q	Element Rh103 KED2Q	Element In115 KED1Q	Element Lu175 KED1Q						
ZZZZZZ	ZZZZZZ	0206												
ZZZZZZ	ZZZZZZ	0211												
CCV11	CCV	0215	89	89	101	87	97	94						
CCB11	CCB	0219	89	88	100	87	95	93						
ZZZZZZ	ZZZZZZ	0224												
K1700171-021	Bird No. 16-21	0228	90	123	105	87	96	97						
K1700171-022	Bird No. 16-22	0233	92	98	103	89	98	97						
K1700171-023	Bird No. 16-23	0237	91	116	104	88	97	97						
K1700171-024	Bird No. 16-24	0242	91	106	104	88	96	99						
K1700171-024D	Bird No. 16-24	0246	90	107	104	85	96	99						
K1700171-024L	Bird No. 16-24	0251	89	92	101	85	97	95						
K1700171-024A	Bird No. 16-24	0255	89	107	103	88	95	95						
K1700171-024S	Bird No. 16-24	0300	91	105	105	83	96	96						
K1700171-025	Bird No. 16-25	0304	89	96	103	84	95	96						
CCV12	CCV	0309	88	87	95	84	91	90						
CCV12	CCV	0313	87	86	98	86	93	91						
CCB12	CCB	0318	86	87	95	87	92	91						
ZZZZZZ	ZZZZZZ	0322												
LLCCVT3	LLCCVT3	0326	86	82	95	84	91	89						

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700171ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 01/31/2017 End Date: 01/31/2017

Sample No.	Client ID	Time	Internal Standards %RI For:										
			Element Ge72 KED Q	Element Rh103 KED Q	Element Q	Element Q	Element Q	Element Q	Element Q	Element Q	Element Q	Element Q	Element Q
Blank	Blank	1241	100	100									
Standard 1	Standard 1	1243	101	101									
ICV2	ICV	1246	102	103									
CCV1	CCV	1248	102	101									
ICB2	ICB	1251	101	103									
CCB1	CCB	1254	101	103									
LLICVT1	LLICVT1	1256	100	101									
ICS-A1	ICSA	1259	93	90									
ICS-AB1	ICSAB	1301	92	90									
ZZZZZZ	ZZZZZZ	1304											
ZZZZZZ	ZZZZZZ	1306											
ZZZZZZ	ZZZZZZ	1309											
K1700171-012	Bird No. 16-12	1312	104	103									
KQ1700682-02	Lab Control	1314	104	103									
CCV2	CCV	1317	103	105									
CCB2	CCB	1319	102	103									
LLCCVT1	LLCCVT1	1322	101	103									



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February 27, 2017

Analytical Report for Service Request No: K1700172

Bill Stubblefield
Oregon State University
Wiegand Hall 421
3051 Campus Way
Corvallis, OR 97331

RE: Avian Tissue Project

Dear Bill,

Enclosed are the results of the sample(s) submitted to our laboratory December 29, 2016
For your reference, these analyses have been assigned our service request number **K1700172**.

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

Please contact me if you have any questions. My extension is 3356. You may also contact me via email at Kurt.Clarkson@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kurt Clarkson
Client Services
Manager



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Table of Contents

Acronyms

Qualifiers

State Certifications, Accreditations, And Licenses

Case Narrative

Chain of Custody

Total Solids

General Chemistry

Metals

Acronyms

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

Inorganic Data Qualifiers

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

Metals Data Qualifiers

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

Organic Data Qualifiers

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

Additional Petroleum Hydrocarbon Specific Qualifiers

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

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

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

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

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



Case Narrative

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

ALS ENVIRONMENTAL

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request No.: K1700172
Date Received: 12/29/16

Case Narrative

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

Sample Receipt

Twenty animal tissue samples were received for analysis at ALS Environmental on 12/29/16. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were frozen at -20°C upon receipt at the laboratory.

General Chemistry Parameters

Total Cyanide by EPA Method 9012B:

Samples 1-4 and 20 were received past holding time. The analysis was performed as soon as possible after receipt by the laboratory. The data was flagged to indicate the holding time violation.

The Relative Percent Difference (RPD) in the replicate matrix spike analyses of sample Bird No. 165-5 GI Contents was outside control criteria. All spike recoveries in the MS, DMS, and associated Laboratory Control Sample 2 (LCS) were within acceptance limits, indicating the analytical batch was in control. No further corrective action was appropriate.

The ALS upper control criterion was exceeded in Laboratory Control Sample (LCS) 2. The error associated with elevated recovery indicated a potential high bias. The sample data was not significantly affected. The samples were not reanalyzed because the result for LCS was within manufacturer's acceptance limits. No further corrective action was appropriate.

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

Total Metals

Matrix Spike Recovery Exceptions:

The control criteria for matrix spike recovery of Aluminum, Calcium, Copper, Iron, Magnesium, Manganese, Potassium, Sodium and Zinc for sample Bird No. 16-5 GI Contents were not applicable. The analyzed concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

Approved by



The matrix spike recovery of Antimony and Cadmium for sample Bird No. 16-5 GI Contents was outside control criteria. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. No further corrective action was appropriate.

The matrix spike recovery of Chromium for sample Bird No. 16-5 GI Contents was outside the ALS control criteria as a result of the heterogeneous character of the sample. The Relative Percent Difference (RPD) for the replicate analysis supported this. The associated QA/QC results (e.g. control sample, calibration standards, etc.) indicated the analysis was in control. No further corrective action was appropriate.

The control criteria for matrix spike recovery of Magnesium, Potassium and Sodium for the Batch QC1 sample were not applicable. The analyzed concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

The matrix spike recovery of Selenium for the Batch QC1 sample was outside control criteria. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. No further corrective action was appropriate.

Relative Percent Difference Exceptions:

The Relative Percent Difference (RPD) for the replicate analysis of Barium, Chromium, Cobalt, Iron, Magnesium and Nickel in sample Bird No. 16-5 GI Contents was outside the Method control limits. The variability in the results was attributed to the heterogeneous distribution of Barium, Chromium, Cobalt, Iron, Magnesium and Nickel in the sample. Freeze drying, grinding in combination with standard mixing techniques were used, but were not sufficient for complete homogenization of this sample.

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

Approved by 



Chain of Custody

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



Laboratory Management Program LaMP Chain of Custody Record

Page 1 of 1

BP Site Node Path: _____

Req Due Date (mm/dd/yy): _____

Rush TAT: Yes No

BP Facility No: BMFOU

Lab Work Order Number: _____

161700172

Lab Name: Oregon Vet. Diagnostic Lab - Oregon State University	Facility Address: BMFOU	Consultant/Contractor: Pioneer Technical Services
Lab Address: Magruder Hall, Rm 134 700 SW 30th St. Corvallis OR	City, State, ZIP Code: Butte, MT, 59701	Consultant/Contractor Project No:
Lab PM: Dr. Christine Loehr	Lead Regulatory Agency: _____	Address: 307 East Park Ave, Anaconda, MT 59711
Lab Phone: office: 541-737-3261	California Global ID No.: _____	Consultant/Contractor PM: Rich Keeland
Lab Shipping Acct: N/A	Enfos Proposal No: _____	Phone: 406-723-1947 Email: richkeeland@pioneer-technical.com
Lab Bottle Order No: N/A	Accounting Mode: Provision _____ OOC-BU _____ OOC-RM _____	Email EDD To: richkeeland@pioneer-technical.com and to lab.enfosdoc@bp.com
Other Info: N/A	Stage: _____ Activity: _____	Invoice To: BP x Contractor _____

BP Project Manager (PM): Tim Hilmo				Matrix				No. Containers / Preservative								Requested Analyses												Report Type & QC Level																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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Sampler's Name: Tim Hilmo				Relinquished By / Affiliation						Date	Time	Accepted By / Affiliation						Date	Time
Sampler's Company: RWH Engineering				Tim Hilmo / IAR						12-8-16	10:00	Rich Keeland / PTS						12-8-16	10:00
Shipment Method: UPS				Ship Date: 12/17/16						12/17/16	2:00pm	Tavis Fellsher / OVDL						12-20-16	1:00pm
Shipment Tracking No:				Gemadherp / OVDL						12/28/16	2:00pm	S / ACS						12/29/16	10:20
Special Instructions:																			
THIS LINE - LAB USE ONLY: Custody Seals In Place: Yes / No				Temp Blank: Yes / No				Cooler Temp on Receipt: _____ °F/C				Trip Blank: Yes / No				MS/MSD Sample Submitted: Yes / No			

Laboratory Management Program LaMP Chain of Custody Record

Laboratory Management Program LaMP Chain of Custody Record

Running number	ID	Weight (g)	Sex (m/f)	Liver	Kidney	GI tract	GI contents	Breast muscle	Thigh muscle	Bone (including marrow)
1	16-1	1772	m	x	x	x	x	x	x	x
2	16-2	2475	m	x	x	x	x	x	x	x
3	16-3	1964	m	x	x	x	x	x	x	x
4	16-4	2419	m	x	x	x	x	x	x	x
5	16-5	2887	m	x	x	x	x	x	x	x
6	16-6	1893	m	x	x	x	x	x	x	x
7	16-7	2317	f	x	x	x	x	x	x	x
8	16-8	2518	m	x	x	x	x	x	x	x
9	16-9	2274	f	x	x	x	x	x	x	x
10	16-10	2521	m	x	x	x	x	x	x	x
11	16-11	2152	m	x	x	x	x	x	x	x
12	16-12	1864	f	x	x	x	x	x	x	x
13	16-13	2170	f	x	x	x	x	x	x	x
14	16-14	1941	f	x	x	x	x	x	x	x
15	16-15	1973	m	x	x	x	x	x	x	x
16	16-16	2532	f	x	x	x	x	x	x	x
17	16-17	2624	m	x	x	x	x	x	x	x
18	16-18	2445	m	x	x	x	x	x	x	x
19	16-19	2418	f	x	x	x	x	x	x	x
20	16-20	2197	m	x	x	x	x	x	x	x
21	16-21	1537	f	x	x	x	x	x	x	x
22	16-22	1741	m	x	x	x	x	x	x	x
23	16-23	1853	f	x	x	x	x	x	x	x
24	16-24	1795	m	x	x	x	x	x	x	x
25	16-25	1838	m	x	x	x	x	x	x	x



Cooler Receipt and Preservation Form

PC CS

Client OSU USFW

Service Request K1700172

Received: 12-29-16 Opened: 12-29-16 By: eg Unloaded: 12-29-16 By: eg

1. Samples were received via? Mail Fed Ex UPS DHL PDX Courier Hand Delivered
2. Samples were received in: (circle) Cooler Box Envelope Other NA
3. Were custody seals on coolers? NA Y N If yes, how many and where? NA
- If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID	Tracking Number	NA	Filed
-10.8	-10.8	-	-	0	361	NA	12 788 146 01 4816	NA	1144

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

Sample ID on Bottle	Sample ID on COC	Identified by:

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

Notes, Discrepancies, & Resolutions:

Page of



Total Solids

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1317 South 13th Avenue, Kelso, WA 98626
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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue
Analysis Method: Freeze Dry
Prep Method: None

Service Request: K1700172
Date Collected: 12/08/16 - 12/19/16
Date Received: 12/29/16
Units: Percent
Basis: Wet

Total Solids

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
Bird No. 16-1 GI Contents	K1700172-001	61.7	-	-	1	01/20/17 10:00	
Bird No. 16-2 GI Contents	K1700172-002	88.5	-	-	1	01/20/17 10:00	
Bird No. 16-3 GI Contents	K1700172-003	79.7	-	-	1	01/20/17 10:00	
Bird No. 16-4 GI Contents	K1700172-004	83.2	-	-	1	01/20/17 10:00	
Bird No. 16-5 GI Contents	K1700172-005	56.4	-	-	1	01/20/17 10:00	
Bird No. 16-6 GI Contents	K1700172-006	60.9	-	-	1	01/20/17 10:00	
Bird No. 16-7 GI Contents	K1700172-007	73.0	-	-	1	01/20/17 10:00	
Bird No. 16-8 GI Contents	K1700172-008	75.6	-	-	1	01/20/17 10:00	
Bird No. 16-9 GI Contents	K1700172-009	63.3	-	-	1	01/20/17 10:00	
Bird No. 16-10 GI Contents	K1700172-010	82.6	-	-	1	01/20/17 10:00	
Bird No. 16-11 GI Contents	K1700172-011	36.2	-	-	1	01/20/17 10:00	
Bird No. 16-12 GI Contents	K1700172-012	42.3	-	-	1	01/20/17 10:00	
Bird No. 16-13 GI Contents	K1700172-013	51.0	-	-	1	01/20/17 10:00	
Bird No. 16-14 GI Contents	K1700172-014	53.4	-	-	1	01/20/17 10:00	
Bird No. 16-15 GI Contents	K1700172-015	42.1	-	-	1	01/20/17 10:00	
Bird No. 16-16 GI Contents	K1700172-016	73.2	-	-	1	01/20/17 10:00	
Bird No. 16-17 GI Contents	K1700172-017	64.0	-	-	1	01/20/17 10:00	
Bird No. 16-18 GI Contents	K1700172-018	81.4	-	-	1	01/20/17 10:00	
Bird No. 16-19 GI Contents	K1700172-019	59.8	-	-	1	01/20/17 10:00	
Bird No. 16-20 GI Contents	K1700172-020	42.1	-	-	1	01/20/17 10:00	
Bird No. 16-21 GI Contents	K1700172-021	20.3	-	-	1	01/20/17 10:00	
Bird No. 16-22 GI Contents	K1700172-022	76.9	-	-	1	01/20/17 10:00	
Bird No. 16-23 GI Contents	K1700172-023	33.2	-	-	1	01/20/17 10:00	
Bird No. 16-24 GI Contents	K1700172-024	38.8	-	-	1	01/20/17 10:00	
Bird No. 16-25 GI Contents	K1700172-025	65.3	-	-	1	01/20/17 10:00	



General Chemistry

ALS Environmental—Kelso Laboratory

1317 South 13th Avenue, Kelso, WA 98626

Phone (360)577-7222 Fax (360)636-1068

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue
Analysis Method: 9012B
Prep Method: EPA 9010B

Service Request: K1700172
Date Collected: 12/08/16 - 12/19/16
Date Received: 12/29/16
Units: mg/Kg
Basis: Wet

Cyanide, Total

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Bird No. 16-1 GI Contents	K1700172-001	0.13	0.10	-	1	02/03/17 12:45	1/31/17	**
Bird No. 16-2 GI Contents	K1700172-002	ND U	0.10	-	1	02/03/17 12:45	1/31/17	**
Bird No. 16-3 GI Contents	K1700172-003	ND U	0.10	-	1	02/03/17 12:45	1/31/17	**
Bird No. 16-4 GI Contents	K1700172-004	ND U	0.10	-	1	02/03/17 12:45	1/31/17	**
Bird No. 16-5 GI Contents	K1700172-005	0.16	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-6 GI Contents	K1700172-006	0.20	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-7 GI Contents	K1700172-007	0.17	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-8 GI Contents	K1700172-008	ND U	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-9 GI Contents	K1700172-009	0.17	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-10 GI Contents	K1700172-010	ND U	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-11 GI Contents	K1700172-011	0.15	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-12 GI Contents	K1700172-012	0.29	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-13 GI Contents	K1700172-013	0.12	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-14 GI Contents	K1700172-014	ND U	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-15 GI Contents	K1700172-015	0.27	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-16 GI Contents	K1700172-016	ND U	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-17 GI Contents	K1700172-017	ND U	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-18 GI Contents	K1700172-018	0.12	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-19 GI Contents	K1700172-019	ND U	0.10	-	1	02/03/17 12:45	1/31/17	*
Bird No. 16-20 GI Contents	K1700172-020	0.26	0.10	-	1	02/03/17 12:45	1/31/17	**
Bird No. 16-21 GI Contents	K1700172-021	2.31	0.10	-	1	02/08/17 16:21	2/8/17	*
Bird No. 16-22 GI Contents	K1700172-022	0.45	0.10	-	1	02/08/17 16:21	2/8/17	*
Bird No. 16-23 GI Contents	K1700172-023	0.31	0.10	-	1	02/08/17 16:21	2/8/17	*
Bird No. 16-24 GI Contents	K1700172-024	0.99	0.10	-	1	02/08/17 16:21	2/8/17	*
Bird No. 16-25 GI Contents	K1700172-025	0.18	0.10	-	1	02/08/17 16:21	2/8/17	*
Method Blank	K1700172-MB1	ND U	0.10	-	1	02/03/17 12:45	1/31/17	
Method Blank	K1700172-MB2	ND U	0.10	-	1	02/08/17 16:21	2/8/17	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Oregon State University
Project Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request:K1700172
Date Collected:NA
Date Received:12/29/16

Analysis Method: 9012B
Prep Method: EPA 9010B

Units:mg/Kg
Basis:Wet

Replicate Sample Summary
Cyanide, Total

Sample Name:	Lab Code:	MRL	MDL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Bird No. 16-5 GI Contents	K1700172-005DUP	0.10	-	0.16	0.16	0.156	1	20	02/03/17
Batch QC	K1700173-024DUP	0.10	-	2.58	2.99	2.79	15	20	02/08/17

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

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

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

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700172
Date Collected: N/A
Date Received: 12/29/16
Date Analyzed: 02/3/17
Date Extracted: 01/31/17

Duplicate Matrix Spike Summary
Cyanide, Total

Sample Name: Bird No. 16-5 GI Contents
Lab Code: K1700172-005
Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet

Analyte Name	Sample Result	Result	Matrix Spike K1700172-005MS		Result	Duplicate Matrix Spike K1700172-005DMS		% Rec Limits	RPD	RPD Limit
			Spike Amount	% Rec		Spike Amount	% Rec			
Cyanide, Total	0.16	4.03	4.87	79	3.01	4.85	59	10-171	29*	20

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

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

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

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700172
Date Collected: N/A
Date Received: N/A
Date Analyzed: 02/8/17
Date Extracted: 02/8/17

Duplicate Matrix Spike Summary
Cyanide, Total

Sample Name: Batch QC
Lab Code: K1700173-024
Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet

Analyte Name	Sample Result	Result	Matrix Spike K1700173-024MS		Result	Duplicate Matrix Spike K1700173-024DMS		% Rec Limits	RPD	RPD Limit
			Spike Amount	% Rec		Spike Amount	% Rec			
Cyanide, Total	2.58	6.01	4.96	69	5.30	4.82	56	10-171	12	20

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

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

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

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700172
Date Analyzed: 02/03/17
Date Extracted: 01/31/17

Lab Control Sample Summary
Cyanide, Total

Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet
Analysis Lot: 533093

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1700172-LCS1	103	70.3	146 *	62-128

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700172
Date Analyzed: 02/08/17
Date Extracted: 02/08/17

Lab Control Sample Summary
Cyanide, Total

Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet
Analysis Lot: 533994

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1700172-LCS2	76.2	70.3	108	62-128

Client: Oregon State University
Project: Avian Tissue Project

Service Request: K1700172

Continuing Calibration Verification (CCV) Summary

Cyanide, Total

Analysis Method: 9012B

Units: ug/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	533093	KQ1701290-10	02/03/17 12:45	100	102	102	90-110
CCV2	533093	KQ1701290-11	02/03/17 12:45	100	101	101	90-110
CCV3	533093	KQ1701290-12	02/03/17 12:45	100	103	103	90-110
CCV4	533093	KQ1701290-13	02/03/17 12:45	100	101	101	90-110
CCV5	533994	KQ1701366-10	02/08/17 16:21	100	102	102	90-110
CCV6	533994	KQ1701366-11	02/08/17 16:21	100	102	102	90-110
CCV7	533994	KQ1701366-12	02/08/17 16:21	100	102	102	90-110
CCV8	533994	KQ1701366-13	02/08/17 16:21	100	102	102	90-110

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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project

Service Request:K1700172

Continuing Calibration Blank (CCB) Summary
Cyanide, Total

Analysis Method: 9012B

Units:mg/Kg

	Analysis Lot	Lab Code	Date Analyzed	MRL	MDL	Result	Q
CCB1	533093	KQ1701290-06	02/03/17 12:45	0.10		ND	U
CCB2	533093	KQ1701290-07	02/03/17 12:45	0.10		ND	U
CCB3	533093	KQ1701290-08	02/03/17 12:45	0.10		ND	U
CCB4	533093	KQ1701290-09	02/03/17 12:45	0.10		ND	U
CCB5	533994	KQ1701366-06	02/08/17 16:21	0.10		ND	U
CCB6	533994	KQ1701366-07	02/08/17 16:21	0.10		ND	U
CCB7	533994	KQ1701366-08	02/08/17 16:21	0.10		ND	U
CCB8	533994	KQ1701366-09	02/08/17 16:21	0.10		ND	U



Metals

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

ALS Group USA, Corp.

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Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700172
Date Collected: 12/08-19/16
Date Received: 12/29/16

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/g
Basis: Dry

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Bird No. 16-1 GI Contents	K1700172-001	1.0	0.06	1	02/01/17	02/03/17	3.73	
Bird No. 16-2 GI Contents	K1700172-002	1.0	0.06	1	02/01/17	02/03/17	4.10	
Bird No. 16-3 GI Contents	K1700172-003	0.9	0.06	1	02/01/17	02/03/17	1.04	
Bird No. 16-4 GI Contents	K1700172-004	1.0	0.06	1	02/01/17	02/03/17	0.84	J
Bird No. 16-5 GI Contents	K1700172-005	1.0	0.06	1	02/01/17	02/03/17	3.28	
Bird No. 16-6 GI Contents	K1700172-006	0.9	0.06	1	02/01/17	02/03/17	1.73	
Bird No. 16-7 GI Contents	K1700172-007	0.9	0.06	1	02/01/17	02/03/17	0.72	J
Bird No. 16-8 GI Contents	K1700172-008	0.9	0.06	1	02/01/17	02/03/17	0.99	
Bird No. 16-9 GI Contents	K1700172-009	0.9	0.06	1	02/01/17	02/03/17	1.07	
Bird No. 16-10 GI Contents	K1700172-010	1.0	0.06	1	02/01/17	02/03/17	0.97	J
Bird No. 16-11 GI Contents	K1700172-011	1.0	0.06	1	02/01/17	02/03/17	2.09	
Bird No. 16-12 GI Contents	K1700172-012	1.0	0.06	1	02/01/17	02/03/17	1.45	
Bird No. 16-13 GI Contents	K1700172-013	1.0	0.06	1	02/01/17	02/03/17	3.36	
Bird No. 16-14 GI Contents	K1700172-014	0.9	0.06	1	02/01/17	02/03/17	1.37	
Bird No. 16-15 GI Contents	K1700172-015	1.0	0.06	1	02/01/17	02/03/17	3.06	
Bird No. 16-16 GI Contents	K1700172-016	0.9	0.06	1	02/01/17	02/03/17	1.51	
Bird No. 16-17 GI Contents	K1700172-017	1.0	0.06	1	02/01/17	02/03/17	0.90	J
Bird No. 16-18 GI Contents	K1700172-018	1.0	0.06	1	02/01/17	02/03/17	0.98	J
Bird No. 16-19 GI Contents	K1700172-019	1.0	0.06	1	02/01/17	02/03/17	0.50	J
Bird No. 16-20 GI Contents	K1700172-020	1.0	0.06	1	02/01/17	02/03/17	2.85	
Method Blank 1	K1700172-MB1	1.0	0.06	1	02/01/17	02/03/17	ND	
Method Blank 2	K1700172-MB2	1.0	0.06	1	02/01/17	02/03/17	ND	
Method Blank 3	K1700172-MB3	1.0	0.06	1	02/01/17	02/03/17	ND	

ALS Group USA, Corp.
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Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700172
Date Collected: 12/19/16
Date Received: 12/29/16

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/g
Basis: Dry

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Bird No. 16-21 GI Contents	K1700172-021	0.9	0.06	1	02/01/17	02/03/17	2.20	
Bird No. 16-22 GI Contents	K1700172-022	0.9	0.06	1	02/01/17	02/03/17	2.16	
Bird No. 16-23 GI Contents	K1700172-023	1.0	0.06	1	02/01/17	02/03/17	3.71	
Bird No. 16-24 GI Contents	K1700172-024	1.0	0.06	1	02/01/17	02/03/17	0.86	J
Bird No. 16-25 GI Contents	K1700172-025	0.9	0.06	1	02/01/17	02/03/17	1.81	
Method Blank 1	K1700172-MB1	1.0	0.06	1	02/01/17	02/03/17	ND	
Method Blank 2	K1700172-MB2	1.0	0.06	1	02/01/17	02/03/17	ND	
Method Blank 3	K1700172-MB3	1.0	0.06	1	02/01/17	02/03/17	ND	

ALS Group USA, Corp.
dba ALS Environmental
 QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700172
Date Collected: NA
Date Received: 12/29/16
Date Extracted: 02/01/17
Date Analyzed: 02/03/17

Matrix Spike/Duplicate Matrix Spike Summary
 Total Metals

Sample Name: Bird No. 16-3 GI Contents Units: ng/g
 Lab Code: K1700172-003S, K1700173-003SD Basis: Dry
 Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		ALS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Mercury	METHOD	1631E	4.8	239	238	1.04	253	241	105	101	70-130	5	

ALS Group USA, Corp.
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 QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700172
Date Collected: NA
Date Received: 12/29/16
Date Extracted: 02/01/17
Date Analyzed: 02/03/17

Matrix Spike/Duplicate Matrix Spike Summary
 Total Metals

Sample Name: Bird No. 16-12 GI Contents Units: ng/g
 Lab Code: K1700172-012S, K1700172-012SD Basis: Dry
 Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		ALS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Mercury	METHOD	1631E	4.8	243	240	1.45	262	258	107	107	70-130	2	

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700172
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 02/03/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Initial) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery	Result Notes
						Acceptance Limits	
Mercury	METHOD	1631E	5.00	5.73	115	70-130	

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700172
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 02/03/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	4.98	100	70-130	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Animal tissue

Service Request: K1700172
Date Collected: NA
Date Received: NA
Date Extracted: 02/01/17
Date Analyzed: 02/03/17

Quality Control Sample (QCS) Summary
Total Metals

Sample Name: Quality Control Sample
Lab Code: K1700172-QCS
Test Notes:

Units: ng/g
Basis: Dry

Source: TORT-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	292	284	97	70-130	

ALS Group USA, Corp.
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 QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700172
Date Collected: 12/19/16
Date Received: 12/29/16
Date Extracted: 02/01/17
Date Analyzed: 02/03/17

Matrix Spike/Duplicate Matrix Spike Summary
 Total Metals

Sample Name: Bird No. 16-22 GI Contents Units: ng/g
 Lab Code: K1700172-022S, K1700172-022SD Basis: Dry
 Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		ALS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Mercury	METHOD	1631E	4.9	231	246	2.16	235	251	101	101	70-130	7	

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700172
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 02/03/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Initial) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	4.56	91	70-130	

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700172
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 02/03/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery	Result Notes
						Acceptance Limits	
Mercury	METHOD	1631E	5.00	4.67	93	70-130	

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Animal tissue

Service Request: K1700172
Date Collected: NA
Date Received: NA
Date Extracted: 02/01/17
Date Analyzed: 02/03/17

Quality Control Sample (QCS) Summary
Total Metals

Sample Name: Quality Control Sample
Lab Code: K1700172-QCS
Test Notes:

Units: ng/g
Basis: Dry

Source: TORT-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	292	278	95	70-130	

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-1 GI Contents

Lab Code: K1700172-001

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/01/17	944		
Antimony	6020A	0.047	0.002	5.0	01/31/17	02/01/17	0.095		N
Arsenic	6020A	0.48	0.02	5.0	01/31/17	02/01/17	22.1		
Barium	6020A	0.047	0.005	5.0	01/31/17	02/01/17	23.6		*
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/01/17	0.154		
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/01/17	1.68		N
Calcium	6010C	3.8	1.9	1.0	01/31/17	02/01/17	668		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/01/17	54.0		N*
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/01/17	2.33		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	73.4		
Iron	6020A	0.9	0.2	5.0	01/31/17	02/01/17	3200		*
Lead	6020A	0.0190	0.0005	5.0	01/31/17	02/01/17	1.70		
Magnesium	6010C	0.9	0.5	1.0	01/31/17	02/01/17	549		
Manganese	6020A	0.047	0.008	5.0	01/31/17	02/01/17	139		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/01/17	24.2		*
Potassium	6010C	19	3.8	1.0	01/31/17	02/01/17	3090		
Selenium	6020A	0.9	0.2	5.0	01/31/17	02/01/17	1.0		
Silver	6020A	0.019	0.006	5.0	01/31/17	02/01/17	0.021		
Sodium	6010C	19.0	1.9	1.0	01/31/17	02/01/17	917		
Thallium	6020A	0.0190	0.0009	5.0	01/31/17	02/01/17	0.0060	J	
Vanadium	6020A	0.190	0.007	5.0	01/31/17	02/01/17	1.75		
Zinc	6010C	0.38	0.06	1.0	01/31/17	02/01/17	478		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-2 GI Contents

Lab Code: K1700172-002

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/01/17	831		
Antimony	6020A	0.048	0.002	5.0	01/31/17	02/01/17	0.002	U	N
Arsenic	6020A	0.48	0.02	5.0	01/31/17	02/01/17	0.52		
Barium	6020A	0.048	0.005	5.0	01/31/17	02/01/17	28.0		*
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/01/17	0.076		
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/01/17	0.286		N
Calcium	6010C	3.8	1.9	1.0	01/31/17	02/01/17	675		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/01/17	0.56		N*
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/01/17	0.699		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	86.9		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1390		*
Lead	6020A	0.0192	0.0005	5.0	01/31/17	02/01/17	0.756		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	538		
Manganese	6020A	0.048	0.008	5.0	01/31/17	02/01/17	40.9		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/01/17	0.96		*
Potassium	6010C	19	3.8	1.0	01/31/17	02/01/17	924		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	0.2	J	
Silver	6020A	0.019	0.006	5.0	01/31/17	02/01/17	0.022		
Sodium	6010C	19.2	1.9	1.0	01/31/17	02/01/17	208		
Thallium	6020A	0.0192	0.0009	5.0	01/31/17	02/01/17	0.0098	J	
Vanadium	6020A	0.192	0.007	5.0	01/31/17	02/01/17	2.23		
Zinc	6010C	0.38	0.06	1.0	01/31/17	02/01/17	101		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-3 GI Contents

Lab Code: K1700172-003

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	797		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.007	J	N
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	1.21		
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	18.4		*
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.096		
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	1.17		N
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/01/17	465		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	45.7		N*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.909		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	58.7		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1090		*
Lead	6020A	0.0199	0.0005	5.0	01/31/17	02/01/17	1.01		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	283		
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	45.7		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	20.0		*
Potassium	6010C	20	4.0	1.0	01/31/17	02/01/17	1970		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	0.5	J	
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.013	J	
Sodium	6010C	19.9	2.0	1.0	01/31/17	02/01/17	636		
Thallium	6020A	0.0199	0.0009	5.0	01/31/17	02/01/17	0.0074	J	
Vanadium	6020A	0.199	0.007	5.0	01/31/17	02/01/17	1.94		
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/01/17	207		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-4 GI Contents

Lab Code: K1700172-004

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/01/17	533		
Antimony	6020A	0.048	0.002	5.0	01/31/17	02/01/17	0.006	J	N
Arsenic	6020A	0.48	0.02	5.0	01/31/17	02/01/17	1.01		
Barium	6020A	0.048	0.005	5.0	01/31/17	02/01/17	24.5		*
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/01/17	0.065		
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/01/17	0.354		N
Calcium	6010C	3.9	1.9	1.0	01/31/17	02/01/17	193		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/01/17	0.96		N*
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/01/17	0.594		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	39.6		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	2110		*
Lead	6020A	0.0193	0.0005	5.0	01/31/17	02/01/17	0.546		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	197		
Manganese	6020A	0.048	0.008	5.0	01/31/17	02/01/17	75.9		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/01/17	1.12		*
Potassium	6010C	19	3.9	1.0	01/31/17	02/01/17	1050		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	0.4	J	
Silver	6020A	0.019	0.006	5.0	01/31/17	02/01/17	0.011	J	
Sodium	6010C	19.3	1.9	1.0	01/31/17	02/01/17	181		
Thallium	6020A	0.0193	0.0009	5.0	01/31/17	02/01/17	0.0113	J	
Vanadium	6020A	0.193	0.007	5.0	01/31/17	02/01/17	1.72		
Zinc	6010C	0.39	0.06	1.0	01/31/17	02/01/17	89.5		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-5 GI Contents

Lab Code: K1700172-005

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/01/17	3450		
Antimony	6020A	0.048	0.002	5.0	01/31/17	02/01/17	0.005	J	N
Arsenic	6020A	0.48	0.02	5.0	01/31/17	02/01/17	0.72		
Barium	6020A	0.048	0.005	5.0	01/31/17	02/01/17	13.2		*
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/01/17	0.668		
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/01/17	4.38		N
Calcium	6010C	3.9	1.9	1.0	01/31/17	02/01/17	1110		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/01/17	12.7		N*
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/01/17	3.15		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	304		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1280		*
Lead	6020A	0.0194	0.0005	5.0	01/31/17	02/01/17	1.14		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	1820		*
Manganese	6020A	0.048	0.008	5.0	01/31/17	02/01/17	467		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/01/17	5.47		*
Potassium	6010C	19	3.9	1.0	01/31/17	02/01/17	4570		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.5		
Silver	6020A	0.019	0.006	5.0	01/31/17	02/01/17	0.018	J	
Sodium	6010C	19.4	1.9	1.0	01/31/17	02/01/17	1430		
Thallium	6020A	0.0194	0.0009	5.0	01/31/17	02/01/17	0.0081	J	
Vanadium	6020A	0.194	0.007	5.0	01/31/17	02/01/17	1.74		
Zinc	6010C	0.39	0.06	1.0	01/31/17	02/01/17	1610		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-6 GI Contents

Lab Code: K1700172-006

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	1970		
Antimony	6020A	0.049	0.002	5.0	01/31/17	02/01/17	0.012	J	N
Arsenic	6020A	0.49	0.02	5.0	01/31/17	02/01/17	1.05		
Barium	6020A	0.049	0.005	5.0	01/31/17	02/01/17	23.4		*
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.430		
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	4.31		N
Calcium	6010C	3.9	2.0	1.0	01/31/17	02/01/17	1260		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	131		N*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	2.77		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	256		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1280		*
Lead	6020A	0.0195	0.0005	5.0	01/31/17	02/01/17	6.34		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	498		
Manganese	6020A	0.049	0.008	5.0	01/31/17	02/01/17	322		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	57.8		*
Potassium	6010C	20	3.9	1.0	01/31/17	02/01/17	3290		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.0		
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.042		
Sodium	6010C	19.5	2.0	1.0	01/31/17	02/01/17	1000		
Thallium	6020A	0.0195	0.0009	5.0	01/31/17	02/01/17	0.0085	J	
Vanadium	6020A	0.195	0.007	5.0	01/31/17	02/01/17	1.78		
Zinc	6010C	0.39	0.06	1.0	01/31/17	02/01/17	1180		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-7 GI Contents

Lab Code: K1700172-007

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/01/17	922		
Antimony	6020A	0.047	0.002	5.0	01/31/17	02/01/17	0.007	J	N
Arsenic	6020A	0.47	0.02	5.0	01/31/17	02/01/17	0.76		
Barium	6020A	0.047	0.005	5.0	01/31/17	02/01/17	20.6		*
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/01/17	0.123		
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/01/17	1.18		N
Calcium	6010C	3.7	1.9	1.0	01/31/17	02/01/17	384		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/01/17	158		N*
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/01/17	2.70		*
Copper	6020A	0.09	0.02	5.0	01/31/17	02/01/17	88.4		
Iron	6020A	0.9	0.2	5.0	01/31/17	02/01/17	1920		*
Lead	6020A	0.0186	0.0005	5.0	01/31/17	02/01/17	0.635		
Magnesium	6010C	0.9	0.5	1.0	01/31/17	02/01/17	375		
Manganese	6020A	0.047	0.007	5.0	01/31/17	02/01/17	137		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/01/17	68.3		*
Potassium	6010C	19	3.7	1.0	01/31/17	02/01/17	2810		
Selenium	6020A	0.9	0.2	5.0	01/31/17	02/01/17	0.5	J	
Silver	6020A	0.019	0.006	5.0	01/31/17	02/01/17	0.009	J	
Sodium	6010C	18.6	1.9	1.0	01/31/17	02/01/17	716		
Thallium	6020A	0.0186	0.0008	5.0	01/31/17	02/01/17	0.0085	J	
Vanadium	6020A	0.186	0.007	5.0	01/31/17	02/01/17	2.01		
Zinc	6010C	0.37	0.06	1.0	01/31/17	02/01/17	366		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-8 GI Contents

Lab Code: K1700172-008

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	1000		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.007	J	N
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	1.75		
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	44.0		*
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.106		
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.711		N
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/01/17	457		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	55.5		N*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	1.67		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	53.8		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	2370		*
Lead	6020A	0.0198	0.0005	5.0	01/31/17	02/01/17	0.918		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	401		
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	76.6		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	25.5		*
Potassium	6010C	20	4.0	1.0	01/31/17	02/01/17	1380		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	0.3	J	
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.033		
Sodium	6010C	19.8	2.0	1.0	01/31/17	02/01/17	325		
Thallium	6020A	0.0198	0.0009	5.0	01/31/17	02/01/17	0.0114	J	
Vanadium	6020A	0.198	0.007	5.0	01/31/17	02/01/17	4.71		
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/01/17	210		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-9 GI Contents

Lab Code: K1700172-009

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	2170		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.006	J	N
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	1.08		
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	18.8		*
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.350		
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	2.31		N
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/01/17	551		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	46.9		N*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	1.91		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	181		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1440		*
Lead	6020A	0.0199	0.0005	5.0	01/31/17	02/01/17	1.83		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	564		
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	208		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	20.6		*
Potassium	6010C	20	4.0	1.0	01/31/17	02/01/17	3340		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	0.9	J	
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.015	J	
Sodium	6010C	19.9	2.0	1.0	01/31/17	02/01/17	734		
Thallium	6020A	0.0199	0.0009	5.0	01/31/17	02/01/17	0.0081	J	
Vanadium	6020A	0.199	0.007	5.0	01/31/17	02/01/17	2.10		
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/01/17	842		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-10 GI Contents

Lab Code: K1700172-010

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/01/17	1320		
Antimony	6020A	0.047	0.002	5.0	01/31/17	02/01/17	0.007	J	N
Arsenic	6020A	0.47	0.02	5.0	01/31/17	02/01/17	1.22		
Barium	6020A	0.047	0.005	5.0	01/31/17	02/01/17	23.4		*
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/01/17	0.231		
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/01/17	1.31		N
Calcium	6010C	3.8	1.9	1.0	01/31/17	02/01/17	224		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/01/17	21.9		N*
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/01/17	0.866		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	59.5		
Iron	6020A	0.9	0.2	5.0	01/31/17	02/01/17	1050		*
Lead	6020A	0.0189	0.0005	5.0	01/31/17	02/01/17	1.18		
Magnesium	6010C	0.9	0.5	1.0	01/31/17	02/01/17	224		
Manganese	6020A	0.047	0.008	5.0	01/31/17	02/01/17	73.6		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/01/17	9.87		*
Potassium	6010C	19	3.8	1.0	01/31/17	02/01/17	983		
Selenium	6020A	0.9	0.2	5.0	01/31/17	02/01/17	0.5	J	
Silver	6020A	0.019	0.006	5.0	01/31/17	02/01/17	0.007	J	
Sodium	6010C	18.9	1.9	1.0	01/31/17	02/01/17	270		
Thallium	6020A	0.0189	0.0009	5.0	01/31/17	02/01/17	0.0063	J	
Vanadium	6020A	0.189	0.007	5.0	01/31/17	02/01/17	1.99		
Zinc	6010C	0.38	0.06	1.0	01/31/17	02/01/17	387		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-11 GI Contents

Lab Code: K1700172-011

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	2520		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.003	J	N
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.54		
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	14.6		*
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.389		
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	3.12		N
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/01/17	2380		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.00		N*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	2.14		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	283		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	764		*
Lead	6020A	0.0198	0.0005	5.0	01/31/17	02/01/17	0.558		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	1120		*
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	336		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.91		*
Potassium	6010C	20	4.0	1.0	01/31/17	02/01/17	4260		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.2		
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.013	J	
Sodium	6010C	19.8	2.0	1.0	01/31/17	02/01/17	1520		
Thallium	6020A	0.0198	0.0009	5.0	01/31/17	02/01/17	0.0098	J	
Vanadium	6020A	0.198	0.007	5.0	01/31/17	02/01/17	1.36		
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/01/17	968		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-12 GI Contents

Lab Code: K1700172-012

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/01/17	5290		
Antimony	6020A	0.047	0.002	5.0	01/31/17	02/01/17	0.007	J	N
Arsenic	6020A	0.47	0.02	5.0	01/31/17	02/01/17	2.60		
Barium	6020A	0.047	0.005	5.0	01/31/17	02/01/17	13.6		*
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/01/17	1.04		
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/01/17	4.81		N
Calcium	6010C	3.8	1.9	1.0	01/31/17	02/01/17	812		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/01/17	105		N*
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/01/17	4.05		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	508		
Iron	6020A	0.9	0.2	5.0	01/31/17	02/01/17	1530		*
Lead	6020A	0.0189	0.0005	5.0	01/31/17	02/01/17	1.71		
Magnesium	6010C	0.9	0.5	1.0	01/31/17	02/01/17	791		*
Manganese	6020A	0.047	0.008	5.0	01/31/17	02/01/17	358		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/01/17	46.0		*
Potassium	6010C	19	3.8	1.0	01/31/17	02/01/17	2950		
Selenium	6020A	0.9	0.2	5.0	01/31/17	02/01/17	1.7		
Silver	6020A	0.019	0.006	5.0	01/31/17	02/01/17	0.019	J	
Sodium	6010C	18.9	1.9	1.0	01/31/17	02/01/17	1590		
Thallium	6020A	0.0189	0.0009	5.0	01/31/17	02/01/17	0.0136	J	
Vanadium	6020A	0.189	0.007	5.0	01/31/17	02/01/17	2.17		
Zinc	6010C	0.38	0.06	1.0	01/31/17	02/01/17	1690		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-13 GI Contents

Lab Code: K1700172-013

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	2460		
Antimony	6020A	0.049	0.002	5.0	01/31/17	02/01/17	0.047	J	N
Arsenic	6020A	0.49	0.02	5.0	01/31/17	02/01/17	1.47		
Barium	6020A	0.049	0.005	5.0	01/31/17	02/01/17	13.1		*
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/01/17	0.324		
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/01/17	3.07		N
Calcium	6010C	3.9	2.0	1.0	01/31/17	02/01/17	876		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.45		N*
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/01/17	3.15		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	253		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1610		*
Lead	6020A	0.0195	0.0005	5.0	01/31/17	02/01/17	1.34		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	1240		*
Manganese	6020A	0.049	0.008	5.0	01/31/17	02/01/17	322		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	2.43		*
Potassium	6010C	19	3.9	1.0	01/31/17	02/01/17	3150		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	0.8	J	
Silver	6020A	0.019	0.006	5.0	01/31/17	02/01/17	0.042		
Sodium	6010C	19.5	2.0	1.0	01/31/17	02/01/17	923		
Thallium	6020A	0.0195	0.0009	5.0	01/31/17	02/01/17	0.0098	J	
Vanadium	6020A	0.195	0.007	5.0	01/31/17	02/01/17	3.57		
Zinc	6010C	0.39	0.06	1.0	01/31/17	02/01/17	864		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-14 GI Contents

Lab Code: K1700172-014

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	324		
Antimony	6020A	0.049	0.002	5.0	01/31/17	02/01/17	0.002	J	N
Arsenic	6020A	0.49	0.02	5.0	01/31/17	02/01/17	1.09		
Barium	6020A	0.049	0.005	5.0	01/31/17	02/01/17	11.4		*
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.031		
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.521		N
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/01/17	2680		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.75		N*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.501		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	27.5		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	811		*
Lead	6020A	0.0197	0.0005	5.0	01/31/17	02/01/17	0.739		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	605		
Manganese	6020A	0.049	0.008	5.0	01/31/17	02/01/17	69.1		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.58		*
Potassium	6010C	20	4.0	1.0	01/31/17	02/01/17	2520		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	0.5	J	
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.045		
Sodium	6010C	19.7	2.0	1.0	01/31/17	02/01/17	633		
Thallium	6020A	0.0197	0.0009	5.0	01/31/17	02/01/17	0.0116	J	
Vanadium	6020A	0.197	0.007	5.0	01/31/17	02/01/17	1.64		
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/01/17	170		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-15 GI Contents

Lab Code: K1700172-015

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	4690		
Antimony	6020A	0.049	0.002	5.0	01/31/17	02/01/17	0.023	J	N
Arsenic	6020A	0.49	0.02	5.0	01/31/17	02/01/17	2.09		
Barium	6020A	0.049	0.005	5.0	01/31/17	02/01/17	29.5		*
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.747		
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	3.97		N
Calcium	6010C	3.9	2.0	1.0	01/31/17	02/01/17	1080		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	123		N*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	3.32		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	513		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	2000		*
Lead	6020A	0.0196	0.0005	5.0	01/31/17	02/01/17	6.44		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	810		*
Manganese	6020A	0.049	0.008	5.0	01/31/17	02/01/17	223		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	53.6		*
Potassium	6010C	20	3.9	1.0	01/31/17	02/01/17	3160		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.4		
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.070		
Sodium	6010C	19.6	2.0	1.0	01/31/17	02/01/17	2640		
Thallium	6020A	0.0196	0.0009	5.0	01/31/17	02/01/17	0.0113	J	
Vanadium	6020A	0.196	0.007	5.0	01/31/17	02/01/17	3.34		
Zinc	6010C	0.39	0.06	1.0	01/31/17	02/01/17	1040		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-16 GI Contents

Lab Code: K1700172-016

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	1120		
Antimony	6020A	0.049	0.002	5.0	01/31/17	02/01/17	0.004	J	N
Arsenic	6020A	0.49	0.02	5.0	01/31/17	02/01/17	1.39		
Barium	6020A	0.049	0.005	5.0	01/31/17	02/01/17	17.0		*
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.097		
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.466		N
Calcium	6010C	3.9	2.0	1.0	01/31/17	02/01/17	377		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.64		N*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	1.01		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	71.5		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1100		*
Lead	6020A	0.0196	0.0005	5.0	01/31/17	02/01/17	1.24		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	463		
Manganese	6020A	0.049	0.008	5.0	01/31/17	02/01/17	85.1		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.30		*
Potassium	6010C	20	3.9	1.0	01/31/17	02/01/17	2180		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	0.3	J	
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.012	J	
Sodium	6010C	19.6	2.0	1.0	01/31/17	02/01/17	455		
Thallium	6020A	0.0196	0.0009	5.0	01/31/17	02/01/17	0.0110	J	
Vanadium	6020A	0.196	0.007	5.0	01/31/17	02/01/17	2.47		
Zinc	6010C	0.39	0.06	1.0	01/31/17	02/01/17	158		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-17 GI Contents

Lab Code: K1700172-017

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	1280		
Antimony	6020A	0.049	0.002	5.0	01/31/17	02/01/17	0.005	J	N
Arsenic	6020A	0.49	0.02	5.0	01/31/17	02/01/17	0.75		
Barium	6020A	0.049	0.005	5.0	01/31/17	02/01/17	23.5		*
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/01/17	0.192		
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/01/17	1.70		N
Calcium	6010C	3.9	2.0	1.0	01/31/17	02/01/17	599		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	36.1		N*
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/01/17	2.79		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	105		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	813		*
Lead	6020A	0.0195	0.0005	5.0	01/31/17	02/01/17	1.46		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	1010		*
Manganese	6020A	0.049	0.008	5.0	01/31/17	02/01/17	263		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	17.2		*
Potassium	6010C	19	3.9	1.0	01/31/17	02/01/17	2810		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	0.5	J	
Silver	6020A	0.019	0.006	5.0	01/31/17	02/01/17	0.013	J	
Sodium	6010C	19.5	2.0	1.0	01/31/17	02/01/17	583		
Thallium	6020A	0.0195	0.0009	5.0	01/31/17	02/01/17	0.0054	J	
Vanadium	6020A	0.195	0.007	5.0	01/31/17	02/01/17	1.31		
Zinc	6010C	0.39	0.06	1.0	01/31/17	02/01/17	586		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-18 GI Contents

Lab Code: K1700172-018

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/01/17	1350		
Antimony	6020A	0.048	0.002	5.0	01/31/17	02/01/17	0.005	J	N
Arsenic	6020A	0.48	0.02	5.0	01/31/17	02/01/17	1.10		
Barium	6020A	0.048	0.005	5.0	01/31/17	02/01/17	17.3		*
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/01/17	0.168		
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/01/17	1.20		N
Calcium	6010C	3.8	1.9	1.0	01/31/17	02/01/17	387		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/01/17	44.0		N*
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/01/17	1.49		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	84.5		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	2460		*
Lead	6020A	0.0192	0.0005	5.0	01/31/17	02/01/17	1.52		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	477		
Manganese	6020A	0.048	0.008	5.0	01/31/17	02/01/17	142		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/01/17	19.9		*
Potassium	6010C	19	3.8	1.0	01/31/17	02/01/17	1580		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	0.6	J	
Silver	6020A	0.019	0.006	5.0	01/31/17	02/01/17	0.010	J	
Sodium	6010C	19.2	1.9	1.0	01/31/17	02/01/17	368		
Thallium	6020A	0.0192	0.0009	5.0	01/31/17	02/01/17	0.0082	J	
Vanadium	6020A	0.192	0.007	5.0	01/31/17	02/01/17	4.06		
Zinc	6010C	0.38	0.06	1.0	01/31/17	02/01/17	412		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-19 GI Contents

Lab Code: K1700172-019

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/01/17	1230		
Antimony	6020A	0.047	0.002	5.0	01/31/17	02/01/17	0.004	J	N
Arsenic	6020A	0.47	0.02	5.0	01/31/17	02/01/17	0.96		
Barium	6020A	0.047	0.005	5.0	01/31/17	02/01/17	20.0		*
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/01/17	0.171		
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/01/17	0.983		N
Calcium	6010C	3.7	1.9	1.0	01/31/17	02/01/17	589		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/01/17	11.1		N*
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/01/17	1.11		*
Copper	6020A	0.09	0.02	5.0	01/31/17	02/01/17	122		
Iron	6020A	0.9	0.2	5.0	01/31/17	02/01/17	943		*
Lead	6020A	0.0186	0.0005	5.0	01/31/17	02/01/17	0.573		
Magnesium	6010C	0.9	0.5	1.0	01/31/17	02/01/17	293		
Manganese	6020A	0.047	0.007	5.0	01/31/17	02/01/17	66.4		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/01/17	5.33		*
Potassium	6010C	19	3.7	1.0	01/31/17	02/01/17	1680		
Selenium	6020A	0.9	0.2	5.0	01/31/17	02/01/17	0.5	J	
Silver	6020A	0.019	0.006	5.0	01/31/17	02/01/17	0.009	J	
Sodium	6010C	18.6	1.9	1.0	01/31/17	02/01/17	483		
Thallium	6020A	0.0186	0.0008	5.0	01/31/17	02/01/17	0.0057	J	
Vanadium	6020A	0.186	0.007	5.0	01/31/17	02/01/17	2.25		
Zinc	6010C	0.37	0.06	1.0	01/31/17	02/01/17	262		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-20 GI Contents

Lab Code: K1700172-020

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	1540		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.004	J	N
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.98		
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	10.0		*
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.323		
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	5.85		N
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/01/17	1540		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.30		N*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	2.47		*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	232		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1220		*
Lead	6020A	0.0199	0.0005	5.0	01/31/17	02/01/17	0.780		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	801		*
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	375		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	2.49		*
Potassium	6010C	20	4.0	1.0	01/31/17	02/01/17	4500		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.0	J	
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.011	J	
Sodium	6010C	19.9	2.0	1.0	01/31/17	02/01/17	1260		
Thallium	6020A	0.0199	0.0009	5.0	01/31/17	02/01/17	0.0079	J	
Vanadium	6020A	0.199	0.007	5.0	01/31/17	02/01/17	1.94		
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/01/17	1100		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-21 GI Contents

Lab Code: K1700172-021

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	9.8	1.0	25.0	01/31/17	02/02/17	13600		
Antimony	6020A	0.049	0.002	5.0	01/31/17	02/02/17	0.015	J	
Arsenic	6020A	0.49	0.02	5.0	01/31/17	02/02/17	2.48		
Barium	6020A	0.049	0.005	5.0	01/31/17	02/02/17	8.44		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/02/17	2.22		
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/02/17	13.8		
Calcium	6010C	3.9	2.0	1.0	01/31/17	02/02/17	1930		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/02/17	19.3		
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/02/17	5.50		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/02/17	654		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/02/17	1220		
Lead	6020A	0.0196	0.0005	5.0	01/31/17	02/02/17	2.94		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	1620		
Manganese	6020A	0.245	0.039	25.0	01/31/17	02/02/17	989		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/02/17	11.1		
Potassium	6010C	39	3.9	1.0	01/31/17	02/02/17	7710		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/02/17	3.4		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/02/17	0.062		
Sodium	6010C	19.6	2.0	1.0	01/31/17	02/02/17	6130		
Thallium	6020A	0.0196	0.0009	5.0	01/31/17	02/02/17	0.0068	J	
Vanadium	6020A	0.196	0.007	5.0	01/31/17	02/02/17	1.01		
Zinc	6010C	1.96	0.29	5.0	01/31/17	02/02/17	4090		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-22 GI Contents

Lab Code: K1700172-022

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/02/17	1440		
Antimony	6020A	0.048	0.002	5.0	01/31/17	02/02/17	0.006	J	
Arsenic	6020A	0.48	0.02	5.0	01/31/17	02/02/17	0.95		
Barium	6020A	0.048	0.005	5.0	01/31/17	02/02/17	9.83		
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/02/17	0.118		
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/02/17	1.25		
Calcium	6010C	3.9	1.9	1.0	01/31/17	02/02/17	1150		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/02/17	4.70		
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/02/17	1.13		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/02/17	33.8		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/02/17	2250		
Lead	6020A	0.0194	0.0005	5.0	01/31/17	02/02/17	2.47		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	824		
Manganese	6020A	0.048	0.008	5.0	01/31/17	02/02/17	108		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/02/17	2.20		
Potassium	6010C	39	3.9	1.0	01/31/17	02/02/17	1680		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/02/17	0.3	J	N
Silver	6020A	0.019	0.006	5.0	01/31/17	02/02/17	0.015	J	
Sodium	6010C	19.4	1.9	1.0	01/31/17	02/02/17	417		
Thallium	6020A	0.0194	0.0009	5.0	01/31/17	02/02/17	0.0086	J	
Vanadium	6020A	0.194	0.007	5.0	01/31/17	02/02/17	4.47		
Zinc	6010C	0.39	0.06	1.0	01/31/17	02/02/17	301		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-23 GI Contents

Lab Code: K1700172-023

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/02/17	4660		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/02/17	0.026	J	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/02/17	1.39		
Barium	6020A	0.050	0.005	5.0	01/31/17	02/02/17	21.1		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/02/17	0.814		
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/02/17	5.29		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	2810		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/02/17	32.0		
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/02/17	1.83		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/02/17	387		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/02/17	1050		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/02/17	1.90		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	975		
Manganese	6020A	0.250	0.040	25.0	01/31/17	02/02/17	278		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/02/17	14.4		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	7230		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/02/17	2.0		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/02/17	0.022		
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	3590		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/02/17	0.0094	J	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/02/17	2.24		
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	1330		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-24 GI Contents

Lab Code: K1700172-024

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/02/17	4950		
Antimony	6020A	0.048	0.002	5.0	01/31/17	02/02/17	0.004	J	
Arsenic	6020A	0.48	0.02	5.0	01/31/17	02/02/17	1.14		
Barium	6020A	0.048	0.005	5.0	01/31/17	02/02/17	21.1		
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/02/17	0.745		
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/02/17	4.08		
Calcium	6010C	3.8	1.9	1.0	01/31/17	02/02/17	1150		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/02/17	46.0		
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/02/17	2.32		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/02/17	249		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/02/17	1170		
Lead	6020A	0.0192	0.0005	5.0	01/31/17	02/02/17	1.47		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	944		
Manganese	6020A	0.240	0.038	25.0	01/31/17	02/02/17	323		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/02/17	20.6		
Potassium	6010C	38	3.8	1.0	01/31/17	02/02/17	6090		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/02/17	1.3		N
Silver	6020A	0.019	0.006	5.0	01/31/17	02/02/17	0.091		
Sodium	6010C	19.2	1.9	1.0	01/31/17	02/02/17	4370		
Thallium	6020A	0.0192	0.0009	5.0	01/31/17	02/02/17	0.0060	J	
Vanadium	6020A	0.192	0.007	5.0	01/31/17	02/02/17	1.64		
Zinc	6010C	0.38	0.06	1.0	01/31/17	02/02/17	1470		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-25 GI Contents

Lab Code: K1700172-025

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/02/17	4360		
Antimony	6020A	0.047	0.002	5.0	01/31/17	02/02/17	0.003	J	
Arsenic	6020A	0.47	0.02	5.0	01/31/17	02/02/17	1.15		
Barium	6020A	0.047	0.005	5.0	01/31/17	02/02/17	39.3		
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/02/17	0.075		
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/02/17	0.511		
Calcium	6010C	3.8	1.9	1.0	01/31/17	02/02/17	1120		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/02/17	57.5		
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/02/17	0.889		
Copper	6020A	0.09	0.02	5.0	01/31/17	02/02/17	42.1		
Iron	6020A	0.9	0.2	5.0	01/31/17	02/02/17	1120		
Lead	6020A	0.0189	0.0005	5.0	01/31/17	02/02/17	0.776		
Magnesium	6010C	0.9	0.5	1.0	01/31/17	02/02/17	327		
Manganese	6020A	0.047	0.008	5.0	01/31/17	02/02/17	25.4		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/02/17	25.0		
Potassium	6010C	38	3.8	1.0	01/31/17	02/02/17	1870		
Selenium	6020A	0.9	0.2	5.0	01/31/17	02/02/17	0.3	J	N
Silver	6020A	0.019	0.006	5.0	01/31/17	02/02/17	0.006	J	
Sodium	6010C	18.9	1.9	1.0	01/31/17	02/02/17	782		
Thallium	6020A	0.0189	0.0008	5.0	01/31/17	02/02/17	0.0052	J	
Vanadium	6020A	0.189	0.007	5.0	01/31/17	02/02/17	2.33		
Zinc	6010C	0.38	0.06	1.0	01/31/17	02/02/17	112		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received:

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Method Blank

Lab Code: KQ1700983-01

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	0.3	J	
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	N
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	U	
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.005	U	*
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.002	U	N
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/01/17	2.0	U	
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.02	U	N*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	*
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	0.03	J	
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	0.2	U	*
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0005	J	
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/01/17	0.5	U	
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	0.008	U	
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.02	U	*
Potassium	6010C	20	4.0	1.0	01/31/17	02/01/17	4.0	U	
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	0.2	U	
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/01/17	2.0	U	
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0009	U	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.007	U	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/01/17	0.13	J	

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received:

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Method Blank

Lab Code: KQ1700987-01

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/02/17	0.2	J	
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/02/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/02/17	0.02	U	
Barium	6020A	0.050	0.005	5.0	01/31/17	02/02/17	0.005	U	
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/02/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/02/17	0.002	U	
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	2.0	U	
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/02/17	0.02	U	
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/02/17	0.003	U	
Copper	6020A	0.10	0.02	5.0	01/31/17	02/02/17	0.02	U	
Iron	6020A	1.0	0.2	5.0	01/31/17	02/02/17	0.2	U	
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/02/17	0.0005	J	
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	0.5	U	
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/02/17	0.008	U	
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/02/17	0.02	U	
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	4.0	U	
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/02/17	0.2	U	N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/02/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	2.0	U	
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/02/17	0.0009	U	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/02/17	0.007	U	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	0.06	U	

Comments:

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum	100.0	90.1	90	25.0	25.2	101	25.6	102	6020A
Antimony	25.0	25.6	102	25.0	24.8	99	24.9	100	6020A
Arsenic	25.0	25.8	103	25.0	25.1	100	24.0	96	6020A
Barium	100.0	101.2	101	25.0	24.1	96	24.7	99	6020A
Beryllium	2.5	2.6	104	25.0	23.1	92	23.4	94	6020A
Cadmium	12.5	13.5	108	25.0	25.0	100	24.6	98	6020A
Calcium	5000	5036	101	500	500	100	504	101	6010C
Calcium	12500	12480	100	10000	10170	102	10260	103	6010C
Chromium	10.0	10.4	104	25.0	25.2	101	25.0	100	6020A
Cobalt	25.0	26.7	107	25.0	25.1	100	25.4	102	6020A
Copper	12.5	13.1	105	25.0	25.6	102	25.9	104	6020A
Iron	50.0	52.1	104	25.0	24.9	100	24.5	98	6020A
Lead	25.0	25.8	103	25.0	24.9	100	24.5	98	6020A
Magnesium	12500.0	12180	97	10000.0	10000	100	9994	100	6010C
Magnesium	5000.0	4936	99	250.0	250	100	253	101	6010C
Manganese	25.0	25.0	100	25.0	25.0	100	24.6	98	6020A
Nickel	25.0	26.2	105	25.0	25.2	101	25.4	102	6020A
Potassium	12500.0	12500	100	10000.0	10120	101	10180	102	6010C
Selenium	25.0	25.1	100	25.0	25.5	102	25.2	101	6020A
Silver	12.5	13.6	109	25.0	25.2	101	24.8	99	6020A
Sodium	12500.0	12440	100	10000.0	10120	101	10090	101	6010C
Thallium	25.0	25.8	103	25.0	24.6	98	24.3	97	6020A
Vanadium	25.0	26.3	105	25.0	25.0	100	24.8	99	6020A
Zinc	1250.0	1235	99	250.0	250	100	251	100	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	26.2	105	25.5	102	6020A
Antimony				25.0	24.9	100	25.3	101	6020A
Arsenic				25.0	25.1	100	25.0	100	6020A
Barium				25.0	23.8	95	24.4	98	6020A
Beryllium				25.0	23.6	94	23.0	92	6020A
Cadmium				25.0	25.3	101	25.1	100	6020A
Calcium				10000	10170	102	10150	102	6010C
Calcium				500	496	99	501	100	6010C
Chromium				25.0	25.6	102	25.4	102	6020A
Cobalt				25.0	26.1	104	25.9	104	6020A
Copper				25.0	26.1	104	26.0	104	6020A
Iron				25.0	25.2	101	25.5	102	6020A
Lead				25.0	24.4	98	24.8	99	6020A
Magnesium				10000.0	9899	99	10110	101	6010C
Magnesium				250.0	253	101	251	100	6010C
Manganese				25.0	24.6	98	25.0	100	6020A
Nickel				25.0	26.2	105	26.1	104	6020A
Potassium				10000.0	10110	101	10140	101	6010C
Selenium				25.0	25.0	100	25.6	102	6020A
Silver				25.0	25.2	101	25.0	100	6020A
Sodium				10000.0	10030	100	10200	102	6010C
Thallium				25.0	24.5	98	24.6	98	6020A
Vanadium				25.0	25.3	101	25.1	100	6020A
Zinc				250.0	253	101	250	100	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.2	101	25.5	102	6020A
Antimony				25.0	24.3	97	25.2	101	6020A
Arsenic				25.0	24.9	100	24.7	99	6020A
Barium				25.0	23.8	95	24.8	99	6020A
Beryllium				25.0	22.9	92	22.8	91	6020A
Cadmium				25.0	25.4	102	26.0	104	6020A
Chromium				25.0	25.2	101	25.1	100	6020A
Cobalt				25.0	25.7	103	25.7	103	6020A
Copper				25.0	25.9	104	25.9	104	6020A
Iron				25.0	25.2	101	25.0	100	6020A
Lead				25.0	24.3	97	24.7	99	6020A
Manganese				25.0	24.4	98	25.3	101	6020A
Nickel				25.0	26.3	105	26.0	104	6020A
Selenium				25.0	26.2	105	24.2	97	6020A
Silver				25.0	26.4	106	26.3	105	6020A
Thallium				25.0	24.3	97	24.7	99	6020A
Vanadium				25.0	25.3	101	24.6	98	6020A

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.5	102	24.2	97	6020A
Antimony				25.0	25.2	101	24.8	99	6020A
Arsenic				25.0	25.4	102	24.6	98	6020A
Barium				25.0	24.3	97	24.0	96	6020A
Beryllium				25.0	23.3	93	22.9	92	6020A
Cadmium				25.0	24.9	100	25.6	102	6020A
Chromium				25.0	25.7	103	25.7	103	6020A
Cobalt				25.0	25.8	103	25.9	104	6020A
Copper				25.0	25.6	102	26.2	105	6020A
Iron				25.0	25.3	101	25.4	102	6020A
Lead				25.0	25.6	102	25.1	100	6020A
Manganese				25.0	25.1	100	24.5	98	6020A
Nickel				25.0	25.7	103	26.1	104	6020A
Selenium				25.0	25.3	101	24.2	97	6020A
Silver				25.0	24.6	98	25.9	104	6020A
Thallium				25.0	25.5	102	25.0	100	6020A
Vanadium				25.0	25.6	102	25.7	103	6020A

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.6	102	24.7	99	6020A
Antimony				25.0	25.1	100	24.8	99	6020A
Arsenic				25.0	24.1	96	24.2	97	6020A
Barium				25.0	24.4	98	24.1	96	6020A
Beryllium				25.0	23.5	94	22.6	90	6020A
Cadmium				25.0	24.8	99	25.1	100	6020A
Chromium				25.0	25.2	101	24.4	98	6020A
Cobalt				25.0	25.8	103	25.0	100	6020A
Copper				25.0	25.5	102	25.6	102	6020A
Iron				25.0	24.9	100	24.2	97	6020A
Lead				25.0	24.9	100	25.1	100	6020A
Manganese				25.0	23.5	94	24.9	100	6020A
Nickel				25.0	25.7	103	25.4	102	6020A
Selenium				25.0	24.6	98	24.7	99	6020A
Silver				25.0	25.6	102	25.4	102	6020A
Thallium				25.0	24.7	99	25.1	100	6020A
Vanadium				25.0	24.9	100	25.0	100	6020A

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.5	102	24.4	98	6020A
Antimony				25.0	25.0	100	25.2	101	6020A
Arsenic				25.0	24.4	98	25.1	100	6020A
Barium				25.0	24.2	97	24.3	97	6020A
Beryllium				25.0	22.8	91	22.7	91	6020A
Cadmium				25.0	25.4	102	24.9	100	6020A
Chromium				25.0	24.9	100	24.8	99	6020A
Cobalt				25.0	25.4	102	25.2	101	6020A
Copper				25.0	25.8	103	25.6	102	6020A
Iron				25.0	24.3	97	24.3	97	6020A
Lead				25.0	25.3	101	25.2	101	6020A
Manganese				25.0	25.0	100	24.0	96	6020A
Nickel				25.0	25.6	102	25.5	102	6020A
Selenium				25.0	24.3	97	25.4	102	6020A
Silver				25.0	25.7	103	24.6	98	6020A
Thallium				25.0	24.8	99	24.9	100	6020A
Vanadium				25.0	25.1	100	25.1	100	6020A

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum	100.0	92.0	92	25.0	25.3	101	24.3	97	6020A
Beryllium	2.5	2.6	104	25.0	25.1	100	24.6	98	6020A
Calcium	5000	4966	99	500	510	102	503	101	6010C
Calcium	12500	12240	98	10000	10130	101	9983	100	6010C
Magnesium	12500.0	12270	98	10000.0	10200	102	9986	100	6010C
Magnesium	5000.0	4973	99	250.0	256	102	259	104	6010C
Manganese	25.0	25.5	102	25.0	25.4	102	25.1	100	6020A
Potassium	12500.0	12450	100	10000.0	10070	101	9942	99	6010C
Sodium	12500.0	12760	102	10000.0	10120	101	9978	100	6010C
Zinc	1250.0	1257	101	250.0	258	103	256	102	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.0	100			6020A
Beryllium				25.0	24.9	100			6020A
Calcium				10000	10070	101			6010C
Calcium				500	506	101			6010C
Magnesium				10000.0	9893	99			6010C
Magnesium				250.0	257	103			6010C
Manganese				25.0	24.8	99			6020A
Potassium				10000.0	9905	99			6010C
Sodium				10000.0	9962	100			6010C
Zinc				250.0	253	101			6010C

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION
Client: Oregon State University
SDG No.: K1700172
Contract: _____ **Lab Code:** ALSK
Case No.: _____ **SAS No.:** _____

Initial Calibration Source: Inorganic Ventures
Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLICVT1									
	Aluminum	4.124	4.000	103	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Antimony	0.094	0.100	94	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Arsenic	1.098	1.000	110	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Barium	0.104	0.100	104	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Beryllium	0.040	0.040	100	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Cadmium	0.047	0.040	118	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Chromium	0.408	0.400	102	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Cobalt	0.039	0.040	98	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Copper	0.201	0.200	100	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Iron	2.061	2.000	103	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Lead	0.041	0.040	102	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Manganese	0.107	0.100	107	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Nickel	0.423	0.400	106	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Selenium	2.161	2.000	108	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Silver	0.045	0.040	112	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Thallium	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Vanadium	0.426	0.400	106	70.0 - 130.0	MS	2/1/2017	15:20	020117a
LLCCVT1									
	Aluminum	4.188	4.000	105	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Antimony	0.103	0.100	103	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Arsenic	1.006	1.000	101	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Barium	0.100	0.100	100	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Beryllium	0.041	0.040	102	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Cadmium	0.046	0.040	115	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Chromium	0.427	0.400	107	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Cobalt	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Copper	0.219	0.200	110	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Iron	2.070	2.000	104	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Lead	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Manganese	0.124	0.100	124	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Nickel	0.434	0.400	108	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Selenium	1.908	2.000	95	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Silver	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Thallium	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Vanadium	0.405	0.400	101	70.0 - 130.0	MS	2/1/2017	19:05	020117a

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

SDG No.: K1700172

Contract: _____ **Lab Code:** ALSK

Case No.: _____ **SAS No.:** _____

Initial Calibration Source: Inorganic Ventures

Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLCCVT2									
	Aluminum	4.305	4.000	108	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Antimony	0.104	0.100	104	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Arsenic	1.060	1.000	106	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Barium	0.097	0.100	97	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Beryllium	0.039	0.040	98	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Cadmium	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Chromium	0.429	0.400	107	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Cobalt	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Copper	0.224	0.200	112	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Iron	2.091	2.000	105	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Lead	0.040	0.040	100	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Manganese	0.118	0.100	118	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Nickel	0.419	0.400	105	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Selenium	1.892	2.000	95	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Silver	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Thallium	0.042	0.040	105	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Vanadium	0.398	0.400	100	70.0 - 130.0	MS	2/1/2017	23:07	020117a

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

SDG No.: K1700172

Contract: _____ **Lab Code:** ALSK

Case No.: _____ **SAS No.:** _____

Initial Calibration Source: Inorganic Ventures

Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLCCVT3									
	Aluminum	4.198	4.000	105	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Antimony	0.108	0.100	108	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Arsenic	1.010	1.000	101	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Barium	0.101	0.100	101	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Beryllium	0.039	0.040	98	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Cadmium	0.037	0.040	92	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Chromium	0.428	0.400	107	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Cobalt	0.037	0.040	92	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Copper	0.210	0.200	105	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Iron	2.054	2.000	103	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Lead	0.043	0.040	108	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Manganese	0.114	0.100	114	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Nickel	0.443	0.400	111	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Selenium	1.989	2.000	99	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Silver	0.042	0.040	105	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Thallium	0.044	0.040	110	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Vanadium	0.430	0.400	108	70.0 - 130.0	MS	2/2/2017	03:10	020117a
LLCCVT4									
	Aluminum	4.136	4.000	103	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Antimony	0.096	0.100	96	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Arsenic	1.084	1.000	108	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Barium	0.109	0.100	109	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Beryllium	0.038	0.040	95	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Cadmium	0.043	0.040	108	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Chromium	0.395	0.400	99	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Cobalt	0.042	0.040	105	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Copper	0.197	0.200	98	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Iron	2.100	2.000	105	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Lead	0.041	0.040	102	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Manganese	0.112	0.100	112	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Nickel	0.396	0.400	99	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Selenium	2.023	2.000	101	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Silver	0.043	0.040	108	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Thallium	0.043	0.040	108	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Vanadium	0.409	0.400	102	70.0 - 130.0	MS	2/2/2017	06:04	020117a

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

SDG No.: K1700172

Contract: _____ **Lab Code:** ALSK

Case No.: _____ **SAS No.:** _____

Initial Calibration Source: Inorganic Ventures

Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLICV1									
	Calcium	20.4	20.0	102	70.0 - 130.0	P	2/1/2017	14:42	020117AICP
	Magnesium	5.2	5.0	104	70.0 - 130.0	P	2/1/2017	14:42	020117AICP
	Potassium	247.2	200.0	124	70.0 - 130.0	P	2/1/2017	14:42	020117AICP
	Sodium	216.9	200.0	108	70.0 - 130.0	P	2/1/2017	14:42	020117AICP
	Zinc	4.1	4.0	102	70.0 - 130.0	P	2/1/2017	14:42	020117AICP
LLCCV1									
	Calcium	20.3	20.0	102	70.0 - 130.0	P	2/1/2017	17:16	020117AICP
	Magnesium	5.0	5.0	98	70.0 - 130.0	P	2/1/2017	17:16	020117AICP
	Potassium	204.3	200.0	102	70.0 - 130.0	P	2/1/2017	17:16	020117AICP
	Sodium	212.1	200.0	106	70.0 - 130.0	P	2/1/2017	17:16	020117AICP
	Zinc	4.2	4.0	105	70.0 - 130.0	P	2/1/2017	17:16	020117AICP
LLICVT1									
	Aluminum	4.182	4.000	105	70.0 - 130.0	MS	2/2/2017	13:30	020217a
	Beryllium	0.043	0.040	108	70.0 - 130.0	MS	2/2/2017	13:30	020217a
	Manganese	0.101	0.100	101	70.0 - 130.0	MS	2/2/2017	13:30	020217a
LLCCVT1									
	Aluminum	4.090	4.000	102	70.0 - 130.0	MS	2/2/2017	14:32	020217a
	Beryllium	0.039	0.040	98	70.0 - 130.0	MS	2/2/2017	14:32	020217a
	Manganese	0.118	0.100	118	70.0 - 130.0	MS	2/2/2017	14:32	020217a
LLICV1									
	Calcium	21.4	20.0	107	70.0 - 130.0	P	2/2/2017	08:40	020217AICP
	Magnesium	5.3	5.0	106	70.0 - 130.0	P	2/2/2017	08:40	020217AICP
	Potassium	178.3	200.0	89	70.0 - 130.0	P	2/2/2017	08:40	020217AICP
	Sodium	182.5	200.0	91	70.0 - 130.0	P	2/2/2017	08:40	020217AICP
	Zinc	4.2	4.0	105	70.0 - 130.0	P	2/2/2017	08:40	020217AICP

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION**Client:** Oregon State University**SDG No.:** K1700172**Contract:** _____ **Lab Code:** ALSK**Case No.:** _____ **SAS No.:** _____**Initial Calibration Source:** Inorganic Ventures**Continuing Calibration Source:** ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLCCV1									
	Calcium	22.2	20.0	111	70.0 - 130.0	P	2/2/2017	10:23	020217AICP
	Magnesium	5.4	5.0	108	70.0 - 130.0	P	2/2/2017	10:23	020217AICP
	Potassium	213.5	200.0	107	70.0 - 130.0	P	2/2/2017	10:23	020217AICP
	Sodium	184.3	200.0	92	70.0 - 130.0	P	2/2/2017	10:23	020217AICP
	Zinc	4.4	4.0	110	70.0 - 130.0	P	2/2/2017	10:23	020217AICP

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Antimony	0.016	J	0.004	U	0.013	J	0.014	J	6020A
Arsenic	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Barium	0.010	U	0.010	U	0.010	U	0.010	U	6020A
Beryllium	0.006	U	0.006	U	0.006	U	0.006	U	6020A
Cadmium	0.004	U	0.004	U	0.004	U	0.004	U	6020A
Calcium	20.0	U	20.0	U	20.0	U	20.0	U	6010C
Chromium	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Cobalt	0.006	U	0.006	U	0.006	U	0.006	U	6020A
Copper	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Iron	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Lead	0.0010	U	0.0010	U	0.0010	U	0.0010	U	6020A
Magnesium	5.0	U	5.0	U	5.0	U	5.0	U	6010C
Manganese	0.016	U	0.016	U	0.016	U	0.039	J	6020A
Nickel	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Potassium	40	U	40	U	40	U	40	U	6010C
Selenium	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Silver	0.012	U	0.012	U	0.012	U	0.012	U	6020A
Sodium	20.0	U	20.0	U	20.0	U	20.0	U	6010C
Thallium	0.0018	U	0.0018	U	0.0018	U	0.0018	U	6020A
Vanadium	0.014	U	0.014	U	0.014	U	0.014	U	6020A
Zinc	0.60	U	0.60	U	0.60	U	0.60	U	6010C

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.014	J	0.017	J	0.019	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.004	U	0.004	U	0.004	U	6020A
Calcium			20.0	U					6010C
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			0.04	U	0.04	U	0.04	U	6020A
Iron			0.4	U	0.4	U	0.4	U	6020A
Lead			0.0010	U	0.0010	U	0.0010	U	6020A
Magnesium			5.0	U					6010C
Manganese			0.035	J	0.018	J	0.021	J	6020A
Nickel			0.04	U	0.04	U	0.04	U	6020A
Potassium			40	J					6010C
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.012	U	0.012	U	0.012	U	6020A
Sodium			20.0	U					6010C
Thallium			0.0018	U	0.0018	U	0.0018	U	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A
Zinc			0.60	U					6010C

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.016	J	0.019	J	0.017	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.004	U	0.004	U	0.004	U	6020A
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			0.04	U	0.04	U	0.04	U	6020A
Iron			0.4	U	0.4	U	0.4	U	6020A
Lead			0.0010	U	0.0010	U	0.0010	U	6020A
Manganese			0.020	J	0.016	U	0.016	U	6020A
Nickel			0.04	U	0.04	U	0.04	U	6020A
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.012	U	0.012	U	0.012	U	6020A
Thallium			0.0018	U	0.0018	U	0.0018	U	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.018	J	0.016	J	0.018	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.004	U	0.004	U	0.004	U	6020A
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			0.04	U	0.04	U	0.04	U	6020A
Iron			0.4	U	0.4	U	0.4	U	6020A
Lead			0.0010	U	0.0010	U	0.0010	U	6020A
Manganese			0.016	U	0.016	U	0.016	U	6020A
Nickel			0.04	U	0.04	U	0.04	U	6020A
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.012	U	0.012	U	0.012	U	6020A
Thallium			0.0018	U	0.0018	U	0.0018	U	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.018	J	0.004	U	0.016	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.004	U	0.004	U	0.004	U	6020A
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			0.04	U	0.04	U	0.04	U	6020A
Iron			0.4	U	0.4	U	0.4	U	6020A
Lead			0.0010	U	0.0010	U	0.0010	U	6020A
Manganese			0.016	U	0.016	U	0.016	U	6020A
Nickel			0.04	U	0.04	U	0.04	U	6020A
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.012	U	0.012	U	0.012	U	6020A
Thallium			0.0018	U	0.0018	U	0.0018	U	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U					6020A
Antimony			0.019	U					6020A
Arsenic			0.04	U					6020A
Barium			0.010	U					6020A
Beryllium			0.006	U					6020A
Cadmium			0.004	U					6020A
Chromium			0.04	U					6020A
Cobalt			0.006	U					6020A
Copper			0.04	U					6020A
Iron			0.4	U					6020A
Lead			0.0010	U					6020A
Manganese			0.016	U					6020A
Nickel			0.04	U					6020A
Selenium			0.4	U					6020A
Silver			0.012	U					6020A
Thallium			0.0018	U					6020A
Vanadium			0.014	U					6020A

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Beryllium	0.006	U	0.006	U	0.006	U	0.006	U	6020A
Calcium	20.0	U	20.0	U	20.0	U	20.0	U	6010C
Magnesium	5.0	U	5.0	U	5.0	U	5.0	U	6010C
Manganese	0.016	U	0.016	U	0.016	U	0.016	U	6020A
Potassium	40	U	60	J	40	J	40	U	6010C
Sodium	20.0	U	20.0	U	20.0	U	20.0	U	6010C
Zinc	0.60	U	0.60	U	0.60	U	0.60	J	6010C

Metals

- 4 -

ICP INTERFERENCE CHECK SAMPLE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

ICS Source: Inorganic Ventures

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Calcium	500000.0	500000.0	489300.0	490100.0	98			
Magnesium	500000.0	500000.0	507400.0	510200.0	102			
Potassium	0.0		-33.1	-66.8				
Sodium	0.0		9.6	0.3				
Zinc	0.0	1000.0	0.8	942.9	94			

Metals

- 4 -

ICP INTERFERENCE CHECK SAMPLE
Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-MS-04

ICS Source: Inorganic Ventures

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Aluminum			19246	20039		20149	20203	
Antimony			0	0		0	0	
Arsenic		25	0	25	100	0	27	108
Barium			1	1		1	1	
Beryllium			0	0		0	0	
Cadmium		25	0	26	104	0	27	108
Chromium		50	1	55	110	1	57	114
Cobalt		50	1	54	108	1	57	114
Copper		50	1	48	96	1	50	100
Iron			46763	47859		49870	50943	
Lead			0	0		0	0	
Manganese		50	1	48	96	1	51	102
Nickel		50	1	51	102	1	53	106
Selenium		25	0	25	100	0	26	104
Silver	0.0	12.5	0	12.8	102	0	13.3	106
Thallium	0.0		0	0.0		0	0.0	
Vanadium		50	0	56	112	0	58	116

Metals

- 4 -

ICP INTERFERENCE CHECK SAMPLE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

ICS Source: Inorganic Ventures

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Calcium	500000.0	500000.0	475500.0	481700.0	96			
Magnesium	500000.0	500000.0	518100.0	518900.0	104			
Potassium	0.0		-54.0	-90.7				
Sodium	0.0		10.3	7.3				
Zinc	0.0	1000.0	0.1	961.3	96			

Metals
 - 4 -

ICP INTERFERENCE CHECK SAMPLE

Client: Oregon State University Service Request: K1700172
 Project No.: NA
 Project Name: Avian Tissue Project

ICP ID Number: K-ICP-MS-04 ICS Source: Inorganic Ventures

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Aluminum			20104	20031				
Beryllium			0	0				
Manganese		50	1	52	104			

Metals
- 5A -
SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Bird No. 16-5 GI ContentSS

Lab Code: K1700172-005S

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum		4320.9		3454.1		197.4	439		6020A
Antimony	75 - 125	35.697		0.005	J	49.342	72	N	6020A
Arsenic	75 - 125	19.81		0.72		16.48	116		6020A
Barium	75 - 125	111.153		13.155		98.684	99		6020A
Beryllium	75 - 125	5.777		0.668		4.934	104		6020A
Cadmium	75 - 125	10.636		4.377		4.934	127	N	6020A
Calcium		1560		1110		164.51	274		6010C
Chromium	75 - 125	22.04		12.71		19.74	47	N	6020A
Cobalt	75 - 125	54.923		3.147		49.342	105		6020A
Copper		421.67		303.52		24.67	479		6020A
Iron		1255.0		1281.4		98.7	-27		6020A
Lead	75 - 125	47.4051		1.1364		49.3421	94		6020A
Magnesium		2100		1820		164.51	170		6010C
Manganese		652.176		466.551		49.342	376		6020A
Nickel	75 - 125	52.92		5.47		49.34	96		6020A
Potassium		5830		4570		164.51	766		6010C
Selenium	75 - 125	21.7		1.5		16.5	122		6020A
Silver	75 - 125	4.972		0.018	J	4.934	100		6020A
Sodium		1960		1430		164.51	322		6010C
Thallium	75 - 125	3.3701		0.0081	J	3.2862	102		6020A
Vanadium	75 - 125	53.740		1.744		49.342	105		6020A
Zinc		2200		1610		49.34	1196		6010C

An empty field in the Control Limit column indicates the control limit is not applicable

Metals
- 5A -
SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Batch QC1S

Lab Code: K1700173-024S

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum	75 - 125	187.1		1.5	J	197.4	94		6020A
Antimony	75 - 125	51.073		0.002	U	49.342	104		6020A
Arsenic	75 - 125	19.12		0.02	U	16.48	116		6020A
Barium	75 - 125	98.380		0.149		98.684	100		6020A
Beryllium	75 - 125	4.952		0.003	U	4.934	100		6020A
Cadmium	75 - 125	5.526		0.071		4.934	111		6020A
Calcium	75 - 125	375		198		164.51	108		6010C
Chromium	75 - 125	20.43		0.26		19.74	102		6020A
Cobalt	75 - 125	52.014		0.053		49.342	105		6020A
Copper	75 - 125	58.02		31.32		24.67	108		6020A
Iron	75 - 125	412.9		308.5		98.7	106		6020A
Lead	75 - 125	48.4676		0.0591		49.3421	98		6020A
Magnesium		1120		925		164.51	119		6010C
Manganese	75 - 125	47.936		4.910		49.342	87		6020A
Nickel	75 - 125	51.79		0.14	J	49.34	105		6020A
Potassium		11500		11300		164.51	122		6010C
Selenium	75 - 125	23.7		2.8		16.5	127	N	6020A
Silver	75 - 125	5.274		0.006	U	4.934	107		6020A
Sodium		1690		1510		164.51	109		6010C
Thallium	75 - 125	3.5453		0.0015	J	3.2862	108		6020A
Vanadium	75 - 125	51.457		0.007	U	49.342	104		6020A
Zinc	75 - 125	148		95.7		49.34	106		6010C

An empty field in the Control Limit column indicates the control limit is not applicable

Metals

- 5B -

POST SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Basis: DRY

Matrix: WATER

Sample Name: Bird No. 16-5 GI ContentsA

Lab Code: K1700172-005A

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Antimony	80 - 120	53.351		0.011		50.0	107		6020A
Arsenic	80 - 120	54.37		1.49		50.0	106		6020A
Barium	80 - 120	80.831		27.188		50.0	107		6020A
Beryllium	80 - 120	52.828		1.380		50.0	103		6020A
Cadmium	80 - 120	64.070		9.046		50.0	110		6020A
Chromium	80 - 120	78.30		26.28		50.0	104		6020A
Cobalt	80 - 120	58.959		6.503		50.0	105		6020A
Copper	80 - 120	679.39		627.27		50.0	104		6020A
Iron	80 - 120	2839.5		2648.3		200.0	96		6020A
Lead	80 - 120	52.9463		2.3487		50.0	101		6020A
Nickel	80 - 120	63.35		11.30		50.0	104		6020A
Selenium	80 - 120	56.8		3.1		50.0	107		6020A
Silver	80 - 120	10.180		0.037		10.0	101		6020A
Thallium	80 - 120	50.1539		0.0167		50.0	100		6020A
Vanadium	80 - 120	55.776		3.604		50.0	104		6020A

Metals

- 5B -

POST SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Basis: DRY

Matrix: WATER

Sample Name: Batch QC1A

Lab Code: K1700173-024A

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum	80 - 120	54.8		3.0		50.0	104		6020A
Antimony	80 - 120	53.180		0.004		50.0	106		6020A
Arsenic	80 - 120	56.04		0.04		50.0	112		6020A
Barium	80 - 120	50.038		0.298		50.0	99		6020A
Beryllium	80 - 120	49.362		0.006		50.0	99		6020A
Cadmium	80 - 120	55.735		0.141		50.0	111		6020A
Chromium	80 - 120	51.56		0.53		50.0	102		6020A
Cobalt	80 - 120	51.424		0.105		50.0	103		6020A
Copper	80 - 120	112.85		62.64		50.0	100		6020A
Iron	80 - 120	790.8		616.9		200.0	87		6020A
Lead	80 - 120	50.8020		0.1183		50.0	101		6020A
Manganese	80 - 120	54.682		9.819		50.0	90		6020A
Nickel	80 - 120	51.07		0.28		50.0	102		6020A
Selenium	80 - 120	65.3		5.6		50.0	119		6020A
Silver	80 - 120	10.408		0.012		10.0	104		6020A
Thallium	80 - 120	50.0556		0.0029		50.0	100		6020A
Vanadium	80 - 120	50.917		0.014		50.0	102		6020A

Metals
- 6 -
DUPLICATES

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Bird No. 16-5 GI Contents

Lab Code: K1700172-005D

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Aluminum	20	3454.1		3026.0		13.2		6020A
Antimony		0.005	J	0.007	J	33.3		6020A
Arsenic		0.72		0.83		14.2		6020A
Barium	20	13.155		7.038		60.6	*	6020A
Beryllium	20	0.668		0.605		9.9		6020A
Cadmium	20	4.377		4.051		7.7		6020A
Calcium	20	1110		1070		3.7		6010C
Chromium	20	12.71		1.07		168.9	*	6020A
Cobalt	20	3.147		2.559		20.6	*	6020A
Copper	20	303.52		285.78		6.0		6020A
Iron	20	1281.4		899.2		35.1	*	6020A
Lead	20	1.1364		1.0916		4.0		6020A
Magnesium	20	1820		1380		27.5	*	6010C
Manganese	20	466.551		434.464		7.1		6020A
Nickel	20	5.47		1.72		104.3	*	6020A
Potassium	20	4570		4310		5.9		6010C
Selenium		1.5		1.5		0.0		6020A
Silver		0.018	J	0.014	J	25.0		6020A
Sodium	20	1430		1390		2.8		6010C
Thallium		0.0081	J	0.0062	J	26.6		6020A
Vanadium	20	1.744		1.584		9.6		6020A
Zinc	20	1610		1490		7.7		6010C

An empty field in the Control Limit column indicates the control limit is not applicable.

Metals
- 6 -
DUPLICATES

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Batch QC1D

Lab Code: K1700173-024D

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Aluminum		1.5	J	3.1		69.6		6020A
Antimony		0.002	U	0.002	U			6020A
Arsenic		0.02	U	0.02	U			6020A
Barium		0.149		0.164		9.6		6020A
Beryllium		0.003	U	0.003	J	200.0		6020A
Cadmium		0.071		0.088		21.4		6020A
Calcium	20	198		203		2.5		6010C
Chromium		0.26		0.29		10.9		6020A
Cobalt		0.053		0.056		5.5		6020A
Copper	20	31.32		32.85		4.8		6020A
Iron	20	308.5		320.4		3.8		6020A
Lead		0.0591		0.0649		9.4		6020A
Magnesium	20	925		951		2.8		6010C
Manganese	20	4.910		5.145		4.7		6020A
Nickel		0.14	J	0.13	J	7.4		6020A
Potassium	20	11300		11500		1.8		6010C
Selenium		2.8		3.1		10.2		6020A
Silver		0.006	U	0.007	J	200.0		6020A
Sodium	20	1510		1530		1.3		6010C
Thallium		0.0015	J	0.0018	J	18.2		6020A
Vanadium		0.007	U	0.013	J	200.0		6020A
Zinc	20	95.7		98.7		3.1		6010C

An empty field in the Control Limit column indicates the control limit is not applicable.

Metals

- 7 -

LABORATORY CONTROL SAMPLE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

Aqueous LCS Source: ALS MIXED

Solid LCS Source:

Analyte	Aqueous (ug/L)			Solid (mg/kg)				
	True	Found	%R	True	Found	C	Limits	%R
Aluminum	2000.0	1903.3	95					
Antimony	500.0	489.2	98					
Arsenic	167.0	191.4	115					
Barium	1000.0	1014.8	101					
Beryllium	50.0	51.2	102					
Cadmium	50.0	53.0	106					
Calcium	1667	1880	113					
Chromium	200.0	204.0	102					
Cobalt	500.0	513.9	103					
Copper	250.0	256.9	103					
Iron	1000.0	1013.3	101					
Lead	500.0	528.2	106					
Magnesium	1667	1850	111					
Manganese	500.0	460.2	92					
Nickel	500.0	509.6	102					
Potassium	1667	1880	113					
Selenium	167.0	190.5	114					
Silver	50.0	54.0	108					
Sodium	1667	1900	114					
Thallium	33.3	38.5	116					
Vanadium	500.0	512.1	102					
Zinc	500	495	99					

Metals

- 7 -

LABORATORY CONTROL SAMPLE

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

Aqueous LCS Source: ALS MIXED

Solid LCS Source:

Analyte	Aqueous (ug/L)			Solid (mg/kg)				
	True	Found	%R	True	Found	C	Limits	%R
Aluminum	2000.0	1800.5	90					
Antimony	500.0	485.3	97					
Arsenic	167.0	192.3	115					
Barium	1000.0	950.5	95					
Beryllium	50.0	50.4	101					
Cadmium	50.0	51.8	104					
Calcium	1667	1870	112					
Chromium	200.0	207.2	104					
Cobalt	500.0	521.2	104					
Copper	250.0	255.1	102					
Iron	1000.0	1011.7	101					
Lead	500.0	505.0	101					
Magnesium	1667	1860	112					
Manganese	500.0	453.8	91					
Nickel	500.0	514.6	103					
Potassium	1667	1960	118					
Selenium	167.0	189.0	113					
Silver	50.0	52.4	105					
Sodium	1667	1950	117					
Thallium	33.3	37.1	111					
Vanadium	500.0	518.0	104					
Zinc	500	507	101					

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700172
Date Collected: NA
Date Received: NA
Date Extracted: 01/31/17
Date Analyzed: 02/01/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700172-SRM1
Test Notes: Dorm-4 Solids = 94.5%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Dorm-4

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	6.8	7.5	110	4.93-8.93	
Cadmium	PSEP Tissue	6020A	0.306	0.343	112	0.233 - 0.385	
Chromium	PSEP Tissue	6020A	1.87	1.79	96	1.37-2.44	
Copper	PSEP Tissue	6020A	15.9	16.1	101	12.0 - 20.2	
Iron	PSEP Tissue	6020A	341	354	104	251-442	
Lead	PSEP Tissue	6020A	0.416	0.356	86	0.290 - 0.563	
Nickel	PSEP Tissue	6020A	1.36	1.33	98	0.912-1.9	
Selenium	PSEP Tissue	6020A	3.56	4.58	129	2.58 - 4.68	
Zinc	PSEP Tissue	6010C	52.20	53.1	102	39.2 - 66.5	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700172
Date Collected: NA
Date Received: NA
Date Extracted: 01/31/17
Date Analyzed: 02/01/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700172-SRM2
Test Notes: Tort-3 Solids = 99.1%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Tort-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	59.5	72.6	122	44.6-76.0	
Cadmium	PSEP Tissue	6020A	42.3	44.8	106	32.4-52.9	
Chromium	PSEP Tissue	6020A	1.95	1.88	96	1.37-2.63	
Copper	PSEP Tissue	6020A	497	467	94	380-623	
Iron	PSEP Tissue	6020A	179	170	95	137-224	
Lead	PSEP Tissue	6020A	0.225	0.207	92	0.166-0.292	
Manganese	PSEP Tissue	6020A	15.6	13.8	88	11.7-19.9	
Nickel	PSEP Tissue	6020A	5.3	5.2	98	4.05-6.65	
Selenium	PSEP Tissue	6020A	10.9	12.7	117	7.9-14.3	
Vanadium	PSEP Tissue	6020A	9.1	9.3	102	7.0-11.4	
Zinc	PSEP Tissue	6010C	136	133	98	104-170	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700172
Date Collected: NA
Date Received: NA
Date Extracted: 01/31/17
Date Analyzed: 02/01-02/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700172-SRM3
Test Notes: Dorm-4 Solids = 94.5%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Dorm-4

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	6.8	7.7	113	4.93-8.93	
Cadmium	PSEP Tissue	6020A	0.306	0.366	120	0.233 - 0.385	
Chromium	PSEP Tissue	6020A	1.87	1.82	97	1.37-2.44	
Copper	PSEP Tissue	6020A	15.9	16.7	105	12.0 - 20.2	
Iron	PSEP Tissue	6020A	341	369	108	251-442	
Lead	PSEP Tissue	6020A	0.416	0.358	86	0.290 - 0.563	
Nickel	PSEP Tissue	6020A	1.36	1.34	99	0.912-1.9	
Selenium	PSEP Tissue	6020A	3.56	4.43	124	2.58 - 4.68	
Zinc	PSEP Tissue	6010C	52.20	54.5	104	39.2 - 66.5	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700172
Date Collected: NA
Date Received: NA
Date Extracted: 01/31/17
Date Analyzed: 02/01-02/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700172-SRM4
Test Notes: Tort-3 Solids = 99.1%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Tort-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	59.5	73.0	123	44.6-76.0	
Cadmium	PSEP Tissue	6020A	42.3	44.7	106	32.4-52.9	
Chromium	PSEP Tissue	6020A	1.95	1.90	97	1.37-2.63	
Copper	PSEP Tissue	6020A	497	480	97	380-623	
Iron	PSEP Tissue	6020A	179	172	96	137-224	
Lead	PSEP Tissue	6020A	0.225	0.220	98	0.166-0.292	
Manganese	PSEP Tissue	6020A	15.6	13.9	89	11.7-19.9	
Nickel	PSEP Tissue	6020A	5.3	5.4	102	4.05-6.65	
Selenium	PSEP Tissue	6020A	10.9	12.6	116	7.9-14.3	
Vanadium	PSEP Tissue	6020A	9.1	9.5	104	7.0-11.4	
Zinc	PSEP Tissue	6010C	136	137	101	104-170	

Metals

- 9 -

ICP SERIAL DILUTIONS
Client: Oregon State University

Service Request: K1700172

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Sample Name: Bird No. 16-5 GI ContentsL

Lab Code: K1700172-005L

Analyte	Initial Sample Result (I) C	Serial Dilution Result (S) C	% Differ- ence	Q	M
Aluminum	7138.4	6815.9	5		MS
Antimony	0.011 J	0.020 U	100.0		MS
Arsenic	1.49	1.44 J	3		MS
Barium	27.188	25.335	7		MS
Beryllium	1.380	1.280	7		MS
Cadmium	9.046	8.457	7		MS
Calcium	11450.0	12175.0	6.3		P
Chromium	26.28	24.27	8		MS
Cobalt	6.503	5.973	8		MS
Copper	627.27	603.28	4		MS
Iron	2648.3	2447.3	8		MS
Lead	2.3487	2.3073	2		MS
Magnesium	18780.0	18160.0	3.3		P
Manganese	964.206	963.984	0		MS
Nickel	11.30	10.54	7		MS
Potassium	47250.0	47130.0	0.3		P
Selenium	3.1	3.2 J	3		MS
Silver	0.037 J	0.060 U	100.0		MS
Sodium	14750.0	14715.0	0.2		P
Thallium	0.0167 J	0.0129 J	23		MS
Vanadium	3.604	3.191	11	E	MS
Zinc	16680.00	17965.00	7.7		P

Metals

- 9 -

ICP SERIAL DILUTIONS
Client: Oregon State University

Service Request: K1700172

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Sample Name: Batch QC1L

Lab Code: K1700173-024L

Analyte	Initial Sample Result (I)		Serial Dilution Result (S)		% Differ- ence	Q	M
Aluminum	3.0	J	4.2	J	40		MS
Antimony	0.004	U	0.020	U			MS
Arsenic	0.04	U	0.20	U			MS
Barium	0.298		0.251	J	16		MS
Beryllium	0.006	U	0.030	U			MS
Cadmium	0.141		0.137	J	3		MS
Calcium	1980.0		1956.5		1.2		P
Chromium	0.53		0.47	J	11		MS
Cobalt	0.105		0.108	J	3		MS
Copper	62.64		60.43		4		MS
Iron	616.9		590.0		4		MS
Lead	0.1183		0.1250	J	6		MS
Magnesium	9248.0		9080.0		1.8		P
Manganese	9.819		10.506		7		MS
Nickel	0.28	J	0.23	J	18		MS
Potassium	112500.0		111850.0		0.6		P
Selenium	5.6		4.8	J	14		MS
Silver	0.012	U	0.060	U			MS
Sodium	15100.0		14860.0		1.6		P
Thallium	0.0029	J	0.0090	U	100.0		MS
Vanadium	0.014	U	0.070	U			MS
Zinc	956.50		931.00		2.7		P

- 10 -

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP/ICP-MS ID #:

GFAA ID #:

AA ID #:

Analyte	Wave-length (nm)	Back-ground	MRL ug/L	MDL ug/L	M
Calcium	393.3		40.0	20.0	P
Magnesium	279.5		10.0	5.0	P
Potassium	766.5		200.0	40.0	P
Sodium	589.5		200.0	20.0	P
Zinc	206.2		4.00	0.60	P

Comments:

Metals

- 10 -

DETECTION LIMITS**Client:** Oregon State University**Service Request:** K1700172**Project No.:** NA**Project Name:** Avian Tissue Project**ICP/ICP-MS ID #:** K-ICP-MS-04**GFAA ID #:****AA ID #:**

Analyte	Isotope	Back-ground	MRL ug/L	MDL ug/L	M
Aluminum	27		4.0	0.4	MS
Antimony	123		0.100	0.004	MS
Arsenic	75		1.00	0.04	MS
Barium	137		0.100	0.010	MS
Beryllium	9		0.040	0.006	MS
Cadmium	111		0.040	0.004	MS
Chromium	52		0.40	0.04	MS
Cobalt	59		0.040	0.006	MS
Copper	65		0.20	0.04	MS
Iron	56		2.0	0.4	MS
Lead	208		0.0400	0.0010	MS
Manganese	55		0.100	0.016	MS
Nickel	60		0.40	0.04	MS
Selenium	78		2.0	0.4	MS
Silver	107		0.040	0.012	MS
Thallium	205		0.0400	0.0018	MS
Vanadium	51		0.400	0.014	MS

Comments:

Metals

- 11A -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Al	Ca	Fe	Mg	Ag
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	-0.0001350	0.0000000	0.0000000
Arsenic	189.042	0.0000420	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000070	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	-0.0006190	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000620	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0000150	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	-0.0000970	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000140	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000130	0.0000000	0.0000310	0.0000000

Comments:

Metals

- 11A -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	0.0000000	-0.0000420	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0001090	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		As	B	Ba	Be	Cd
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.042	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	-0.0001240
Cobalt	228.616	0.0000000	0.0000000	-0.0001140	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Co	Cr	Cu	K	Li
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	-0.0004810	0.0000000	0.0000000
Arsenic	189.042	0.0000000	0.0005710	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0025040	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0000520	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0002840	0.0000000	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0003570	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0001760	0.0000000	0.0000000
Nickel	231.604	-0.0001780	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0016430	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Vanadium	292.402	0.0000000	-0.0025430	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0007230	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Mn	Mo	Na	Ni	Pb
	182.034	0.0041380	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	-0.0007310	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.042	-0.0003130	0.0017060	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	-0.0000720	-0.0004190	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	-0.0019530	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	-0.0000310	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	-0.0011810	0.0000000	0.0000990	0.0000000
Copper	327.396	0.0000000	-0.0002870	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	-0.0005980	0.0000000	0.0002670	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0004730	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0123240	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0016500	0.0001830	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	-0.0005630	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0001330	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Vanadium	292.402	-0.0002140	0.0000000	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	-0.0001370	0.0000000	0.0060370	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		P	Sb	Se	Si	Sn
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.042	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0001370	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Service Request: K1700172

Project Name: Avian Tissue Project

K-ICP-AES-03

Vanadium	292.402	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Form XI (PART 2) - IN

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Sr	Ti	Tl	V	Zn
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	0.0000000	0.0023400	0.0000000
Arsenic	189.042	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	0.0000000	-0.0004790	0.0000000
Cadmium	226.502	0.0000000	0.0000240	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0025120	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0001450	0.0000000	-0.0001220	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000820	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0008000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Vanadium	292.402	0.0000000	0.0004600	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	-0.0005560	0.0000000	0.0000000	0.0000000

Comments:

Metals
 -12-
 ICP LINEAR RANGES (QUARTERLY)

Client: Oregon State University Service Request: K1700172
 Project No.: NA
 Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	Method
Calcium	15.000	900000	6010C
Magnesium	15.000	90000	6010C
Potassium	15.000	900000	6010C
Sodium	15.000	900000	6010C
Zinc	15.000	18000	6010C

Comments:

Metals

-12-

ICP LINEAR RANGES (QUARTERLY)

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-MS-04

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	Method
Aluminum	45.000	18000	6020A
Antimony	45.000	900	6020A
Arsenic	45.000	3000	6020A
Barium	45.000	3000	6020A
Beryllium	45.000	900	6020A
Cadmium	45.000	3000	6020A
Chromium	45.000	3000	6020A
Cobalt	45.000	3000	6020A
Copper	45.000	3000	6020A
Iron	45.000	18000	6020A
Lead	45.000	3000	6020A
Manganese	45.000	3000	6020A
Nickel	45.000	3000	6020A
Selenium	45.000	3000	6020A
Silver	45.000	900	6020A
Thallium	45.000	3000	6020A
Vanadium	45.000	3000	6020A

Comments:

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

Method: P

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700172-001	1/31/2017	0.3160	30.0
K1700172-002	1/31/2017	0.3130	30.0
K1700172-003	1/31/2017	0.3020	30.0
K1700172-004	1/31/2017	0.3110	30.0
K1700172-005	1/31/2017	0.3100	30.0
K1700172-005D	1/31/2017	0.3000	30.0
K1700172-005S	1/31/2017	0.3040	30.0
K1700172-006	1/31/2017	0.3070	30.0
K1700172-007	1/31/2017	0.3220	30.0
K1700172-008	1/31/2017	0.3030	30.0
K1700172-009	1/31/2017	0.3010	30.0
K1700172-010	1/31/2017	0.3170	30.0
K1700172-011	1/31/2017	0.3030	30.0
K1700172-012	1/31/2017	0.3170	30.0
K1700172-013	1/31/2017	0.3080	30.0
K1700172-014	1/31/2017	0.3040	30.0
K1700172-015	1/31/2017	0.3060	30.0
K1700172-016	1/31/2017	0.3060	30.0
K1700172-017	1/31/2017	0.3080	30.0
K1700172-018	1/31/2017	0.3130	30.0
K1700172-019	1/31/2017	0.3220	30.0
K1700172-020	1/31/2017	0.3010	30.0
KQ1700983-01	1/31/2017	0.3000	30.0
KQ1700983-02	1/31/2017	30.0	30.0
KQ1700983-03	1/31/2017	0.3030	30.0
KQ1700983-04	1/31/2017	0.3160	30.0

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

Method: P

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700172-021	1/31/2017	0.3060	30.0
K1700172-022	1/31/2017	0.3100	30.0
K1700172-023	1/31/2017	0.3000	30.0
K1700172-024	1/31/2017	0.3130	30.0
K1700172-025	1/31/2017	0.3180	30.0
K1700173-024D	1/31/2017	0.3100	30.0
K1700173-024S	1/31/2017	0.3040	30.0
KQ1700987-01	1/31/2017	0.3000	30.0
KQ1700987-02	1/31/2017	30.0	30.0
KQ1700987-03	1/31/2017	0.3160	30.0
KQ1700987-04	1/31/2017	0.3240	30.0

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

Method: MS

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700172-001	1/31/2017	0.3160	30.0
K1700172-002	1/31/2017	0.3130	30.0
K1700172-003	1/31/2017	0.3020	30.0
K1700172-004	1/31/2017	0.3110	30.0
K1700172-005	1/31/2017	0.3100	30.0
K1700172-005D	1/31/2017	0.3000	30.0
K1700172-005S	1/31/2017	0.3040	30.0
K1700172-006	1/31/2017	0.3070	30.0
K1700172-007	1/31/2017	0.3220	30.0
K1700172-008	1/31/2017	0.3030	30.0
K1700172-009	1/31/2017	0.3010	30.0
K1700172-010	1/31/2017	0.3170	30.0
K1700172-011	1/31/2017	0.3030	30.0
K1700172-012	1/31/2017	0.3170	30.0
K1700172-013	1/31/2017	0.3080	30.0
K1700172-014	1/31/2017	0.3040	30.0
K1700172-015	1/31/2017	0.3060	30.0
K1700172-016	1/31/2017	0.3060	30.0
K1700172-017	1/31/2017	0.3080	30.0
K1700172-018	1/31/2017	0.3130	30.0
K1700172-019	1/31/2017	0.3220	30.0
K1700172-020	1/31/2017	0.3010	30.0
KQ1700983-01	1/31/2017	0.3000	30.0
KQ1700983-02	1/31/2017	30.0	30.0
KQ1700983-03	1/31/2017	0.3030	30.0
KQ1700983-04	1/31/2017	0.3160	30.0

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Project Name: Avian Tissue Project

Method: MS

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700172-021	1/31/2017	0.3060	30.0
K1700172-022	1/31/2017	0.3100	30.0
K1700172-023	1/31/2017	0.3000	30.0
K1700172-024	1/31/2017	0.3130	30.0
K1700172-025	1/31/2017	0.3180	30.0
K1700173-024D	1/31/2017	0.3100	30.0
K1700173-024S	1/31/2017	0.3040	30.0
KQ1700987-01	1/31/2017	0.3000	30.0
KQ1700987-02	1/31/2017	30.0	30.0
KQ1700987-03	1/31/2017	0.3160	30.0
KQ1700987-04	1/31/2017	0.3240	30.0

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Run Number: 020117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 2/1/2017

End Date: 2/1/2017

Sample No.	D/F	Time	% R	Analytes																											
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V	Z N	C N				
BLK	1.0	14:24							X						X				X			X				X					
STD A	1.0	14:27							X						X											X					
STD B	1.0	14:29							X						X				X			X									
ICV1	1.0	14:32							X						X																
ICV1	1.0	14:34							X						X				X			X				X					
ZZZZZZ	1.0	14:37																													
ICB1	1.0	14:39							X						X				X			X				X					
LLICV1	1.0	14:42							X						X				X			X				X					
ZZZZZZ	1.0	14:44																													
ZZZZZZ	1.0	14:47																													
CCV1	1.0	14:49							X						X				X			X									
CCV1	1.0	14:52							X						X											X					
CCB1	1.0	14:54							X						X				X			X				X					
ICS-A1	1.0	14:57							X						X				X			X				X					
ICS-AB1	1.0	14:59							X						X				X			X				X					
KQ1700983-01	1.0	15:32							X						X				X			X				X					
KQ1700983-02	1.0	15:35							X						X				X			X				X					
KQ1700983-03	1.0	15:37																													
KQ1700983-04	1.0	15:40																													
K1700172-005	1.0	15:42							X						X				X			X				X					
K1700172-005L	5.0	15:45							X						X				X			X				X					
K1700172-005D	1.0	15:47							X						X				X			X				X					
K1700172-005S	1.0	15:50							X						X				X			X									
K1700172-001	1.0	15:52							X						X				X			X				X					
K1700172-005S	5.0	15:56																								X					
CCV2	1.0	15:59							X						X				X			X									
CCV2	1.0	16:01							X						X											X					
CCB2	1.0	16:04							X						X				X			X				X					
K1700172-002	1.0	16:06							X						X				X			X				X					
K1700172-003	1.0	16:09							X						X				X			X				X					
K1700172-004	1.0	16:11							X						X				X			X				X					
K1700172-006	1.0	16:13							X						X				X			X				X					

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Run Number: 020117AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 2/1/2017

End Date: 2/1/2017

Sample No.	D/F	Time	% R	Analytes																											
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V	Z N	C N				
K1700172-007	1.0	16:16							X						X				X			X				X					
K1700172-008	1.0	16:18							X						X				X			X				X					
K1700172-009	1.0	16:20							X						X				X			X				X					
K1700172-010	1.0	16:23							X						X				X			X				X					
K1700172-011	1.0	16:25							X						X				X			X				X					
K1700172-012	1.0	16:28							X						X				X			X				X					
CCV3	1.0	16:30							X						X				X			X									
CCV3	1.0	16:33							X						X											X					
CCB3	1.0	16:35							X						X				X			X				X					
K1700172-013	1.0	16:38							X						X				X			X				X					
K1700172-014	1.0	16:40							X						X				X			X				X					
K1700172-015	1.0	16:43							X						X				X			X				X					
K1700172-016	1.0	16:45							X						X				X			X				X					
K1700172-017	1.0	16:47							X						X				X			X				X					
K1700172-018	1.0	16:50							X						X				X			X				X					
K1700172-019	1.0	16:52							X						X				X			X				X					
K1700172-020	1.0	16:55							X						X				X			X				X					
ZZZZZZ	1.0	17:03																													
ZZZZZZ	1.0	17:06																													
CCV4	1.0	17:08							X						X				X			X									
CCV4	1.0	17:11							X						X											X					
CCB4	1.0	17:13							X						X				X			X				X					
LLCCV1	1.0	17:16							X						X				X			X				X					

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Run Number: 020217AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 2/2/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K E	S E	A G	N A	T L	V
BLK	1.0	08:20							X						X				X			X			X
STD A	1.0	08:22							X						X										X
STD B	1.0	08:25							X						X				X			X			
ICV2	1.0	08:28							X						X										
ICV2	1.0	08:30							X						X				X			X			X
ZZZZZZ	1.0	08:32																							
ICB2	1.0	08:37							X						X				X			X			X
LLICV1	1.0	08:40							X						X				X			X			X
ZZZZZZ	1.0	08:42																							
ZZZZZZ	1.0	08:44																							
CCV1	1.0	08:47							X						X				X			X			
ZZZZZZ	1.0	08:50																							
CCV1	1.0	08:53							X						X										X
CCB1	1.0	08:55							X						X				X			X			X
ICS-A1	1.0	08:57							X						X				X			X			X
ICS-AB1	1.0	09:00							X						X				X			X			X
KQ1700987-01	1.0	09:20							X						X				X			X			X
KQ1700987-02	1.0	09:23							X						X				X			X			X
KQ1700987-03	1.0	09:25																							
KQ1700987-04	1.0	09:27																							
ZZZZZZ	1.0	09:30																							
K1700173-024L	5.0	09:32							X						X				X			X			X
K1700173-024D	1.0	09:35							X						X				X			X			X
K1700173-024S	1.0	09:37							X						X				X			X			X
ZZZZZZ	1.0	09:40																							
ZZZZZZ	1.0	09:42																							
CCV2	1.0	09:44							X						X				X			X			
CCV2	1.0	09:47							X						X										X
CCB2	1.0	09:49							X						X				X			X			X
ZZZZZZ	1.0	09:52																							
ZZZZZZ	1.0	09:54																							
K1700172-021	1.0	09:56							X						X				X			X			

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Run Number: 020217AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 2/2/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																											
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V	Z N	C N				
K1700172-022	1.0	09:59								X					X				X			X			X						
K1700172-023	1.0	10:02								X					X				X			X			X						
K1700172-024	1.0	10:04								X					X				X			X			X						
K1700172-025	1.0	10:06								X					X				X			X			X						
K1700172-021	5.0	10:09																							X						
ZZZZZZ	1.0	10:11																													
ZZZZZZ	1.0	10:14																													
CCV3	1.0	10:16								X					X				X			X									
CCV3	1.0	10:19								X					X										X						
CCB3	1.0	10:21								X					X				X			X			X						
LLCCV1	1.0	10:23								X					X				X			X			X						

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Run Number: 020117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/1/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
Blank	1.0	14:49		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
Standard 1	1.0	14:54		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ICV1	1.0	14:58		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
CCV1	1.0	15:03		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ICB1	1.0	15:07		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
CCB1	1.0	15:12		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZ	1.0	15:16																							
LLICVT1	1.0	15:20		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ICS-A1	1.0	15:25		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ICS-AB1	1.0	15:29		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZ	1.0	15:34																							
KQ1700983-01	5.0	15:38		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
KQ1700983-02	5.0	15:43		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
KQ1700983-03	5.0	15:47																							
KQ1700983-04	5.0	15:52																							
K1700172-001	5.0	15:56		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-002	5.0	16:01		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-003	5.0	16:05		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
CCV2	1.0	16:10		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
CCB2	1.0	16:14		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-004	5.0	16:19		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-005	5.0	16:23		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-005D	5.0	16:28		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-005L	5.0	16:32		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-005A	5.0	16:37			X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-005S	5.0	16:41		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-006	5.0	16:46		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-007	5.0	16:50		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-008	5.0	16:55		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-009	5.0	16:59		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
CCV3	1.0	17:04		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
CCB3	1.0	17:08		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Run Number: 020117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/1/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
K1700172-010	5.0	17:13		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-011	5.0	17:17		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-012	5.0	17:22		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-013	5.0	17:26		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-014	5.0	17:31		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-015	5.0	17:35		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-016	5.0	17:40		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-017	5.0	17:44		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-018	5.0	17:49		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-019	5.0	17:53		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
CCV4	1.0	17:58		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
CCB4	1.0	18:02		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-020	5.0	18:07		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	5.0	18:11																							
ZZZZZZ	5.0	18:16																							
ZZZZZZ	5.0	18:20																							
ZZZZZZ	5.0	18:25																							
ZZZZZZ	5.0	18:29																							
ZZZZZZ	5.0	18:34																							
ZZZZZZ	5.0	18:38																							
ZZZZZZ	5.0	18:43																							
ZZZZZZ	5.0	18:47																							
CCV5	1.0	18:52		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	18:56																							
CCB5	1.0	19:01		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
LLCCVT1	1.0	19:05		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	19:10																							
ZZZZZZ	5.0	19:14																							
ZZZZZZ	5.0	19:19																							
ZZZZZZ	5.0	19:23																							
ZZZZZZ	5.0	19:28																							
ZZZZZZ	5.0	19:32																							

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Run Number: 020117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/1/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
ZZZZZZ	5.0	19:37																							
ZZZZZZ	5.0	19:41																							
ZZZZZZ	5.0	19:45																							
ZZZZZZ	5.0	19:50																							
ZZZZZZ	5.0	19:54																							
CCV6	1.0	19:59		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	20:03																							
CCB6	1.0	20:08		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	5.0	20:12																							
ZZZZZZ	5.0	20:17																							
ZZZZZZ	5.0	20:21																							
ZZZZZZ	5.0	20:26																							
ZZZZZZ	5.0	20:30																							
ZZZZZZ	5.0	20:35																							
ZZZZZZ	5.0	20:39																							
ZZZZZZ	5.0	20:44																							
ZZZZZZ	5.0	20:48																							
ZZZZZZ	5.0	20:53																							
CCV7	1.0	20:57		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	21:02																							
CCB7	1.0	21:06		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	5.0	21:11																							
ZZZZZZ	5.0	21:15																							
ZZZZZZ	5.0	21:20																							
ZZZZZZ	5.0	21:24																							
ZZZZZZ	5.0	21:29																							
ZZZZZZ	5.0	21:33																							
ZZZZZZ	5.0	21:38																							
ZZZZZZ	5.0	21:42																							
ZZZZZZ	5.0	21:47																							
ZZZZZZ	5.0	21:51																							
CCV8	1.0	21:56		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Run Number: 020117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/1/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
ZZZZZZ	1.0	22:00																							
CCB8	1.0	22:05		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	5.0	22:09																							
ZZZZZZ	5.0	22:14																							
ZZZZZZ	5.0	22:18																							
ZZZZZZ	5.0	22:23																							
ZZZZZZ	5.0	22:27																							
ZZZZZZ	5.0	22:32																							
ZZZZZZ	5.0	22:36																							
ZZZZZZ	5.0	22:41																							
ZZZZZZ	5.0	22:45																							
ZZZZZZ	5.0	22:50																							
CCV9	1.0	22:54		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	22:58																							
CCB9	1.0	23:03		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
LLCCVT2	1.0	23:07		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	23:12																							
ICS-A2	1.0	23:16		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ICS-AB2	1.0	23:21		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	23:25																							
ZZZZZZ	5.0	23:30																							
ZZZZZZ	5.0	23:34																							
ZZZZZZ	5.0	23:39																							
ZZZZZZ	5.0	23:43																							
ZZZZZZ	5.0	23:48																							
ZZZZZZ	5.0	23:52																							
ZZZZZZ	5.0	23:57																							
CCV10	1.0	00:01		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	00:06																							
CCB10	1.0	00:10		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	5.0	00:15																							
ZZZZZZ	5.0	00:19																							

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Run Number: 020117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/1/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																											
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V	Z N	C N				
ZZZZZZ	5.0	00:24																													
ZZZZZZ	5.0	00:28																													
ZZZZZZ	5.0	00:33																													
ZZZZZZ	5.0	00:37																													
ZZZZZZ	5.0	00:42																													
ZZZZZZ	5.0	00:46																													
ZZZZZZ	5.0	00:51																													
ZZZZZZ	5.0	00:55																													
CCV11	1.0	01:00		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
ZZZZZZ	1.0	01:04																													
CCB11	1.0	01:08		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
ZZZZZZ	5.0	01:13																													
ZZZZZZ	5.0	01:17																													
ZZZZZZ	5.0	01:22																													
ZZZZZZ	5.0	01:26																													
ZZZZZZ	5.0	01:31																													
ZZZZZZ	5.0	01:35																													
ZZZZZZ	5.0	01:40																													
ZZZZZZ	5.0	01:44																													
ZZZZZZ	5.0	01:49																													
ZZZZZZ	5.0	01:53																													
CCV12	1.0	01:58		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
ZZZZZZ	1.0	02:02																													
CCB12	1.0	02:07		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
ZZZZZZ	5.0	02:11																													
ZZZZZZ	5.0	02:16																													
ZZZZZZ	5.0	02:20																													
ZZZZZZ	5.0	02:25																													
ZZZZZZ	5.0	02:29																													
ZZZZZZ	5.0	02:34																													
ZZZZZZ	5.0	02:38																													
ZZZZZZ	5.0	02:43																													

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Run Number: 020117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/1/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
KQ1700987-01	5.0	02:47			X	X	X		X		X	X	X	X	X				X		X	X		X	X
KQ1700987-02	5.0	02:52			X	X	X		X		X	X	X	X	X				X		X	X		X	X
CCV13	1.0	02:56		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	03:01																							
CCB13	1.0	03:05		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
LLCCVT3	1.0	03:10		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	03:14																							
KQ1700987-03	5.0	03:18																							
KQ1700987-04	5.0	03:23																							
K1700172-021	5.0	03:27			X	X	X	X	X		X	X	X	X	X				X		X	X		X	X
K1700172-022	5.0	03:32		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700172-023	5.0	03:36		X	X	X	X	X	X		X	X	X	X	X				X		X	X		X	X
K1700172-024	5.0	03:41		X	X	X	X	X	X		X	X	X	X	X				X		X	X		X	X
K1700172-025	5.0	03:45		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	5.0	03:50																							
ZZZZZZ	5.0	03:54																							
ZZZZZZ	5.0	03:59																							
CCV14	1.0	04:03		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	04:08																							
ZZZZZZ	1.0	04:12																							
CCB14	1.0	04:17		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	5.0	04:21																							
K1700173-024D	5.0	04:26		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700173-024L	5.0	04:30		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700173-024A	5.0	04:35		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700173-024S	5.0	04:39		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	5.0	04:44																							
ZZZZZZ	5.0	04:48																							
ZZZZZZ	5.0	04:53																							
ZZZZZZ	5.0	04:57																							
ZZZZZZ	5.0	05:02																							
ZZZZZZ	1.0	05:06																							

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Run Number: 020117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/1/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																							
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V	Z N	C N
CCV15	1.0	05:10		X	X	X	X	X	X		X	X	X	X	X		X		X	X		X	X				
CCB15	1.0	05:15		X	X	X	X	X	X		X	X	X	X	X		X		X	X		X	X				
ZZZZZZ	5.0	05:20																									
ZZZZZZ	5.0	05:24																									
ZZZZZZ	5.0	05:29																									
ZZZZZZ	5.0	05:33																									
ZZZZZZ	5.0	05:37																									
ZZZZZZ	5.0	05:42																									
ZZZZZZ	1.0	05:47																									
CCV16	1.0	05:51		X	X	X	X	X	X		X	X	X	X	X		X		X	X		X	X				
CCB16	1.0	05:55		X	X	X	X	X	X		X	X	X	X	X		X		X	X		X	X				
ZZZZZZ	1.0	06:00																									
LLCCVT4	1.0	06:04		X	X	X	X	X	X		X	X	X	X	X		X		X	X		X	X				

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700172

Project No.: NA

Run Number: 020217a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/2/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																											
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V	Z N	C N				
Blank	1.0	13:11		X				X									X														
Standard 1	1.0	13:14		X				X									X														
ICV2	1.0	13:17		X				X									X														
CCV1	1.0	13:20		X				X									X														
ICB2	1.0	13:23		X				X									X														
CCB1	1.0	13:27		X				X									X														
LLICVT1	1.0	13:30		X				X									X														
ICS-A1	1.0	13:33		X				X									X														
ICS-AB1	1.0	13:36		X				X									X														
ZZZZZZ	1.0	13:39																													
ZZZZZZ	5.0	13:42																													
ZZZZZZ	5.0	13:45																													
ZZZZZZ	5.0	13:48																													
ZZZZZZ	5.0	13:51																													
ZZZZZZ	5.0	13:54																													
ZZZZZZ	5.0	13:57																													
KQ1700987-01	5.0	14:01		X				X									X														
CCV2	1.0	14:04		X				X									X														
CCB2	1.0	14:07		X				X									X														
KQ1700987-02	5.0	14:10		X				X									X														
ZZZZZZ	5.0	14:13																													
K1700172-021	25.0	14:16		X													X														
K1700172-023	25.0	14:19															X														
K1700172-024	25.0	14:22															X														
CCV3	1.0	14:25		X				X									X														
CCB3	1.0	14:28		X				X									X														
LLCCVT1	1.0	14:32		X				X									X														

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700172

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element Li6 KED1 Q	Element Ge72 KED2 Q	Element Ge72 KED3 Q	Element Sc45 STD Q	Element Rh103 KED2 Q	Element In115 KED1 Q				
Blank	Blank	1449	100	100	100	100	100	100				
Standard 1	Standard 1	1454	101	100	100	97	100	100				
ICV1	ICV	1458	102	100	99	99	97	102				
CCV1	CCV	1503	104	101	99	99	96	103				
ICB1	ICB	1507	102	99	99	97	97	102				
CCB1	CCB	1512	102	100	100	97	99	100				
ZZZZZZ	ZZZZZZ	1516										
LLICVT1	LLICVT1	1520	104	99	100	98	97	103				
ICS-A1	ICSA	1525	98	92	93	97	86	92				
ICS-AB1	ICSAB	1529	100	93	93	97	87	93				
ZZZZZZ	ZZZZZZ	1534										
KQ1700983-01	Method Blank	1538	103	104	103	100	102	105				
KQ1700983-02	Lab Control	1543	106	103	105	101	101	108				
KQ1700983-03	K1700172-SRM1	1547	108	102	103	111	95	105				
KQ1700983-04	K1700172-SRM2	1552	107	99	99	106	95	103				
K1700172-001	Bird No. 16-1 GI	1556	109	103	101	108	101	107				
K1700172-002	Bird No. 16-2 GI	1601	109	106	102	105	103	108				
K1700172-003	Bird No. 16-3 GI	1605	112	101	101	106	100	109				
CCV2	CCV	1610	107	99	102	100	99	108				
CCB2	CCB	1614	105	103	100	101	100	106				
K1700172-004	Bird No. 16-4 GI	1619	109	102	102	105	100	108				
K1700172-005	Bird No. 16-5 GI	1623	113	103	102	112	99	107				
K1700172-005D	Bird No. 16-5 GI	1628	111	102	102	112	100	110				
K1700172-005L	Bird No. 16-5 GI	1632	110	100	103	109	101	111				
K1700172-005A	Bird No. 16-5 GI	1637	111	103	101	114	97	107				
K1700172-005S	Bird No. 16-5 GI	1641	111	102	99	114	99	110				
K1700172-006	Bird No. 16-6 GI	1646	111	100	102	112	100	108				
K1700172-007	Bird No. 16-7 GI	1650	111	102	98	113	101	111				
K1700172-008	Bird No. 16-8 GI	1655	111	105	101	110	102	109				
K1700172-009	Bird No. 16-9 GI	1659	112	100	101	112	100	111				
CCV3	CCV	1704	109	101	97	104	102	109				
CCB3	CCB	1708	109	97	99	104	98	109				
K1700172-010	Bird No. 16-10	1713	111	99	100	106	98	110				
K1700172-011	Bird No. 16-11	1717	109	101	98	108	95	111				
K1700172-012	Bird No. 16-12	1722	110	100	100	117	97	112				
K1700172-013	Bird No. 16-13	1726	109	101	99	115	98	110				
K1700172-014	Bird No. 16-14	1731	110	99	100	107	96	111				
K1700172-015	Bird No. 16-15	1735	108	99	97	117	97	111				
K1700172-016	Bird No. 16-16	1740	112	101	101	112	100	110				
K1700172-017	Bird No. 16-17	1744	109	102	99	101	99	108				
K1700172-018	Bird No. 16-18	1749	112	102	101	108	98	110				
K1700172-019	Bird No. 16-19	1753	112	103	97	113	101	111				
CCV4	CCV	1758	110	100	98	104	100	111				
CCB4	CCB	1802	109	100	99	102	101	108				

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700172

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element Li6 KED1 Q	Element Ge72 KED2 Q	Element Ge72 KED3 Q	Element Sc45 STD Q	Element Rh103 KED2 Q	Element In115 KED1 Q				
K1700172-020	Bird No. 16-20	1807	111	99	99	112	97	108				
ZZZZZZ	ZZZZZZ	1811										
ZZZZZZ	ZZZZZZ	1816										
ZZZZZZ	ZZZZZZ	1820										
ZZZZZZ	ZZZZZZ	1825										
ZZZZZZ	ZZZZZZ	1829										
ZZZZZZ	ZZZZZZ	1834										
ZZZZZZ	ZZZZZZ	1838										
ZZZZZZ	ZZZZZZ	1843										
ZZZZZZ	ZZZZZZ	1847										
CCV5	CCV	1852	113	100	99	109	103	113				
ZZZZZZ	ZZZZZZ	1856										
CCB5	CCB	1901	110	99	97	107	100	111				
LLCCVT1	LLCCVT1	1905	111	101	95	105	99	113				
ZZZZZZ	ZZZZZZ	1910										
ZZZZZZ	ZZZZZZ	1914										
ZZZZZZ	ZZZZZZ	1919										
ZZZZZZ	ZZZZZZ	1923										
ZZZZZZ	ZZZZZZ	1928										
ZZZZZZ	ZZZZZZ	1932										
ZZZZZZ	ZZZZZZ	1937										
ZZZZZZ	ZZZZZZ	1941										
ZZZZZZ	ZZZZZZ	1945										
ZZZZZZ	ZZZZZZ	1950										
ZZZZZZ	ZZZZZZ	1954										
CCV6	CCV	1959	112	101	97	112	103	114				
ZZZZZZ	ZZZZZZ	2003										
CCB6	CCB	2008	111	100	96	108	102	114				
ZZZZZZ	ZZZZZZ	2012										
ZZZZZZ	ZZZZZZ	2017										
ZZZZZZ	ZZZZZZ	2021										
ZZZZZZ	ZZZZZZ	2026										
ZZZZZZ	ZZZZZZ	2030										
ZZZZZZ	ZZZZZZ	2035										
ZZZZZZ	ZZZZZZ	2039										
ZZZZZZ	ZZZZZZ	2044										
ZZZZZZ	ZZZZZZ	2048										
ZZZZZZ	ZZZZZZ	2053										
CCV7	CCV	2057	108	99	93	106	99	114				
ZZZZZZ	ZZZZZZ	2102										
CCB7	CCB	2106	114	101	95	109	102	114				
ZZZZZZ	ZZZZZZ	2111										
ZZZZZZ	ZZZZZZ	2115										
ZZZZZZ	ZZZZZZ	2120										

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700172

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element Li6 KED1 Q	Element Ge72 KED2 Q	Element Ge72 KED3 Q	Element Sc45 STD Q	Element Rh103 KED2 Q	Element In115 KED1 Q				
ZZZZZZ	ZZZZZZ	2124										
ZZZZZZ	ZZZZZZ	2129										
ZZZZZZ	ZZZZZZ	2133										
ZZZZZZ	ZZZZZZ	2138										
ZZZZZZ	ZZZZZZ	2142										
ZZZZZZ	ZZZZZZ	2147										
ZZZZZZ	ZZZZZZ	2151										
CCV8	CCV	2156	116	102	96	111	103	117				
ZZZZZZ	ZZZZZZ	2200										
CCB8	CCB	2205	112	100	96	108	102	116				
ZZZZZZ	ZZZZZZ	2209										
ZZZZZZ	ZZZZZZ	2214										
ZZZZZZ	ZZZZZZ	2218										
ZZZZZZ	ZZZZZZ	2223										
ZZZZZZ	ZZZZZZ	2227										
ZZZZZZ	ZZZZZZ	2232										
ZZZZZZ	ZZZZZZ	2236										
ZZZZZZ	ZZZZZZ	2241										
ZZZZZZ	ZZZZZZ	2245										
ZZZZZZ	ZZZZZZ	2250										
CCV9	CCV	2254	119	102	98	115	102	121				
ZZZZZZ	ZZZZZZ	2258										
CCB9	CCB	2303	113	103	98	112	101	119				
LLCCVT2	LLCCVT2	2307	116	104	98	110	104	119				
ZZZZZZ	ZZZZZZ	2312										
ICS-A2	ICSA	2316	108	91	88	105	89	101				
ICS-AB2	ICSAB	2321	106	87	86	97	85	100				
ZZZZZZ	ZZZZZZ	2325										
ZZZZZZ	ZZZZZZ	2330										
ZZZZZZ	ZZZZZZ	2334										
ZZZZZZ	ZZZZZZ	2339										
ZZZZZZ	ZZZZZZ	2343										
ZZZZZZ	ZZZZZZ	2348										
ZZZZZZ	ZZZZZZ	2352										
ZZZZZZ	ZZZZZZ	2357										
CCV10	CCV	0001	117	101	99	114	100	117				
ZZZZZZ	ZZZZZZ	0006										
CCB10	CCB	0010	117	99	97	113	102	118				
ZZZZZZ	ZZZZZZ	0015										
ZZZZZZ	ZZZZZZ	0019										
ZZZZZZ	ZZZZZZ	0024										
ZZZZZZ	ZZZZZZ	0028										
ZZZZZZ	ZZZZZZ	0033										
ZZZZZZ	ZZZZZZ	0037										

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700172

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element Li6 KED1 Q	Element Ge72 KED2 Q	Element Ge72 KED3 Q	Element Sc45 STD Q	Element Rh103 KED2 Q	Element In115 KED1 Q				
ZZZZZZ	ZZZZZZ	0042										
ZZZZZZ	ZZZZZZ	0046										
ZZZZZZ	ZZZZZZ	0051										
ZZZZZZ	ZZZZZZ	0055										
CCV11	CCV	0100	117	99	96	112	101	113				
ZZZZZZ	ZZZZZZ	0104										
CCB11	CCB	0108	112	100	97	110	100	110				
ZZZZZZ	ZZZZZZ	0113										
ZZZZZZ	ZZZZZZ	0117										
ZZZZZZ	ZZZZZZ	0122										
ZZZZZZ	ZZZZZZ	0126										
ZZZZZZ	ZZZZZZ	0131										
ZZZZZZ	ZZZZZZ	0135										
ZZZZZZ	ZZZZZZ	0140										
ZZZZZZ	ZZZZZZ	0144										
ZZZZZZ	ZZZZZZ	0149										
ZZZZZZ	ZZZZZZ	0153										
CCV12	CCV	0158	123	101	94	115	101	115				
ZZZZZZ	ZZZZZZ	0202										
CCB12	CCB	0207	114	96	95	112	95	111				
ZZZZZZ	ZZZZZZ	0211										
ZZZZZZ	ZZZZZZ	0216										
ZZZZZZ	ZZZZZZ	0220										
ZZZZZZ	ZZZZZZ	0225										
ZZZZZZ	ZZZZZZ	0229										
ZZZZZZ	ZZZZZZ	0234										
ZZZZZZ	ZZZZZZ	0238										
ZZZZZZ	ZZZZZZ	0243										
KQ1700987-01	Method Blank	0247		113	108		108	124				
KQ1700987-02	Lab Control	0252		110	104		109	125				
CCV13	CCV	0256	121	104	97	123	101	117				
ZZZZZZ	ZZZZZZ	0301										
CCB13	CCB	0305	115	100	92	119	99	114				
LLCCVT3	LLCCVT3	0310	115	99	94	118	100	114				
ZZZZZZ	ZZZZZZ	0314										
KQ1700987-03	K1700172-SRM3	0318	111	95	92	125	93	110				
KQ1700987-04	K1700172-SRM4	0323	112	93	88	117	91	107				
K1700172-021	Bird No. 16-21	0327	110	95	91		94	120				
K1700172-022	Bird No. 16-22	0332	113	98	95	125	100	112				
K1700172-023	Bird No. 16-23	0336	107	99	92		95	113				
K1700172-024	Bird No. 16-24	0341	110	97	92		94	115				
K1700172-025	Bird No. 16-25	0345	111	98	93	122	98	114				
ZZZZZZ	ZZZZZZ	0350										
ZZZZZZ	ZZZZZZ	0354										

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700172

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element Li6 KED1 Q	Element Ge72 KED2 Q	Element Ge72 KED3 Q	Element Sc45 STD Q	Element Rh103 KED2 Q	Element In115 KED1 Q				
ZZZZZZ	ZZZZZZ	0359										
CCV14	CCV	0403	112	96	91	116	96	112				
ZZZZZZ	ZZZZZZ	0408										
ZZZZZZ	ZZZZZZ	0412										
CCB14	CCB	0417	109	97	92	115	96	112				
ZZZZZZ	ZZZZZZ	0421										
K1700173-024D	Batch QC1D	0426	110	97	89	117	94	110				
K1700173-024L	Batch QC1L	0430	112	96	92	113	95	114				
K1700173-024A	Batch QC1A	0435	113	95	91	117	93	114				
K1700173-024S	Batch QC1S	0439	110	98	90	118	94	112				
ZZZZZZ	ZZZZZZ	0444										
ZZZZZZ	ZZZZZZ	0448										
ZZZZZZ	ZZZZZZ	0453										
ZZZZZZ	ZZZZZZ	0457										
ZZZZZZ	ZZZZZZ	0502										
ZZZZZZ	ZZZZZZ	0506										
CCV15	CCV	0510	114	98	92	120	96	115				
CCB15	CCB	0515	114	98	90	118	100	116				
ZZZZZZ	ZZZZZZ	0520										
ZZZZZZ	ZZZZZZ	0524										
ZZZZZZ	ZZZZZZ	0529										
ZZZZZZ	ZZZZZZ	0533										
ZZZZZZ	ZZZZZZ	0537										
ZZZZZZ	ZZZZZZ	0542										
ZZZZZZ	ZZZZZZ	0547										
CCV16	CCV	0551	120	97	93	123	100	113				
CCB16	CCB	0555	119	95	91	119	98	113				
ZZZZZZ	ZZZZZZ	0600										
LLCCVT4	LLCCVT4	0604	117	96	93	117	97	115				

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700172

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 02/02/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:											
			Element Li6 KED1	Q	Element Ge72 STD	Q	Element 	Q	Element 	Q	Element 	Q	Element 	Q
Blank	Blank	1311	100											
Standard 1	Standard 1	1314	104											
ICV2	ICV	1317	105											
CCV1	CCV	1320	102											
ICB2	ICB	1323	101											
CCB1	CCB	1327	99											
LLICVT1	LLICVT1	1330	100											
ICS-A1	ICSA	1333	96											
ICS-AB1	ICSAB	1336	98											
ZZZZZZ	ZZZZZZ	1339												
ZZZZZZ	ZZZZZZ	1342												
ZZZZZZ	ZZZZZZ	1345												
ZZZZZZ	ZZZZZZ	1348												
ZZZZZZ	ZZZZZZ	1351												
ZZZZZZ	ZZZZZZ	1354												
ZZZZZZ	ZZZZZZ	1357												
KQ1700987-01	Method Blank	1401	105											
CCV2	CCV	1404	106											
CCB2	CCB	1407	104											
KQ1700987-02	Lab Control	1410	105											
ZZZZZZ	ZZZZZZ	1413												
K1700172-021	Bird No. 16-21	1416	103											
K1700172-023	Bird No. 16-23	1419	101											
K1700172-024	Bird No. 16-24	1422	99											
CCV3	CCV	1425	102											
CCB3	CCB	1428	103											
LLCCVT1	LLCCVT1	1432	104											

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp.

Contract: _____

Lab Code: ALSK Case No.: _____NRAS No.: _____ SDG NO.: K1700172ICP-MS Instrument ID: K-ICP-MS-04Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
Blank	Blank	1449	100									
Standard 1	Standard 1	1454	102									
ICV1	ICV	1458	102									
CCV1	CCV	1503	102									
ICB1	ICB	1507	103									
CCB1	CCB	1512	102									
ZZZZZZ	ZZZZZZ	1516										
LLICVT1	LLICVT1	1520	103									
ICS-A1	ICSA	1525	98									
ICS-AB1	ICSAB	1529	100									
ZZZZZZ	ZZZZZZ	1534										
KQ1700983-01	Method Blank	1538	107									
KQ1700983-02	Lab Control	1543	108									
KQ1700983-03	K1700172-SRM1	1547	112									
KQ1700983-04	K1700172-SRM2	1552	109									
K1700172-001	Bird No. 16-1 GI	1556	109									
K1700172-002	Bird No. 16-2 GI	1601	111									
K1700172-003	Bird No. 16-3 GI	1605	111									
CCV2	CCV	1610	108									
CCB2	CCB	1614	106									
K1700172-004	Bird No. 16-4 GI	1619	109									
K1700172-005	Bird No. 16-5 GI	1623	114									
K1700172-005D	Bird No. 16-5 GI	1628	115									
K1700172-005L	Bird No. 16-5 GI	1632	113									
K1700172-005A	Bird No. 16-5 GI	1637	112									
K1700172-005S	Bird No. 16-5 GI	1641	117									
K1700172-006	Bird No. 16-6 GI	1646	115									
K1700172-007	Bird No. 16-7 GI	1650	111									
K1700172-008	Bird No. 16-8 GI	1655	112									
K1700172-009	Bird No. 16-9 GI	1659	113									
CCV3	CCV	1704	108									
CCB3	CCB	1708	108									
K1700172-010	Bird No. 16-10	1713	112									
K1700172-011	Bird No. 16-11	1717	112									
K1700172-012	Bird No. 16-12	1722	118									
K1700172-013	Bird No. 16-13	1726	112									
K1700172-014	Bird No. 16-14	1731	111									
K1700172-015	Bird No. 16-15	1735	115									
K1700172-016	Bird No. 16-16	1740	112									
K1700172-017	Bird No. 16-17	1744	111									
K1700172-018	Bird No. 16-18	1749	113									
K1700172-019	Bird No. 16-19	1753	113									
CCV4	CCV	1758	110									
CCB4	CCB	1802	109									

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp.

Contract: _____

Lab Code: ALSK Case No.: _____

NRAS No.: _____

SDG NO.: K1700172ICP-MS Instrument ID: K-ICP-MS-04Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:										
			Element	Q	Element	Q	Element	Q	Element	Q	Element	Q	
K1700172-020	Bird No. 16-20	1807	Lu175 KED	114									
ZZZZZZ	ZZZZZZ	1811											
ZZZZZZ	ZZZZZZ	1816											
ZZZZZZ	ZZZZZZ	1820											
ZZZZZZ	ZZZZZZ	1825											
ZZZZZZ	ZZZZZZ	1829											
ZZZZZZ	ZZZZZZ	1834											
ZZZZZZ	ZZZZZZ	1838											
ZZZZZZ	ZZZZZZ	1843											
ZZZZZZ	ZZZZZZ	1847											
CCV5	CCV	1852		111									
ZZZZZZ	ZZZZZZ	1856											
CCB5	CCB	1901		110									
LLCCVT1	LLCCVT1	1905		108									
ZZZZZZ	ZZZZZZ	1910											
ZZZZZZ	ZZZZZZ	1914											
ZZZZZZ	ZZZZZZ	1919											
ZZZZZZ	ZZZZZZ	1923											
ZZZZZZ	ZZZZZZ	1928											
ZZZZZZ	ZZZZZZ	1932											
ZZZZZZ	ZZZZZZ	1937											
ZZZZZZ	ZZZZZZ	1941											
ZZZZZZ	ZZZZZZ	1945											
ZZZZZZ	ZZZZZZ	1950											
ZZZZZZ	ZZZZZZ	1954											
CCV6	CCV	1959		114									
ZZZZZZ	ZZZZZZ	2003											
CCB6	CCB	2008		111									
ZZZZZZ	ZZZZZZ	2012											
ZZZZZZ	ZZZZZZ	2017											
ZZZZZZ	ZZZZZZ	2021											
ZZZZZZ	ZZZZZZ	2026											
ZZZZZZ	ZZZZZZ	2030											
ZZZZZZ	ZZZZZZ	2035											
ZZZZZZ	ZZZZZZ	2039											
ZZZZZZ	ZZZZZZ	2044											
ZZZZZZ	ZZZZZZ	2048											
ZZZZZZ	ZZZZZZ	2053											
CCV7	CCV	2057		112									
ZZZZZZ	ZZZZZZ	2102											
CCB7	CCB	2106		112									
ZZZZZZ	ZZZZZZ	2111											
ZZZZZZ	ZZZZZZ	2115											
ZZZZZZ	ZZZZZZ	2120											

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700172

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:										
			Element	Q	Element	Q	Element	Q	Element	Q	Element	Q	
ZZZZZZ	ZZZZZZ	2124											
ZZZZZZ	ZZZZZZ	2129											
ZZZZZZ	ZZZZZZ	2133											
ZZZZZZ	ZZZZZZ	2138											
ZZZZZZ	ZZZZZZ	2142											
ZZZZZZ	ZZZZZZ	2147											
ZZZZZZ	ZZZZZZ	2151											
CCV8	CCV	2156	115										
ZZZZZZ	ZZZZZZ	2200											
CCB8	CCB	2205	112										
ZZZZZZ	ZZZZZZ	2209											
ZZZZZZ	ZZZZZZ	2214											
ZZZZZZ	ZZZZZZ	2218											
ZZZZZZ	ZZZZZZ	2223											
ZZZZZZ	ZZZZZZ	2227											
ZZZZZZ	ZZZZZZ	2232											
ZZZZZZ	ZZZZZZ	2236											
ZZZZZZ	ZZZZZZ	2241											
ZZZZZZ	ZZZZZZ	2245											
ZZZZZZ	ZZZZZZ	2250											
CCV9	CCV	2254	118										
ZZZZZZ	ZZZZZZ	2258											
CCB9	CCB	2303	115										
LLCCVT2	LLCCVT2	2307	116										
ZZZZZZ	ZZZZZZ	2312											
ICS-A2	ICSA	2316	105										
ICS-AB2	ICSAB	2321	104										
ZZZZZZ	ZZZZZZ	2325											
ZZZZZZ	ZZZZZZ	2330											
ZZZZZZ	ZZZZZZ	2334											
ZZZZZZ	ZZZZZZ	2339											
ZZZZZZ	ZZZZZZ	2343											
ZZZZZZ	ZZZZZZ	2348											
ZZZZZZ	ZZZZZZ	2352											
ZZZZZZ	ZZZZZZ	2357											
CCV10	CCV	0001	116										
ZZZZZZ	ZZZZZZ	0006											
CCB10	CCB	0010	114										
ZZZZZZ	ZZZZZZ	0015											
ZZZZZZ	ZZZZZZ	0019											
ZZZZZZ	ZZZZZZ	0024											
ZZZZZZ	ZZZZZZ	0028											
ZZZZZZ	ZZZZZZ	0033											
ZZZZZZ	ZZZZZZ	0037											

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp.

Contract: _____

Lab Code: ALSK Case No.: _____NRAS No.: _____ SDG NO.: K1700172ICP-MS Instrument ID: K-ICP-MS-04Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
ZZZZZZ	ZZZZZZ	0042										
ZZZZZZ	ZZZZZZ	0046										
ZZZZZZ	ZZZZZZ	0051										
ZZZZZZ	ZZZZZZ	0055										
CCV11	CCV	0100	108									
ZZZZZZ	ZZZZZZ	0104										
CCB11	CCB	0108	109									
ZZZZZZ	ZZZZZZ	0113										
ZZZZZZ	ZZZZZZ	0117										
ZZZZZZ	ZZZZZZ	0122										
ZZZZZZ	ZZZZZZ	0126										
ZZZZZZ	ZZZZZZ	0131										
ZZZZZZ	ZZZZZZ	0135										
ZZZZZZ	ZZZZZZ	0140										
ZZZZZZ	ZZZZZZ	0144										
ZZZZZZ	ZZZZZZ	0149										
ZZZZZZ	ZZZZZZ	0153										
CCV12	CCV	0158	111									
ZZZZZZ	ZZZZZZ	0202										
CCB12	CCB	0207	106									
ZZZZZZ	ZZZZZZ	0211										
ZZZZZZ	ZZZZZZ	0216										
ZZZZZZ	ZZZZZZ	0220										
ZZZZZZ	ZZZZZZ	0225										
ZZZZZZ	ZZZZZZ	0229										
ZZZZZZ	ZZZZZZ	0234										
ZZZZZZ	ZZZZZZ	0238										
ZZZZZZ	ZZZZZZ	0243										
KQ1700987-01	Method Blank	0247	113									
KQ1700987-02	Lab Control	0252	114									
CCV13	CCV	0256	113									
ZZZZZZ	ZZZZZZ	0301										
CCB13	CCB	0305	108									
LLCCVT3	LLCCVT3	0310	108									
ZZZZZZ	ZZZZZZ	0314										
KQ1700987-03	K1700172-SRM3	0318	109									
KQ1700987-04	K1700172-SRM4	0323	108									
K1700172-021	Bird No. 16-21	0327	124									
K1700172-022	Bird No. 16-22	0332	113									
K1700172-023	Bird No. 16-23	0336	116									
K1700172-024	Bird No. 16-24	0341	115									
K1700172-025	Bird No. 16-25	0345	112									
ZZZZZZ	ZZZZZZ	0350										
ZZZZZZ	ZZZZZZ	0354										

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700172

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
ZZZZZZ	ZZZZZZ	0359										
CCV14	CCV	0403	108									
ZZZZZZ	ZZZZZZ	0408										
ZZZZZZ	ZZZZZZ	0412										
CCB14	CCB	0417	107									
ZZZZZZ	ZZZZZZ	0421										
K1700173-024D	Batch QC1D	0426	109									
K1700173-024L	Batch QC1L	0430	107									
K1700173-024A	Batch QC1A	0435	108									
K1700173-024S	Batch QC1S	0439	111									
ZZZZZZ	ZZZZZZ	0444										
ZZZZZZ	ZZZZZZ	0448										
ZZZZZZ	ZZZZZZ	0453										
ZZZZZZ	ZZZZZZ	0457										
ZZZZZZ	ZZZZZZ	0502										
ZZZZZZ	ZZZZZZ	0506										
CCV15	CCV	0510	109									
CCB15	CCB	0515	111									
ZZZZZZ	ZZZZZZ	0520										
ZZZZZZ	ZZZZZZ	0524										
ZZZZZZ	ZZZZZZ	0529										
ZZZZZZ	ZZZZZZ	0533										
ZZZZZZ	ZZZZZZ	0537										
ZZZZZZ	ZZZZZZ	0542										
ZZZZZZ	ZZZZZZ	0547										
CCV16	CCV	0551	108									
CCB16	CCB	0555	108									
ZZZZZZ	ZZZZZZ	0600										
LLCCVT4	LLCCVT4	0604	107									



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February 27, 2017

Analytical Report for Service Request No: K1700174

Bill Stubblefield
Oregon State University
Wiegand Hall 421
3051 Campus Way
Corvallis, OR 97331

RE: Avian Tissue Project

Dear Bill,

Enclosed are the results of the sample(s) submitted to our laboratory December 29, 2016
For your reference, these analyses have been assigned our service request number **K1700174**.

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

Please contact me if you have any questions. My extension is 3356. You may also contact me via email at Kurt.Clarkson@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kurt Clarkson
Client Services
Manager



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Table of Contents

Acronyms

Qualifiers

State Certifications, Accreditations, And Licenses

Case Narrative

Chain of Custody

Total Solids

General Chemistry

Metals

Acronyms

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

Inorganic Data Qualifiers

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

Metals Data Qualifiers

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

Organic Data Qualifiers

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

Additional Petroleum Hydrocarbon Specific Qualifiers

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

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

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

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

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



Case Narrative

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

ALS ENVIRONMENTAL

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request No.: K1700174
Date Received: 12/29/16

Case Narrative

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

Sample Receipt

Twenty animal tissue samples were received for analysis at ALS Environmental on 12/29/16. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were frozen at -20°C upon receipt at the laboratory.

General Chemistry Parameters

Total Cyanide by EPA Method 9012B:

Samples 1-4 and 20 were received past holding time. The analysis was performed as soon as possible after receipt by the laboratory. The data was flagged to indicate the holding time violation.

The ALS upper control criterion was exceeded in Laboratory Control Sample (LCS) 2. The error associated with elevated recovery indicated a potential high bias. The sample data was not significantly affected. The samples were not reanalyzed because the result for LCS was within manufacturer's acceptance limits. No further corrective action was appropriate.

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

Total Metals

Matrix Spike Recovery Exceptions:

The control criteria for matrix spike recovery of Potassium and Sodium for sample Bird No. 16-11 Thigh Muscle were not applicable. The analyzed concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

The matrix spike recovery of Arsenic, Magnesium and Selenium for sample Bird No. 16-11 Thigh Muscle was outside control criteria. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. No further corrective action was appropriate.

Approved by



The post spike recovery of Selenium for sample Bird No. 16-11 Thigh Muscle was outside control criteria. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. The matrix spike outlier suggested a potential high bias in this matrix. No further corrective action was appropriate.

The matrix spike recovery of Chromium for sample Bird No. 16-5 GI Contents was outside the ALS control criteria as a result of the heterogeneous character of the sample. The Relative Percent Difference (RPD) for the replicate analysis supported this. The associated QA/QC results (e.g. control sample, calibration standards, etc.) indicated the analysis was in control. No further corrective action was appropriate.

The control criteria for matrix spike recovery of Magnesium, Potassium and Sodium for the Batch QC1 sample were not applicable. The analyzed concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

The matrix spike recovery of Selenium for the Batch QC1 sample was outside control criteria. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. No further corrective action was appropriate.

Relative Percent Difference Exceptions:

The Relative Percent Difference (RPD) for the replicate analysis of Chromium in sample Bird No. 16-5 GI Contents was outside the Method control limits. The variability in the results was attributed to the heterogeneous distribution of Chromium in the sample. Freeze drying, grinding in combination with standard mixing techniques were used, but were not sufficient for complete homogenization of this sample.

Approved by 



Chain of Custody

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K1700174

Running number	ID	Weight (g)	Sex (m/f)	Liver	Kidney	GI tract	GI contents	Breast muscle	Thigh muscle	Bone (including marrow)
1	16-1	1772	m	x	x	x	x	x	x	x
2	16-2	2475	m	x	x	x	x	x	x	x
3	16-3	1964	m	x	x	x	x	x	x	x
4	16-4	2419	m	x	x	x	x	x	x	x
5	16-5	2887	m	x	x	x	x	x	x	x
6	16-6	1893	m	x	x	x	x	x	x	x
7	16-7	2317	f	x	x	x	x	x	x	x
8	16-8	2518	m	x	x	x	x	x	x	x
9	16-9	2274	f	x	x	x	x	x	x	x
10	16-10	2521	m	x	x	x	x	x	x	x
11	16-11	2152	m	x	x	x	x	x	x	x
12	16-12	1864	f	x	x	x	x	x	x	x
13	16-13	2170	f	x	x	x	x	x	x	x
14	16-14	1941	f	x	x	x	x	x	x	x
15	16-15	1973	m	x	x	x	x	x	x	x
16	16-16	2532	f	x	x	x	x	x	x	x
17	16-17	2624	m	x	x	x	x	x	x	x
18	16-18	2445	m	x	x	x	x	x	x	x
19	16-19	2418	f	x	x	x	x	x	x	x
20	16-20	2197	m	x	x	x	x	x	x	x
21	16-21	1537	f	x	x	x	x	x	x	x
22	16-22	1741	m	x	x	x	x	x	x	x
23	16-23	1853	f	x	x	x	x	x	x	x
24	16-24	1795	m	x	x	x	x	x	x	x
25	16-25	1838	m	x	x	x	x	x	x	x



Cooler Receipt and Preservation Form

PC GS

Client OSU USFW

Service Request K1700174

Received: 12-29-16 Opened: 12-29-16 By: eg Unloaded: 12-29-16 By: eg

1. Samples were received via? Mail Fed Ex UPS DHL PDX Courier Hand Delivered
2. Samples were received in: (circle) Cooler Box Envelope Other NA
3. Were custody seals on coolers? NA Y N If yes, how many and where? NA
- If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID	Tracking Number	NA	Filed
-10.8	-10.8	-	-	<u>Q</u>	361	NA	12 788 146 01 4816	NA	144

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

Sample ID on Bottle	Sample ID on COC	Identified by:

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

Notes, Discrepancies, & Resolutions:

Page of



Total Solids

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ALS Group USA, Corp.
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Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue
Analysis Method: Freeze Dry
Prep Method: None

Service Request: K1700174
Date Collected: 12/08/16 - 12/19/16
Date Received: 12/29/16
Units: Percent
Basis: Wet

Total Solids

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
Bird No. 16-1 Thigh Muscle	K1700174-001	28.5	-	-	1	01/20/17 10:00	
Bird No. 16-2 Thigh Muscle	K1700174-002	30.1	-	-	1	01/20/17 10:00	
Bird No. 16-3 Thigh Muscle	K1700174-003	31.0	-	-	1	01/20/17 10:00	
Bird No. 16-4 Thigh Muscle	K1700174-004	37.2	-	-	1	01/20/17 10:00	
Bird No. 16-5 Thigh Muscle	K1700174-005	26.9	-	-	1	01/20/17 10:00	
Bird No. 16-6 Thigh Muscle	K1700174-006	32.7	-	-	1	01/20/17 10:00	
Bird No. 16-7 Thigh Muscle	K1700174-007	31.7	-	-	1	01/20/17 10:00	
Bird No. 16-8 Thigh Muscle	K1700174-008	36.4	-	-	1	01/20/17 10:00	
Bird No. 16-9 Thigh Muscle	K1700174-009	31.1	-	-	1	01/20/17 10:00	
Bird No. 16-10 Thigh Muscle	K1700174-010	32.8	-	-	1	01/20/17 10:00	
Bird No. 16-11 Thigh Muscle	K1700174-011	37.6	-	-	1	01/20/17 10:00	
Bird No. 16-12 Thigh Muscle	K1700174-012	31.3	-	-	1	01/20/17 10:00	
Bird No. 16-13 Thigh Muscle	K1700174-013	36.2	-	-	1	01/20/17 10:00	
Bird No. 16-14 Thigh Muscle	K1700174-014	41.1	-	-	1	01/20/17 10:00	
Bird No. 16-15 Thigh Muscle	K1700174-015	32.7	-	-	1	01/20/17 10:00	
Bird No. 16-16 Thigh Muscle	K1700174-016	36.7	-	-	1	01/20/17 10:00	
Bird No. 16-17 Thigh Muscle	K1700174-017	36.8	-	-	1	01/20/17 10:00	
Bird No. 16-18 Thigh Muscle	K1700174-018	38.3	-	-	1	01/20/17 10:00	
Bird No. 16-19 Thigh Muscle	K1700174-019	30.3	-	-	1	01/20/17 10:00	
Bird No. 16-20 Thigh Muscle	K1700174-020	41.2	-	-	1	01/20/17 10:00	
Bird No. 16-21 Thigh Muscle	K1700174-021	29.1	-	-	1	01/20/17 10:00	
Bird No. 16-22 Thigh Muscle	K1700174-022	34.4	-	-	1	01/20/17 10:00	
Bird No. 16-23 Thigh Muscle	K1700174-023	32.5	-	-	1	01/20/17 10:00	
Bird No. 16-24 Thigh Muscle	K1700174-024	40.6	-	-	1	01/20/17 10:00	
Bird No. 16-25 Thigh Muscle	K1700174-025	29.3	-	-	1	01/20/17 10:00	



General Chemistry

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue
Analysis Method: 9012B
Prep Method: EPA 9010B

Service Request: K1700174
Date Collected: 12/08/16 - 12/19/16
Date Received: 12/29/16
Units: mg/Kg
Basis: Wet

Cyanide, Total

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Bird No. 16-1 Thigh Muscle	K1700174-001	1.18	0.10	-	1	02/09/17	2/9/17	**
Bird No. 16-2 Thigh Muscle	K1700174-002	1.66	0.10	-	1	02/09/17	2/9/17	**
Bird No. 16-3 Thigh Muscle	K1700174-003	1.17	0.10	-	1	02/09/17	2/9/17	**
Bird No. 16-4 Thigh Muscle	K1700174-004	1.12	0.10	-	1	02/09/17	2/9/17	**
Bird No. 16-5 Thigh Muscle	K1700174-005	1.07	0.10	-	1	02/09/17	2/9/17	*
Bird No. 16-6 Thigh Muscle	K1700174-006	0.90	0.10	-	1	02/09/17	2/9/17	*
Bird No. 16-7 Thigh Muscle	K1700174-007	4.22	0.10	-	1	02/09/17	2/9/17	*
Bird No. 16-8 Thigh Muscle	K1700174-008	1.28	0.10	-	1	02/09/17	2/9/17	*
Bird No. 16-9 Thigh Muscle	K1700174-009	2.83	0.10	-	1	02/09/17	2/9/17	*
Bird No. 16-10 Thigh Muscle	K1700174-010	0.74	0.10	-	1	02/09/17	2/9/17	*
Bird No. 16-11 Thigh Muscle	K1700174-011	0.43	0.10	-	1	02/09/17	2/9/17	*
Bird No. 16-12 Thigh Muscle	K1700174-012	1.57	0.10	-	1	02/09/17	2/9/17	*
Bird No. 16-13 Thigh Muscle	K1700174-013	1.03	0.10	-	1	02/09/17	2/9/17	*
Bird No. 16-14 Thigh Muscle	K1700174-014	0.50	0.10	-	1	02/09/17	2/9/17	*
Bird No. 16-15 Thigh Muscle	K1700174-015	0.70	0.10	-	1	02/09/17	2/9/17	*
Bird No. 16-16 Thigh Muscle	K1700174-016	1.47	0.10	-	1	02/09/17	2/9/17	*
Bird No. 16-17 Thigh Muscle	K1700174-017	1.82	0.10	-	1	02/09/17	2/9/17	*
Bird No. 16-18 Thigh Muscle	K1700174-018	0.59	0.10	-	1	02/09/17	2/9/17	*
Bird No. 16-19 Thigh Muscle	K1700174-019	1.25	0.10	-	1	02/09/17	2/9/17	*
Bird No. 16-20 Thigh Muscle	K1700174-020	0.51	0.10	-	1	02/09/17	2/9/17	**
Bird No. 16-21 Thigh Muscle	K1700174-021	0.86	0.10	-	1	02/08/17	2/8/17	*
Bird No. 16-22 Thigh Muscle	K1700174-022	1.14	0.10	-	1	02/08/17	2/8/17	*
Bird No. 16-23 Thigh Muscle	K1700174-023	0.74	0.10	-	1	02/08/17	2/8/17	*
Bird No. 16-24 Thigh Muscle	K1700174-024	1.53	0.10	-	1	02/08/17	2/8/17	*
Bird No. 16-25 Thigh Muscle	K1700174-025	0.97	0.10	-	1	02/08/17	2/8/17	*
Method Blank	K1700174-MB1	ND U	0.10	-	1	02/08/17	2/8/17	
Method Blank	K1700174-MB2	ND U	0.10	-	1	02/09/17	2/9/17	

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request:K1700174
Date Collected:NA
Date Received:12/29/16

Analysis Method: 9012B
Prep Method: EPA 9010B

Units:mg/Kg
Basis:Wet

Replicate Sample Summary
Cyanide, Total

Sample Name:	Lab Code:	MRL	MDL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Batch QC	K1700173-024DUP	0.10	-	2.58	2.99	2.79	15	20	02/08/17
Bird No. 16-11 Thigh Muscle	K1700174-011DUP	0.10	-	0.43	0.46	0.447	8	20	02/09/17

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

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

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

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700174
Date Collected: N/A
Date Received: N/A
Date Analyzed: 02/8/17
Date Extracted: 02/8/17

Duplicate Matrix Spike Summary
Cyanide, Total

Sample Name: Batch QC
Lab Code: K1700173-024
Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet

Analyte Name	Sample Result	Matrix Spike K1700173-024MS				Duplicate Matrix Spike K1700173-024DMS				RPD
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec	% Rec Limits		
Cyanide, Total	2.58	6.01	4.96	69	5.30	4.82	56	10-171	12	
									20	

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

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

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

ALS Group USA, Corp.
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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700174
Date Collected: N/A
Date Received: 12/29/16
Date Analyzed: 02/9/17
Date Extracted: 02/9/17

Duplicate Matrix Spike Summary
Cyanide, Total

Sample Name: Bird No. 16-11 Thigh Muscle
Lab Code: K1700174-011
Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet

Analyte Name	Sample Result	Result	Matrix Spike K1700174-011MS		Result	Duplicate Matrix Spike K1700174-011DMS		% Rec Limits	RPD	RPD Limit
			Spike Amount	% Rec		Spike Amount	% Rec			
Cyanide, Total	0.43	3.96	4.69	75	3.91	4.73	73	10-171	1	20

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

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

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

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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700174
Date Analyzed: 02/08/17
Date Extracted: 02/08/17

Lab Control Sample Summary
Cyanide, Total

Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet
Analysis Lot: 533994

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1700174-LCS1	76.2	70.3	108	62-128

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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal Tissue

Service Request: K1700174
Date Analyzed: 02/09/17
Date Extracted: 02/09/17

Lab Control Sample Summary
Cyanide, Total

Analysis Method: 9012B
Prep Method: EPA 9010B

Units: mg/Kg
Basis: Wet
Analysis Lot: 534299

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1700174-LCS2	108	70.3	154 *	62-128

Client: Oregon State University
Project: Avian Tissue Project

Service Request: K1700174

Continuing Calibration Verification (CCV) Summary

Cyanide, Total

Analysis Method: 9012B

Units: ug/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	533994	KQ1701366-10	02/08/17 16:21	100	102	102	90-110
CCV2	533994	KQ1701366-11	02/08/17 16:21	100	102	102	90-110
CCV3	533994	KQ1701366-12	02/08/17 16:21	100	102	102	90-110
CCV4	533994	KQ1701366-13	02/08/17 16:21	100	102	102	90-110
CCV5	534299	KQ1701432-10	02/09/17 16:33	100	102	102	90-110
CCV6	534299	KQ1701432-11	02/09/17 16:33	100	104	104	90-110
CCV7	534299	KQ1701432-12	02/09/17 16:33	100	103	103	90-110
CCV8	534299	KQ1701432-13	02/09/17 16:33	100	104	104	90-110

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QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project

Service Request:K1700174

Continuing Calibration Blank (CCB) Summary
Cyanide, Total

Analysis Method: 9012B

Units:mg/Kg

	Analysis Lot	Lab Code	Date Analyzed	MRL	MDL	Result	Q
CCB1	533994	KQ1701366-06	02/08/17 16:21	0.10		ND	U
CCB2	533994	KQ1701366-07	02/08/17 16:21	0.10		ND	U
CCB3	533994	KQ1701366-08	02/08/17 16:21	0.10		ND	U
CCB4	533994	KQ1701366-09	02/08/17 16:21	0.10		ND	U
CCB5	534299	KQ1701432-06	02/09/17 16:33	0.10		ND	U
CCB6	534299	KQ1701432-07	02/09/17 16:33	0.10		ND	U
CCB7	534299	KQ1701432-08	02/09/17 16:33	0.10		ND	U
CCB8	534299	KQ1701432-09	02/09/17 16:33	0.10		ND	U



Metals

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ALS Group USA, Corp.
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Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700174
Date Collected: 12/08-19/16
Date Received: 12/29/16

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/g
Basis: Dry

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Bird No. 16-1 Thigh Muscle	K1700174-001	1.0	0.06	1	02/02/17	02/03/17	6.99	
Bird No. 16-2 Thigh Muscle	K1700174-002	1.0	0.06	1	02/02/17	02/03/17	5.04	
Bird No. 16-3 Thigh Muscle	K1700174-003	1.0	0.06	1	02/02/17	02/03/17	2.20	
Bird No. 16-4 Thigh Muscle	K1700174-004	1.0	0.06	1	02/02/17	02/03/17	2.40	
Bird No. 16-5 Thigh Muscle	K1700174-005	1.0	0.06	1	02/02/17	02/03/17	4.16	
Bird No. 16-6 Thigh Muscle	K1700174-006	1.0	0.06	1	02/02/17	02/03/17	2.40	
Bird No. 16-7 Thigh Muscle	K1700174-007	0.9	0.06	1	02/02/17	02/03/17	1.76	
Bird No. 16-8 Thigh Muscle	K1700174-008	1.0	0.06	1	02/02/17	02/03/17	3.36	
Bird No. 16-9 Thigh Muscle	K1700174-009	1.0	0.06	1	02/02/17	02/03/17	2.55	
Bird No. 16-10 Thigh Muscle	K1700174-010	0.9	0.06	1	02/02/17	02/03/17	2.65	
Bird No. 16-11 Thigh Muscle	K1700174-011	1.0	0.06	1	02/02/17	02/03/17	3.44	
Bird No. 16-12 Thigh Muscle	K1700174-012	1.0	0.06	1	02/02/17	02/03/17	1.94	
Bird No. 16-13 Thigh Muscle	K1700174-013	1.0	0.06	1	02/02/17	02/03/17	2.10	
Bird No. 16-14 Thigh Muscle	K1700174-014	1.0	0.06	1	02/02/17	02/03/17	2.07	
Bird No. 16-15 Thigh Muscle	K1700174-015	1.0	0.06	1	02/02/17	02/03/17	2.12	
Bird No. 16-16 Thigh Muscle	K1700174-016	1.0	0.06	1	02/02/17	02/03/17	2.84	
Bird No. 16-17 Thigh Muscle	K1700174-017	1.0	0.06	1	02/02/17	02/03/17	1.95	
Bird No. 16-18 Thigh Muscle	K1700174-018	1.0	0.06	1	02/02/17	02/03/17	2.25	
Bird No. 16-19 Thigh Muscle	K1700174-019	0.9	0.06	1	02/02/17	02/03/17	2.69	
Bird No. 16-20 Thigh Muscle	K1700174-020	1.0	0.06	1	02/02/17	02/03/17	2.00	
Method Blank 1	K1700174-MB1	1.0	0.06	1	02/02/17	02/03/17	ND	
Method Blank 2	K1700174-MB2	1.0	0.06	1	02/02/17	02/03/17	ND	
Method Blank 3	K1700174-MB3	1.0	0.06	1	02/02/17	02/03/17	ND	

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700174
Date Collected: 12/19/16
Date Received: 12/29/16

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/g
Basis: Dry

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Bird No. 16-21 Thigh Muscle	K1700174-021	0.9	0.06	1	02/02/17	02/03/17	2.46	
Bird No. 16-22 Thigh Muscle	K1700174-022	0.9	0.06	1	02/02/17	02/03/17	4.68	
Bird No. 16-23 Thigh Muscle	K1700174-023	1.0	0.06	1	02/02/17	02/03/17	1.18	
Bird No. 16-24 Thigh Muscle	K1700174-024	0.9	0.06	1	02/02/17	02/03/17	1.63	
Bird No. 16-25 Thigh Muscle	K1700174-025	1.0	0.06	1	02/02/17	02/03/17	2.08	
Method Blank 1	K1700174-MB1	1.0	0.06	1	02/02/17	02/03/17	ND	
Method Blank 2	K1700174-MB2	1.0	0.06	1	02/02/17	02/03/17	ND	
Method Blank 3	K1700174-MB3	1.0	0.06	1	02/02/17	02/03/17	ND	

ALS Group USA, Corp.
dba ALS Environmental
 QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700174
Date Collected: 12/08/16
Date Received: 12/29/16
Date Extracted: 02/02/17
Date Analyzed: 02/03/17

Matrix Spike/Duplicate Matrix Spike Summary
 Total Metals

Sample Name: Bird No. 16-1 Thigh Muscle Units: ng/g
 Lab Code: K1700174-001S, K1700174-001SD Basis: Dry
 Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		ALS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Mercury	METHOD	1631E	4.8	237	238	6.99	243	250	100	102	70-130	3	

ALS Group USA, Corp.
dba ALS Environmental
 QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700174
Date Collected: NA
Date Received: NA
Date Extracted: 02/02/17
Date Analyzed: 02/03/17

Matrix Spike/Duplicate Matrix Spike Summary
 Total Metals

Sample Name: Bird No. 16-11 Thigh Muscle Units: ng/g
 Lab Code: K1700174-011S, K1700174-011SD Basis: Dry
 Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		ALS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Mercury	METHOD	1631E	4.8	236	240	3.44	232	241	97	99	70-130	4	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700174
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 02/03/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Initial) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	4.94	99	70-130	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700174
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 02/03/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	4.78	96	70-130	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Animal tissue

Service Request: K1700174
Date Collected: NA
Date Received: NA
Date Extracted: 02/02/17
Date Analyzed: 02/03/17

Quality Control Sample (QCS) Summary
Total Metals

Sample Name: Quality Control Sample
Lab Code: K1700174-QCS
Test Notes:

Units: ng/g
Basis: Dry

Source: TORT-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	292	286	98	70-130	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
Sample Matrix: Animal tissue

Service Request: K1700174
Date Collected: 12/19/16
Date Received: 12/29/16
Date Extracted: 02/02/17
Date Analyzed: 02/03/17

Matrix Spike/Duplicate Matrix Spike Summary Total Metals

Sample Name: Bird No. 16-23 Thigh Muscle
Lab Code: K1700174-023S, K1700174-023SD
Test Notes:

Units: ng/g
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		ALS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Mercury	METHOD	1631E	4.9	235	243	1.18	221	245	94	100	70-130	10	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700174
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 02/03/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Initial) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	4.56	91	70-130	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Water

Service Request: K1700174
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 02/03/17

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final) Units: ng/g
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	5.00	4.67	93	70-130	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Animal tissue

Service Request: K1700174
Date Collected: NA
Date Received: NA
Date Extracted: 02/02/17
Date Analyzed: 02/03/17

Quality Control Sample (QCS) Summary
Total Metals

Sample Name: Quality Control Sample
Lab Code: K1700174-QCS
Test Notes:

Units: ng/g
Basis: Dry

Source: TORT-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS	Result Notes
						Percent Recovery Acceptance Limits	
Mercury	METHOD	1631E	292	278	95	70-130	

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-1 Thigh Muscle

Lab Code: K1700174-001

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	15.0		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	U	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.188		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.089		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	256		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	2.51		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.156		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	8.38		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	199		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0143	J	
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	875		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	13.5		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.25		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	10700		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.9		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.013	J	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	2260		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0014	J	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.025	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	198		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-2 Thigh Muscle

Lab Code: K1700174-002

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	7.5		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.03	J	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.207		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.150		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	313		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	2.35		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.430		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	12.3		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	172		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0381		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	890		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	41.4		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.34		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	9270		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.0	J	N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	1940		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0012	J	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.014	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	159		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-3 Thigh Muscle

Lab Code: K1700174-003

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	3.4		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	U	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.112		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.104		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	262		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.98		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.089		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	7.21		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	235		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0105	J	
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	714		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	6.64		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.48		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	8570		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	2.0		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	2280		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0009	U	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.007	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	188		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected: 12/8/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-4 Thigh Muscle

Lab Code: K1700174-004

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	6.0		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.004	J	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.04	J	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.269		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.004	J	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.192		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	320		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.31		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.531		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	7.70		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	156		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0729		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	720		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	55.2		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.02		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	6210		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.3		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	1140		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0107	J	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.014	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	132		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-5 Thigh Muscle

Lab Code: K1700174-005

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	5.3		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	U	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.542		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.070		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	313		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	2.60		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.111		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	9.90		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	216		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0714		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	873		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	9.66		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.27		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	10700		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	2.3		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	2430		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0011	J	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.034	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	164		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-6 Thigh Muscle

Lab Code: K1700174-006

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	4.0		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	J	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.132		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.145		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	316		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	4.04		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.499		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	7.12		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	218		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0182	J	
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	667		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	42.4		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	2.22		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	6780		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	2.0		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	1830		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0016	J	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.027	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	145		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-7 Thigh Muscle

Lab Code: K1700174-007

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	2.8		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	U	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.117		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.224		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	208		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	3.71		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.401		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	10.4		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	262		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0163	J	
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	703		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	31.0		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	2.03		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	7730		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.2		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	1980		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0009	U	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.028	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	135		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-8 Thigh Muscle

Lab Code: K1700174-008

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	8.4		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	J	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	J	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.401		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.138		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	261		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.31		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.283		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	7.15		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	167		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0160	J	
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	731		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	35.4		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.85		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	6520		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.4		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	1390		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0011	J	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.030	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	107		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-9 Thigh Muscle

Lab Code: K1700174-009

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	2.9		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	U	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.245		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.395		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	383		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	2.67		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.871		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	10.9		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	236		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0124	J	
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	888		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	66.7		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.83		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	8660		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.9		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	1820		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0009	U	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.015	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	185		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-10 Thigh Muscle

Lab Code: K1700174-010

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	9.9		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.003	J	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	U	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.341		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.005	J	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.107		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	295		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	2.00		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.152		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	9.24		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	192		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.245		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	713		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	16.0		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.05		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	8160		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.6		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	2030		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0029	J	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.023	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	135		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-11 Thigh Muscle

Lab Code: K1700174-011

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	2.9		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	U	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.096		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.069		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	152		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	2.10		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.070		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	4.90		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	126		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0095	J	
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	518		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	5.36		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.02		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	7380		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.4		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	1320		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0010	J	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.013	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	119		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-12 Thigh Muscle

Lab Code: K1700174-012

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	6.2		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	U	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.260		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.112		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	165		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.26		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.121		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	7.83		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	229		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0137	J	
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	790		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	6.92		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.61		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	9480		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.3		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.012	J	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	1800		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0033	J	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.016	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	145		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-13 Thigh Muscle

Lab Code: K1700174-013

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	6.9		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	U	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.113		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.094		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	188		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	2.35		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.204		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	5.11		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	214		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0172	J	
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	669		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	16.1		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.22		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	7790		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.1		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	1450		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0017	J	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.018	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	101		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-14 Thigh Muscle

Lab Code: K1700174-014

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	4.4		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	U	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.064		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.052		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	125		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.32		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.071		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	4.35		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	103		
Lead	6020A	0.0199	0.0005	5.0	01/31/17	02/01/17	0.0204		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	551		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	4.92		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.66		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	7090		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.2		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	19.9	2.0	1.0	01/31/17	02/02/17	1190		
Thallium	6020A	0.0199	0.0009	5.0	01/31/17	02/01/17	0.0058	J	
Vanadium	6020A	0.199	0.007	5.0	01/31/17	02/01/17	0.011	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	113		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-15 Thigh Muscle

Lab Code: K1700174-015

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	2.8		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	U	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.091		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.107		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	139		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	2.35		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.076		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	4.87		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	169		
Lead	6020A	0.0198	0.0005	5.0	01/31/17	02/01/17	0.0081	J	
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	632		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	2.20		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.11		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	8220		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.5		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	19.8	2.0	1.0	01/31/17	02/02/17	1380		
Thallium	6020A	0.0198	0.0009	5.0	01/31/17	02/01/17	0.0015	J	
Vanadium	6020A	0.198	0.007	5.0	01/31/17	02/01/17	0.015	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	139		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-16 Thigh Muscle

Lab Code: K1700174-016

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	10.3		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.06	J	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.106		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.101		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	191		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.91		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.315		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	5.01		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	221		
Lead	6020A	0.0199	0.0005	5.0	01/31/17	02/01/17	0.0834		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	671		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	31.6		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.64		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	7160		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.2		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	19.9	2.0	1.0	01/31/17	02/02/17	1110		
Thallium	6020A	0.0199	0.0009	5.0	01/31/17	02/01/17	0.0016	J	
Vanadium	6020A	0.199	0.007	5.0	01/31/17	02/01/17	0.029	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	121		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-17 Thigh Muscle

Lab Code: K1700174-017

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	3.9		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	J	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.087		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.065		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	229		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.61		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.260		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	4.62		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	198		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0276		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	740		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	27.7		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.50		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	7910		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.6		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	1350		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0009	U	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.012	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	102		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-18 Thigh Muscle

Lab Code: K1700174-018

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	16.1		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.05	J	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.188		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.161		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	299		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	4.18		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.536		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	6.21		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	159		
Lead	6020A	0.0198	0.0005	5.0	01/31/17	02/01/17	0.153		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	643		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	48.7		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	2.29		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	5980		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.2		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	19.8	2.0	1.0	01/31/17	02/02/17	1220		
Thallium	6020A	0.0198	0.0009	5.0	01/31/17	02/01/17	0.0011	J	
Vanadium	6020A	0.198	0.007	5.0	01/31/17	02/01/17	0.035	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	127		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-19 Thigh Muscle

Lab Code: K1700174-019

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	6.1		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.03	J	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.122		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.112		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	181		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.65		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.161		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	6.33		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	272		
Lead	6020A	0.0199	0.0005	5.0	01/31/17	02/01/17	0.0609		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	810		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	22.9		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.43		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	10400		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	1.4		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	19.9	2.0	1.0	01/31/17	02/02/17	1310		
Thallium	6020A	0.0199	0.0009	5.0	01/31/17	02/01/17	0.0010	J	
Vanadium	6020A	0.199	0.007	5.0	01/31/17	02/01/17	0.017	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	124		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-20 Thigh Muscle

Lab Code: K1700174-020

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	4.5		
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	U	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.195		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.131		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	232		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	1.60		*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.174		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	5.77		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	102		
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0204		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	472		N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	13.8		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.90		
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	5670		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	0.8	J	N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	1340		
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0009	U	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.008	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	103		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-21 Thigh Muscle

Lab Code: K1700174-021

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/02/17	5.0		
Antimony	6020A	0.049	0.002	5.0	01/31/17	02/02/17	0.002	U	
Arsenic	6020A	0.49	0.02	5.0	01/31/17	02/02/17	0.02	U	
Barium	6020A	0.049	0.005	5.0	01/31/17	02/02/17	0.148		
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/02/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/02/17	0.098		
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	202		
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/02/17	1.74		
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/02/17	0.083		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/02/17	7.99		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/02/17	140		
Lead	6020A	0.0197	0.0005	5.0	01/31/17	02/02/17	0.0336		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	741		
Manganese	6020A	0.049	0.008	5.0	01/31/17	02/02/17	7.45		
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/02/17	0.86		
Potassium	6010C	39	4.0	1.0	01/31/17	02/02/17	9850		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/02/17	1.7		N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/02/17	0.006	U	
Sodium	6010C	19.7	2.0	1.0	01/31/17	02/02/17	1910		
Thallium	6020A	0.0197	0.0009	5.0	01/31/17	02/02/17	0.0018	J	
Vanadium	6020A	0.197	0.007	5.0	01/31/17	02/02/17	0.010	J	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	162		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-22 Thigh Muscle

Lab Code: K1700174-022

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/02/17	5.6		
Antimony	6020A	0.046	0.002	5.0	01/31/17	02/02/17	0.002	U	
Arsenic	6020A	0.46	0.02	5.0	01/31/17	02/02/17	0.02	U	
Barium	6020A	0.046	0.005	5.0	01/31/17	02/02/17	0.150		
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/02/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/02/17	0.066		
Calcium	6010C	3.7	1.9	1.0	01/31/17	02/02/17	152		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/02/17	2.34		
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/02/17	0.062		
Copper	6020A	0.09	0.02	5.0	01/31/17	02/02/17	9.43		
Iron	6020A	0.9	0.2	5.0	01/31/17	02/02/17	214		
Lead	6020A	0.0186	0.0005	5.0	01/31/17	02/02/17	0.0123	J	
Magnesium	6010C	0.9	0.5	1.0	01/31/17	02/02/17	616		
Manganese	6020A	0.046	0.007	5.0	01/31/17	02/02/17	3.21		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/02/17	1.13		
Potassium	6010C	37	3.7	1.0	01/31/17	02/02/17	8590		
Selenium	6020A	0.9	0.2	5.0	01/31/17	02/02/17	1.2		N
Silver	6020A	0.019	0.006	5.0	01/31/17	02/02/17	0.006	U	
Sodium	6010C	18.6	1.9	1.0	01/31/17	02/02/17	1660		
Thallium	6020A	0.0186	0.0008	5.0	01/31/17	02/02/17	0.0036	J	
Vanadium	6020A	0.186	0.007	5.0	01/31/17	02/02/17	0.016	J	
Zinc	6010C	0.37	0.06	1.0	01/31/17	02/02/17	137		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-23 Thigh Muscle

Lab Code: K1700174-023

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/02/17	1.6	J	
Antimony	6020A	0.048	0.002	5.0	01/31/17	02/02/17	0.002	U	
Arsenic	6020A	0.48	0.02	5.0	01/31/17	02/02/17	0.02	U	
Barium	6020A	0.048	0.005	5.0	01/31/17	02/02/17	0.145		
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/02/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/02/17	0.148		
Calcium	6010C	3.9	1.9	1.0	01/31/17	02/02/17	151		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/02/17	1.18		
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/02/17	0.052		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/02/17	7.52		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/02/17	165		
Lead	6020A	0.0193	0.0005	5.0	01/31/17	02/02/17	0.0065	J	
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	602		
Manganese	6020A	0.048	0.008	5.0	01/31/17	02/02/17	1.61		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/02/17	0.55		
Potassium	6010C	39	3.9	1.0	01/31/17	02/02/17	8680		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/02/17	1.1		N
Silver	6020A	0.019	0.006	5.0	01/31/17	02/02/17	0.006	U	
Sodium	6010C	19.3	1.9	1.0	01/31/17	02/02/17	1620		
Thallium	6020A	0.0193	0.0009	5.0	01/31/17	02/02/17	0.0013	J	
Vanadium	6020A	0.193	0.007	5.0	01/31/17	02/02/17	0.010	J	
Zinc	6010C	0.39	0.06	1.0	01/31/17	02/02/17	130		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-24 Thigh Muscle

Lab Code: K1700174-024

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/02/17	7.9		
Antimony	6020A	0.047	0.002	5.0	01/31/17	02/02/17	0.002	U	
Arsenic	6020A	0.48	0.02	5.0	01/31/17	02/02/17	0.02	U	
Barium	6020A	0.047	0.005	5.0	01/31/17	02/02/17	0.122		
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/02/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/02/17	0.079		
Calcium	6010C	3.8	1.9	1.0	01/31/17	02/02/17	225		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/02/17	1.68		
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/02/17	0.053		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/02/17	4.63		
Iron	6020A	0.9	0.2	5.0	01/31/17	02/02/17	141		
Lead	6020A	0.0190	0.0005	5.0	01/31/17	02/02/17	0.0580		
Magnesium	6010C	0.9	0.5	1.0	01/31/17	02/02/17	493		
Manganese	6020A	0.047	0.008	5.0	01/31/17	02/02/17	4.76		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/02/17	0.79		
Potassium	6010C	38	3.8	1.0	01/31/17	02/02/17	6540		
Selenium	6020A	0.9	0.2	5.0	01/31/17	02/02/17	1.2		N
Silver	6020A	0.019	0.006	5.0	01/31/17	02/02/17	0.019	J	
Sodium	6010C	19.0	1.9	1.0	01/31/17	02/02/17	1300		
Thallium	6020A	0.0190	0.0009	5.0	01/31/17	02/02/17	0.0009	U	
Vanadium	6020A	0.190	0.007	5.0	01/31/17	02/02/17	0.010	J	
Zinc	6010C	0.38	0.06	1.0	01/31/17	02/02/17	95.7		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected: 12/19/2016

Project Name: Avian Tissue Project

Date Received: 12/29/2016

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Bird No. 16-25 Thigh Muscle

Lab Code: K1700174-025

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	1.9	0.2	5.0	01/31/17	02/02/17	4.4		
Antimony	6020A	0.049	0.002	5.0	01/31/17	02/02/17	0.002	U	
Arsenic	6020A	0.49	0.02	5.0	01/31/17	02/02/17	0.02	U	
Barium	6020A	0.049	0.005	5.0	01/31/17	02/02/17	0.197		
Beryllium	6020A	0.019	0.003	5.0	01/31/17	02/02/17	0.003	U	
Cadmium	6020A	0.019	0.002	5.0	01/31/17	02/02/17	0.175		
Calcium	6010C	3.9	1.9	1.0	01/31/17	02/02/17	350		
Chromium	6020A	0.19	0.02	5.0	01/31/17	02/02/17	1.08		
Cobalt	6020A	0.019	0.003	5.0	01/31/17	02/02/17	0.082		
Copper	6020A	0.10	0.02	5.0	01/31/17	02/02/17	6.55		
Iron	6020A	1.0	0.2	5.0	01/31/17	02/02/17	222		
Lead	6020A	0.0194	0.0005	5.0	01/31/17	02/02/17	0.0618		
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	659		
Manganese	6020A	0.049	0.008	5.0	01/31/17	02/02/17	1.91		
Nickel	6020A	0.19	0.02	5.0	01/31/17	02/02/17	0.51		
Potassium	6010C	39	3.9	1.0	01/31/17	02/02/17	8830		
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/02/17	1.2		N
Silver	6020A	0.019	0.006	5.0	01/31/17	02/02/17	0.006	U	
Sodium	6010C	19.4	1.9	1.0	01/31/17	02/02/17	1850		
Thallium	6020A	0.0194	0.0009	5.0	01/31/17	02/02/17	0.0019	J	
Vanadium	6020A	0.194	0.007	5.0	01/31/17	02/02/17	0.018	J	
Zinc	6010C	0.39	0.06	1.0	01/31/17	02/02/17	147		

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received:

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Method Blank

Lab Code: KQ1700985-01

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/01/17	0.4	J	
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/01/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/01/17	0.02	U	N
Barium	6020A	0.050	0.005	5.0	01/31/17	02/01/17	0.005	U	
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/01/17	0.004	J	
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	2.0	U	
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.02	U	*
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/01/17	0.003	U	
Copper	6020A	0.10	0.02	5.0	01/31/17	02/01/17	0.02	U	
Iron	6020A	1.0	0.2	5.0	01/31/17	02/01/17	0.2	U	
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/01/17	0.0008	J	
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	0.5	U	N
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/01/17	0.013	J	
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/01/17	0.02	U	
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	4.0	U	
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/01/17	0.2	U	N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/01/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	2.0	U	
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/01/17	0.0009	U	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/01/17	0.007	U	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	0.08	J	

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Date Collected:

Project Name: Avian Tissue Project

Date Received:

Matrix: TISSUE

Units: mg/Kg

Basis: DRY

Sample Name: Method Blank

Lab Code: KQ1700987-01

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020A	2.0	0.2	5.0	01/31/17	02/02/17	0.2	J	
Antimony	6020A	0.050	0.002	5.0	01/31/17	02/02/17	0.002	U	
Arsenic	6020A	0.50	0.02	5.0	01/31/17	02/02/17	0.02	U	
Barium	6020A	0.050	0.005	5.0	01/31/17	02/02/17	0.005	U	
Beryllium	6020A	0.020	0.003	5.0	01/31/17	02/02/17	0.003	U	
Cadmium	6020A	0.020	0.002	5.0	01/31/17	02/02/17	0.002	U	
Calcium	6010C	4.0	2.0	1.0	01/31/17	02/02/17	2.0	U	
Chromium	6020A	0.20	0.02	5.0	01/31/17	02/02/17	0.02	U	
Cobalt	6020A	0.020	0.003	5.0	01/31/17	02/02/17	0.003	U	
Copper	6020A	0.10	0.02	5.0	01/31/17	02/02/17	0.02	U	
Iron	6020A	1.0	0.2	5.0	01/31/17	02/02/17	0.2	U	
Lead	6020A	0.0200	0.0005	5.0	01/31/17	02/02/17	0.0005	J	
Magnesium	6010C	1.0	0.5	1.0	01/31/17	02/02/17	0.5	U	
Manganese	6020A	0.050	0.008	5.0	01/31/17	02/02/17	0.008	U	
Nickel	6020A	0.20	0.02	5.0	01/31/17	02/02/17	0.02	U	
Potassium	6010C	40	4.0	1.0	01/31/17	02/02/17	4.0	U	
Selenium	6020A	1.0	0.2	5.0	01/31/17	02/02/17	0.2	U	N
Silver	6020A	0.020	0.006	5.0	01/31/17	02/02/17	0.006	U	
Sodium	6010C	20.0	2.0	1.0	01/31/17	02/02/17	2.0	U	
Thallium	6020A	0.0200	0.0009	5.0	01/31/17	02/02/17	0.0009	U	
Vanadium	6020A	0.200	0.007	5.0	01/31/17	02/02/17	0.007	U	
Zinc	6010C	0.40	0.06	1.0	01/31/17	02/02/17	0.06	U	

Comments:

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum	100.0	90.1	90	25.0	25.3	101	24.3	97	6020A
Antimony	25.0	25.6	102	25.0	24.4	98	24.6	98	6020A
Arsenic	25.0	25.8	103	25.0	24.5	98	25.1	100	6020A
Barium	100.0	101.2	101	25.0	24.7	99	25.1	100	6020A
Beryllium	2.5	2.6	104	25.0	25.1	100	24.6	98	6020A
Cadmium	12.5	13.5	108	25.0	25.6	102	25.5	102	6020A
Calcium	5000	4966	99	500	510	102	503	101	6010C
Calcium	12500	12240	98	10000	10130	101	9983	100	6010C
Chromium	10.0	10.4	104	25.0	25.0	100	25.1	100	6020A
Cobalt	25.0	26.7	107	25.0	25.0	100	24.9	100	6020A
Copper	12.5	13.1	105	25.0	25.3	101	25.4	102	6020A
Iron	50.0	52.1	104	25.0	25.1	100	24.6	98	6020A
Lead	25.0	25.8	103	25.0	25.4	102	25.2	101	6020A
Magnesium	12500.0	12270	98	10000.0	10200	102	9986	100	6010C
Magnesium	5000.0	4973	99	250.0	256	102	259	104	6010C
Manganese	25.0	25.0	100	25.0	25.4	102	25.1	100	6020A
Nickel	25.0	26.2	105	25.0	25.1	100	25.1	100	6020A
Potassium	12500.0	12450	100	10000.0	10070	101	9942	99	6010C
Selenium	25.0	25.1	100	25.0	24.9	100	26.1	104	6020A
Silver	12.5	13.6	109	25.0	25.8	103	26.1	104	6020A
Sodium	12500.0	12760	102	10000.0	10120	101	9978	100	6010C
Thallium	25.0	25.8	103	25.0	25.3	101	25.1	100	6020A
Vanadium	25.0	26.3	105	25.0	25.0	100	24.9	100	6020A
Zinc	1250.0	1257	101	250.0	258	103	256	102	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.0	100	24.8	99	6020A
Antimony				25.0	24.9	100	24.8	99	6020A
Arsenic				25.0	25.0	100	25.4	102	6020A
Barium				25.0	24.8	99	24.4	98	6020A
Beryllium				25.0	24.9	100	23.3	93	6020A
Cadmium				25.0	24.4	98	25.3	101	6020A
Calcium				10000	10070	101	10330	103	6010C
Calcium				500	506	101	550	110	6010C
Chromium				25.0	25.6	102	25.0	100	6020A
Cobalt				25.0	25.8	103	25.0	100	6020A
Copper				25.0	26.2	105	25.5	102	6020A
Iron				25.0	25.5	102	24.5	98	6020A
Lead				25.0	25.1	100	24.8	99	6020A
Magnesium				10000.0	9893	99	9977	100	6010C
Magnesium				250.0	257	103	256	102	6010C
Manganese				25.0	24.8	99	24.3	97	6020A
Nickel				25.0	25.8	103	25.2	101	6020A
Potassium				10000.0	9905	99	9959	100	6010C
Selenium				25.0	24.8	99	25.4	102	6020A
Silver				25.0	24.9	100	25.3	101	6020A
Sodium				10000.0	9962	100	10010	100	6010C
Thallium				25.0	24.9	100	24.9	100	6020A
Vanadium				25.0	25.3	101	25.1	100	6020A
Zinc				250.0	253	101	254	102	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.2	101	25.6	102	6020A
Antimony				25.0	24.8	99	24.9	100	6020A
Arsenic				25.0	25.1	100	24.0	96	6020A
Barium				25.0	24.1	96	24.7	99	6020A
Beryllium				25.0	23.1	92	23.4	94	6020A
Cadmium				25.0	25.0	100	24.6	98	6020A
Calcium				10000	10210	102	10180	102	6010C
Calcium				500	546	109	506	101	6010C
Chromium				25.0	25.2	101	25.0	100	6020A
Cobalt				25.0	25.1	100	25.4	102	6020A
Copper				25.0	25.6	102	25.9	104	6020A
Iron				25.0	24.9	100	24.5	98	6020A
Lead				25.0	24.9	100	24.5	98	6020A
Magnesium				10000.0	9954	100	9756	98	6010C
Magnesium				250.0	260	104	257	103	6010C
Manganese				25.0	25.0	100	24.6	98	6020A
Nickel				25.0	25.2	101	25.4	102	6020A
Potassium				10000.0	10150	102	9802	98	6010C
Selenium				25.0	25.5	102	25.2	101	6020A
Silver				25.0	25.2	101	24.8	99	6020A
Sodium				10000.0	10110	101	9726	97	6010C
Thallium				25.0	24.6	98	24.3	97	6020A
Vanadium				25.0	25.0	100	24.8	99	6020A
Zinc				250.0	258	103	256	102	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	26.2	105	25.5	102	6020A
Antimony				25.0	24.9	100	25.3	101	6020A
Arsenic				25.0	25.1	100	25.0	100	6020A
Barium				25.0	23.8	95	24.4	98	6020A
Beryllium				25.0	23.6	94	23.0	92	6020A
Cadmium				25.0	25.3	101	25.1	100	6020A
Calcium				10000	10040	100	10120	101	6010C
Calcium				500	501	100	517	103	6010C
Chromium				25.0	25.6	102	25.4	102	6020A
Cobalt				25.0	26.1	104	25.9	104	6020A
Copper				25.0	26.1	104	26.0	104	6020A
Iron				25.0	25.2	101	25.5	102	6020A
Lead				25.0	24.4	98	24.8	99	6020A
Magnesium				10000.0	9514	95	9787	98	6010C
Magnesium				250.0	256	102	255	102	6010C
Manganese				25.0	24.6	98	25.0	100	6020A
Nickel				25.0	26.2	105	26.1	104	6020A
Potassium				10000.0	9616	96	9828	98	6010C
Selenium				25.0	25.0	100	25.6	102	6020A
Silver				25.0	25.2	101	25.0	100	6020A
Sodium				10000.0	9547	95	9704	97	6010C
Thallium				25.0	24.5	98	24.6	98	6020A
Vanadium				25.0	25.3	101	25.1	100	6020A
Zinc				250.0	256	102	256	102	6010C

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.2	101	25.5	102	6020A
Antimony				25.0	24.3	97	25.2	101	6020A
Arsenic				25.0	24.9	100	24.7	99	6020A
Barium				25.0	23.8	95	24.8	99	6020A
Beryllium				25.0	22.9	92	22.8	91	6020A
Cadmium				25.0	25.4	102	26.0	104	6020A
Chromium				25.0	25.2	101	25.1	100	6020A
Cobalt				25.0	25.7	103	25.7	103	6020A
Copper				25.0	25.9	104	25.9	104	6020A
Iron				25.0	25.2	101	25.0	100	6020A
Lead				25.0	24.3	97	24.7	99	6020A
Manganese				25.0	24.4	98	25.3	101	6020A
Nickel				25.0	26.3	105	26.0	104	6020A
Selenium				25.0	26.2	105	24.2	97	6020A
Silver				25.0	26.4	106	26.3	105	6020A
Thallium				25.0	24.3	97	24.7	99	6020A
Vanadium				25.0	25.3	101	24.6	98	6020A

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.5	102	24.2	97	6020A
Antimony				25.0	25.2	101	24.8	99	6020A
Arsenic				25.0	25.4	102	24.6	98	6020A
Barium				25.0	24.3	97	24.0	96	6020A
Beryllium				25.0	23.3	93	22.9	92	6020A
Cadmium				25.0	24.9	100	25.6	102	6020A
Chromium				25.0	25.7	103	25.7	103	6020A
Cobalt				25.0	25.8	103	25.9	104	6020A
Copper				25.0	25.6	102	26.2	105	6020A
Iron				25.0	25.3	101	25.4	102	6020A
Lead				25.0	25.6	102	25.1	100	6020A
Manganese				25.0	25.1	100	24.5	98	6020A
Nickel				25.0	25.7	103	26.1	104	6020A
Selenium				25.0	25.3	101	24.2	97	6020A
Silver				25.0	24.6	98	25.9	104	6020A
Thallium				25.0	25.5	102	25.0	100	6020A
Vanadium				25.0	25.6	102	25.7	103	6020A

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.6	102	24.7	99	6020A
Antimony				25.0	25.1	100	24.8	99	6020A
Arsenic				25.0	24.1	96	24.2	97	6020A
Barium				25.0	24.4	98	24.1	96	6020A
Beryllium				25.0	23.5	94	22.6	90	6020A
Cadmium				25.0	24.8	99	25.1	100	6020A
Chromium				25.0	25.2	101	24.4	98	6020A
Cobalt				25.0	25.8	103	25.0	100	6020A
Copper				25.0	25.5	102	25.6	102	6020A
Iron				25.0	24.9	100	24.2	97	6020A
Lead				25.0	24.9	100	25.1	100	6020A
Manganese				25.0	23.5	94	24.9	100	6020A
Nickel				25.0	25.7	103	25.4	102	6020A
Selenium				25.0	24.6	98	24.7	99	6020A
Silver				25.0	25.6	102	25.4	102	6020A
Thallium				25.0	24.7	99	25.1	100	6020A
Vanadium				25.0	24.9	100	25.0	100	6020A

Metals
- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				25.0	25.5	102	24.4	98	6020A
Antimony				25.0	25.0	100	25.2	101	6020A
Arsenic				25.0	24.4	98	25.1	100	6020A
Barium				25.0	24.2	97	24.3	97	6020A
Beryllium				25.0	22.8	91	22.7	91	6020A
Cadmium				25.0	25.4	102	24.9	100	6020A
Chromium				25.0	24.9	100	24.8	99	6020A
Cobalt				25.0	25.4	102	25.2	101	6020A
Copper				25.0	25.8	103	25.6	102	6020A
Iron				25.0	24.3	97	24.3	97	6020A
Lead				25.0	25.3	101	25.2	101	6020A
Manganese				25.0	25.0	100	24.0	96	6020A
Nickel				25.0	25.6	102	25.5	102	6020A
Selenium				25.0	24.3	97	25.4	102	6020A
Silver				25.0	25.7	103	24.6	98	6020A
Thallium				25.0	24.8	99	24.9	100	6020A
Vanadium				25.0	25.1	100	25.1	100	6020A

- 2a -

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICV Source: Inorganic Ventures

CCV Source: ALS MIXED

Concentration Units:

Analyte	Initial Calibration			Continuing Calibration					Method
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum	100.0	92.0	92						6020A
Beryllium	2.5	2.6	104						6020A
Manganese	25.0	25.5	102						6020A

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION

 Client: Oregon State University

 SDG No.: K1700174

 Contract: _____ Lab Code: ALSK

Case No.: _____ SAS No.: _____

 Initial Calibration Source: Inorganic Ventures

 Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLICVT1									
	Aluminum	4.124	4.000	103	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Antimony	0.094	0.100	94	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Arsenic	1.098	1.000	110	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Barium	0.104	0.100	104	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Beryllium	0.040	0.040	100	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Cadmium	0.047	0.040	118	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Chromium	0.408	0.400	102	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Cobalt	0.039	0.040	98	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Copper	0.201	0.200	100	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Iron	2.061	2.000	103	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Lead	0.041	0.040	102	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Manganese	0.107	0.100	107	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Nickel	0.423	0.400	106	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Selenium	2.161	2.000	108	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Silver	0.045	0.040	112	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Thallium	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	15:20	020117a
	Vanadium	0.426	0.400	106	70.0 - 130.0	MS	2/1/2017	15:20	020117a
LLCCVT1									
	Aluminum	4.188	4.000	105	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Antimony	0.103	0.100	103	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Arsenic	1.006	1.000	101	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Barium	0.100	0.100	100	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Beryllium	0.041	0.040	102	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Cadmium	0.046	0.040	115	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Chromium	0.427	0.400	107	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Cobalt	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Copper	0.219	0.200	110	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Iron	2.070	2.000	104	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Lead	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Manganese	0.124	0.100	124	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Nickel	0.434	0.400	108	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Selenium	1.908	2.000	95	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Silver	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Thallium	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	19:05	020117a
	Vanadium	0.405	0.400	101	70.0 - 130.0	MS	2/1/2017	19:05	020117a

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION
Client: Oregon State University
SDG No.: K1700174
Contract: _____ **Lab Code:** ALSK
Case No.: _____ **SAS No.:** _____

Initial Calibration Source: Inorganic Ventures
Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLCCVT2									
	Aluminum	4.305	4.000	108	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Antimony	0.104	0.100	104	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Arsenic	1.060	1.000	106	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Barium	0.097	0.100	97	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Beryllium	0.039	0.040	98	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Cadmium	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Chromium	0.429	0.400	107	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Cobalt	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Copper	0.224	0.200	112	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Iron	2.091	2.000	105	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Lead	0.040	0.040	100	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Manganese	0.118	0.100	118	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Nickel	0.419	0.400	105	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Selenium	1.892	2.000	95	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Silver	0.043	0.040	108	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Thallium	0.042	0.040	105	70.0 - 130.0	MS	2/1/2017	23:07	020117a
	Vanadium	0.398	0.400	100	70.0 - 130.0	MS	2/1/2017	23:07	020117a

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION

 Client: Oregon State University

 SDG No.: K1700174

 Contract: _____ Lab Code: ALSK

Case No.: _____ SAS No.: _____

 Initial Calibration Source: Inorganic Ventures

 Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLCCVT3									
	Aluminum	4.198	4.000	105	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Antimony	0.108	0.100	108	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Arsenic	1.010	1.000	101	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Barium	0.101	0.100	101	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Beryllium	0.039	0.040	98	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Cadmium	0.037	0.040	92	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Chromium	0.428	0.400	107	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Cobalt	0.037	0.040	92	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Copper	0.210	0.200	105	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Iron	2.054	2.000	103	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Lead	0.043	0.040	108	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Manganese	0.114	0.100	114	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Nickel	0.443	0.400	111	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Selenium	1.989	2.000	99	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Silver	0.042	0.040	105	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Thallium	0.044	0.040	110	70.0 - 130.0	MS	2/2/2017	03:10	020117a
	Vanadium	0.430	0.400	108	70.0 - 130.0	MS	2/2/2017	03:10	020117a
LLCCVT4									
	Aluminum	4.136	4.000	103	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Antimony	0.096	0.100	96	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Arsenic	1.084	1.000	108	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Barium	0.109	0.100	109	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Beryllium	0.038	0.040	95	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Cadmium	0.043	0.040	108	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Chromium	0.395	0.400	99	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Cobalt	0.042	0.040	105	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Copper	0.197	0.200	98	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Iron	2.100	2.000	105	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Lead	0.041	0.040	102	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Manganese	0.112	0.100	112	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Nickel	0.396	0.400	99	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Selenium	2.023	2.000	101	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Silver	0.043	0.040	108	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Thallium	0.043	0.040	108	70.0 - 130.0	MS	2/2/2017	06:04	020117a
	Vanadium	0.409	0.400	102	70.0 - 130.0	MS	2/2/2017	06:04	020117a

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION

 Client: Oregon State University

 SDG No.: K1700174

 Contract: _____ Lab Code: ALSK

Case No.: _____ SAS No.: _____

 Initial Calibration Source: Inorganic Ventures

 Continuing Calibration Source: ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLICVT1									
	Aluminum	4.182	4.000	105	70.0 - 130.0	MS	2/2/2017	13:30	020217a
	Beryllium	0.043	0.040	108	70.0 - 130.0	MS	2/2/2017	13:30	020217a
	Manganese	0.101	0.100	101	70.0 - 130.0	MS	2/2/2017	13:30	020217a
LLCCVT1									
	Aluminum	4.090	4.000	102	70.0 - 130.0	MS	2/2/2017	14:32	020217a
	Beryllium	0.039	0.040	98	70.0 - 130.0	MS	2/2/2017	14:32	020217a
	Manganese	0.118	0.100	118	70.0 - 130.0	MS	2/2/2017	14:32	020217a
LLICV1									
	Calcium	21.4	20.0	107	70.0 - 130.0	P	2/2/2017	08:40	020217AICP
	Magnesium	5.3	5.0	106	70.0 - 130.0	P	2/2/2017	08:40	020217AICP
	Potassium	178.3	200.0	89	70.0 - 130.0	P	2/2/2017	08:40	020217AICP
	Sodium	182.5	200.0	91	70.0 - 130.0	P	2/2/2017	08:40	020217AICP
	Zinc	4.2	4.0	105	70.0 - 130.0	P	2/2/2017	08:40	020217AICP
LLCCV1									
	Calcium	22.2	20.0	111	70.0 - 130.0	P	2/2/2017	10:23	020217AICP
	Magnesium	5.4	5.0	108	70.0 - 130.0	P	2/2/2017	10:23	020217AICP
	Potassium	213.5	200.0	107	70.0 - 130.0	P	2/2/2017	10:23	020217AICP
	Sodium	184.3	200.0	92	70.0 - 130.0	P	2/2/2017	10:23	020217AICP
	Zinc	4.4	4.0	110	70.0 - 130.0	P	2/2/2017	10:23	020217AICP
LLCCV2									
	Magnesium	5.6	5.0	112	70.0 - 130.0	P	2/2/2017	11:48	020217AICP
	Potassium	227.0	200.0	114	70.0 - 130.0	P	2/2/2017	11:48	020217AICP
	Sodium	213.9	200.0	107	70.0 - 130.0	P	2/2/2017	11:48	020217AICP
	Zinc	4.2	4.0	105	70.0 - 130.0	P	2/2/2017	11:48	020217AICP
LLCCV2									
	Calcium	21.2	20.0	106	70.0 - 130.0	P	2/2/2017	12:00	020217AICP

Metals

- 2a -

LOW LEVEL INITIAL CALIBRATION AND LOW LEVEL CONTINUING CALIBRATION VERIFICATION**Client:** Oregon State University**SDG No.:** K1700174**Contract:** _____ **Lab Code:** ALSK**Case No.:** _____ **SAS No.:** _____**Initial Calibration Source:** Inorganic Ventures**Continuing Calibration Source:** ALS MIXED

Sample ID	Analyte	Result ug/L	True Value ug/L	% Recovery	Acceptance Window (%R)	M	Analysis Date	Analysis Time	Run Number
LLCCV3									
	Magnesium	5.7	5.0	114	70.0 - 130.0	P	2/2/2017	13:38	020217AICP
	Sodium	210.3	200.0	105	70.0 - 130.0	P	2/2/2017	13:38	020217AICP
	Zinc	4.3	4.0	108	70.0 - 130.0	P	2/2/2017	13:38	020217AICP
LLCCV3,0.5									
	Calcium	46.5	40.0	116	70.0 - 130.0	P	2/2/2017	13:51	020217AICP
	Potassium	407.0	400.0	102	70.0 - 130.0	P	2/2/2017	13:51	020217AICP

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Antimony	0.016	J	0.004	U	0.013	J	0.014	J	6020A
Arsenic	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Barium	0.010	U	0.010	U	0.010	U	0.010	U	6020A
Beryllium	0.006	U	0.006	U	0.006	U	0.006	U	6020A
Cadmium	0.004	U	0.004	U	0.004	U	0.004	U	6020A
Calcium	20.0	U	20.0	U	20.0	U	20.0	U	6010C
Chromium	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Cobalt	0.006	U	0.006	U	0.006	U	0.006	U	6020A
Copper	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Iron	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Lead	0.0010	U	0.0010	U	0.0010	U	0.0010	U	6020A
Magnesium	5.0	U	5.0	U	5.0	U	5.0	U	6010C
Manganese	0.016	U	0.016	U	0.016	U	0.016	U	6020A
Nickel	0.04	U	0.04	U	0.04	U	0.04	U	6020A
Potassium	40	U	60	J	40	J	40	U	6010C
Selenium	0.4	U	0.4	U	0.4	U	0.4	U	6020A
Silver	0.012	U	0.012	U	0.012	U	0.012	U	6020A
Sodium	20.0	U	20.0	U	20.0	U	20.0	U	6010C
Thallium	0.0018	U	0.0018	U	0.0018	U	0.0018	U	6020A
Vanadium	0.014	U	0.014	U	0.014	U	0.014	U	6020A
Zinc	0.60	U	0.60	U	0.60	U	0.60	J	6010C

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.014	J	0.017	J	0.019	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.004	U	0.004	U	0.004	U	6020A
Calcium			20.0	U	20.0	U	20.0	U	6010C
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			0.04	U	0.04	U	0.04	U	6020A
Iron			0.4	U	0.4	U	0.4	U	6020A
Lead			0.0010	U	0.0010	U	0.0010	U	6020A
Magnesium			5.0	U	5.0	U	5.0	U	6010C
Manganese			0.035	J	0.018	J	0.021	J	6020A
Nickel			0.04	U	0.04	U	0.04	U	6020A
Potassium			50	J	40	U	60	J	6010C
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.012	U	0.012	U	0.012	U	6020A
Sodium			20.0	U	20.0	U	20.0	U	6010C
Thallium			0.0018	U	0.0018	U	0.0018	U	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A
Zinc			0.60	U	0.60	U	0.60	U	6010C

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.016	J	0.019	J	0.017	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.004	U	0.004	U	0.004	U	6020A
Calcium			20.0	U	20.0	U			6010C
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			0.04	U	0.04	U	0.04	U	6020A
Iron			0.4	U	0.4	U	0.4	U	6020A
Lead			0.0010	U	0.0010	U	0.0010	U	6020A
Magnesium			5.0	U	5.0	U			6010C
Manganese			0.020	J	0.016	U	0.016	U	6020A
Nickel			0.04	U	0.04	U	0.04	U	6020A
Potassium			40	J	80	J			6010C
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.012	U	0.012	U	0.012	U	6020A
Sodium			20.0	U	20.0	U			6010C
Thallium			0.0018	U	0.0018	U	0.0018	U	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A
Zinc			0.60	U	0.60	U			6010C

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.018	J	0.016	J	0.018	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.004	U	0.004	U	0.004	U	6020A
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			0.04	U	0.04	U	0.04	U	6020A
Iron			0.4	U	0.4	U	0.4	U	6020A
Lead			0.0010	U	0.0010	U	0.0010	U	6020A
Manganese			0.016	U	0.016	U	0.016	U	6020A
Nickel			0.04	U	0.04	U	0.04	U	6020A
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.012	U	0.012	U	0.012	U	6020A
Thallium			0.0018	U	0.0018	U	0.0018	U	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U	0.4	U	0.4	U	6020A
Antimony			0.018	J	0.004	U	0.016	J	6020A
Arsenic			0.04	U	0.04	U	0.04	U	6020A
Barium			0.010	U	0.010	U	0.010	U	6020A
Beryllium			0.006	U	0.006	U	0.006	U	6020A
Cadmium			0.004	U	0.004	U	0.004	U	6020A
Chromium			0.04	U	0.04	U	0.04	U	6020A
Cobalt			0.006	U	0.006	U	0.006	U	6020A
Copper			0.04	U	0.04	U	0.04	U	6020A
Iron			0.4	U	0.4	U	0.4	U	6020A
Lead			0.0010	U	0.0010	U	0.0010	U	6020A
Manganese			0.016	U	0.016	U	0.016	U	6020A
Nickel			0.04	U	0.04	U	0.04	U	6020A
Selenium			0.4	U	0.4	U	0.4	U	6020A
Silver			0.012	U	0.012	U	0.012	U	6020A
Thallium			0.0018	U	0.0018	U	0.0018	U	6020A
Vanadium			0.014	U	0.014	U	0.014	U	6020A

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum			0.4	U					6020A
Antimony			0.019	U					6020A
Arsenic			0.04	U					6020A
Barium			0.010	U					6020A
Beryllium			0.006	U					6020A
Cadmium			0.004	U					6020A
Chromium			0.04	U					6020A
Cobalt			0.006	U					6020A
Copper			0.04	U					6020A
Iron			0.4	U					6020A
Lead			0.0010	U					6020A
Manganese			0.016	U					6020A
Nickel			0.04	U					6020A
Selenium			0.4	U					6020A
Silver			0.012	U					6020A
Thallium			0.0018	U					6020A
Vanadium			0.014	U					6020A

Metals

- 3 -
BLANKS

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): ug/L

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Method
		C	1	C	2	C	3	C	
Aluminum	0.4	U							6020A
Beryllium	0.006	U							6020A
Manganese	0.016	U							6020A

Metals

- 4 -

ICP INTERFERENCE CHECK SAMPLE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

ICS Source: Inorganic Ventures

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Calcium	500000.0	500000.0	475500.0	481700.0	96			
Magnesium	500000.0	500000.0	518100.0	518900.0	104			
Potassium	0.0		-54.0	-90.7				
Sodium	0.0		10.3	7.3				
Zinc	0.0	1000.0	0.1	961.3	96			

Metals

- 4 -

ICP INTERFERENCE CHECK SAMPLE
Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-MS-04

ICS Source: Inorganic Ventures

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Aluminum			19246	20039		20149	20203	
Antimony			0	0		0	0	
Arsenic		25	0	25	100	0	27	108
Barium			1	1		1	1	
Beryllium			0	0		0	0	
Cadmium		25	0	26	104	0	27	108
Chromium		50	1	55	110	1	57	114
Cobalt		50	1	54	108	1	57	114
Copper		50	1	48	96	1	50	100
Iron			46763	47859		49870	50943	
Lead			0	0		0	0	
Manganese		50	1	48	96	1	51	102
Nickel		50	1	51	102	1	53	106
Selenium		25	0	25	100	0	26	104
Silver	0.0	12.5	0	12.8	102	0	13.3	106
Thallium	0.0		0	0.0		0	0.0	
Vanadium		50	0	56	112	0	58	116

- 4 -

Service Request: K1700174

Project Name: Avian Tissue Project

ICS Source: Inorganic Ventures

Concentration Units): ug/L

Metals
- 5A -
SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Batch QC1S

Lab Code: K1700173-024S

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum	75 - 125	187.1		1.5	J	197.4	94		6020A
Antimony	75 - 125	51.073		0.002	U	49.342	104		6020A
Arsenic	75 - 125	19.12		0.02	U	16.48	116		6020A
Barium	75 - 125	98.380		0.149		98.684	100		6020A
Beryllium	75 - 125	4.952		0.003	U	4.934	100		6020A
Cadmium	75 - 125	5.526		0.071		4.934	111		6020A
Calcium	75 - 125	375		198		164.51	108		6010C
Chromium	75 - 125	20.43		0.26		19.74	102		6020A
Cobalt	75 - 125	52.014		0.053		49.342	105		6020A
Copper	75 - 125	58.02		31.32		24.67	108		6020A
Iron	75 - 125	412.9		308.5		98.7	106		6020A
Lead	75 - 125	48.4676		0.0591		49.3421	98		6020A
Magnesium		1120		925		164.51	119		6010C
Manganese	75 - 125	47.936		4.910		49.342	87		6020A
Nickel	75 - 125	51.79		0.14	J	49.34	105		6020A
Potassium		11500		11300		164.51	122		6010C
Selenium	75 - 125	23.7		2.8		16.5	127	N	6020A
Silver	75 - 125	5.274		0.006	U	4.934	107		6020A
Sodium		1690		1510		164.51	109		6010C
Thallium	75 - 125	3.5453		0.0015	J	3.2862	108		6020A
Vanadium	75 - 125	51.457		0.007	U	49.342	104		6020A
Zinc	75 - 125	148		95.7		49.34	106		6010C

An empty field in the Control Limit column indicates the control limit is not applicable

Metals
- 5A -
SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Bird No. 16-11 Thigh Muscl

Lab Code: K1700174-011S

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum	75 - 125	190.0		2.9		200.0	94		6020A
Antimony	75 - 125	50.947		0.002	U	50.000	102		6020A
Arsenic	75 - 125	21.01		0.02	U	16.70	126	N	6020A
Barium	75 - 125	99.368		0.096		100.000	99		6020A
Beryllium	75 - 125	4.989		0.003	U	5.000	100		6020A
Cadmium	75 - 125	5.597		0.069		5.000	111		6020A
Calcium	75 - 125	339		152		166.70	112		6010C
Chromium	75 - 125	22.10		2.10		20.00	100		6020A
Cobalt	75 - 125	53.394		0.070		50.000	107		6020A
Copper	75 - 125	31.71		4.90		25.00	107		6020A
Iron	75 - 125	232.0		125.5		100.0	106		6020A
Lead	75 - 125	49.5445		0.0095	J	50.0000	99		6020A
Magnesium	75 - 125	735		518		166.70	130	N	6010C
Manganese	75 - 125	50.384		5.357		50.000	90		6020A
Nickel	75 - 125	53.88		1.02		50.00	106		6020A
Potassium		7940		7380		166.70	336		6010C
Selenium	75 - 125	24.5		1.4		16.7	138	N	6020A
Silver	75 - 125	5.490		0.006	U	5.000	110		6020A
Sodium		1560		1320		166.70	144		6010C
Thallium	75 - 125	3.6936		0.0010	J	3.3300	111		6020A
Vanadium	75 - 125	52.216		0.013	J	50.000	104		6020A
Zinc	75 - 125	180		119		50.00	122		6010C

An empty field in the Control Limit column indicates the control limit is not applicable

Metals

- 5B -

POST SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Basis: DRY

Matrix: WATER

Sample Name: Batch QC1A

Lab Code: K1700173-024A

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum	80 - 120	54.8		3.0		50.0	104		6020A
Antimony	80 - 120	53.180		0.004		50.0	106		6020A
Arsenic	80 - 120	56.04		0.04		50.0	112		6020A
Barium	80 - 120	50.038		0.298		50.0	99		6020A
Beryllium	80 - 120	49.362		0.006		50.0	99		6020A
Cadmium	80 - 120	55.735		0.141		50.0	111		6020A
Chromium	80 - 120	51.56		0.53		50.0	102		6020A
Cobalt	80 - 120	51.424		0.105		50.0	103		6020A
Copper	80 - 120	112.85		62.64		50.0	100		6020A
Iron	80 - 120	790.8		616.9		200.0	87		6020A
Lead	80 - 120	50.8020		0.1183		50.0	101		6020A
Manganese	80 - 120	54.682		9.819		50.0	90		6020A
Nickel	80 - 120	51.07		0.28		50.0	102		6020A
Selenium	80 - 120	65.3		5.6		50.0	119		6020A
Silver	80 - 120	10.408		0.012		10.0	104		6020A
Thallium	80 - 120	50.0556		0.0029		50.0	100		6020A
Vanadium	80 - 120	50.917		0.014		50.0	102		6020A

Metals

- 5B -

POST SPIKE SAMPLE RECOVERY

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Basis: DRY

Matrix: WATER

Sample Name: Bird No. 16-11 Thigh Muscl

Lab Code: K1700174-011A

Analyte	Control Limit %R	Spike Result	C	Sample Result	C	Spike Added	%R	Q	Method
Aluminum	80 - 120	57.3		5.7		50.0	103		6020A
Antimony	80 - 120	54.412		0.004		50.0	109		6020A
Arsenic	80 - 120	57.01		0.04		50.0	114		6020A
Barium	80 - 120	51.779		0.193		50.0	103		6020A
Beryllium	80 - 120	50.418		0.006		50.0	101		6020A
Cadmium	80 - 120	54.803		0.138		50.0	109		6020A
Chromium	80 - 120	56.50		4.20		50.0	105		6020A
Cobalt	80 - 120	53.306		0.139		50.0	106		6020A
Copper	80 - 120	62.89		9.80		50.0	106		6020A
Iron	80 - 120	462.7		251.1		200.0	106		6020A
Lead	80 - 120	50.8200		0.0190		50.0	102		6020A
Manganese	80 - 120	55.504		10.715		50.0	90		6020A
Nickel	80 - 120	55.71		2.04		50.0	107		6020A
Selenium	80 - 120	65.9		1.4		50.0	126		6020A
Silver	80 - 120	9.895		0.012		10.0	99		6020A
Thallium	80 - 120	49.6048		0.0020		50.0	99		6020A
Vanadium	80 - 120	52.877		0.026		50.0	106		6020A

Metals
- 6 -
DUPLICATES

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Batch QC1D

Lab Code: K1700173-024D

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Aluminum		1.5	J	3.1		69.6		6020A
Antimony		0.002	U	0.002	U			6020A
Arsenic		0.02	U	0.02	U			6020A
Barium		0.149		0.164		9.6		6020A
Beryllium		0.003	U	0.003	J	200.0		6020A
Cadmium		0.071		0.088		21.4		6020A
Calcium	20	198		203		2.5		6010C
Chromium		0.26		0.29		10.9		6020A
Cobalt		0.053		0.056		5.5		6020A
Copper	20	31.32		32.85		4.8		6020A
Iron	20	308.5		320.4		3.8		6020A
Lead		0.0591		0.0649		9.4		6020A
Magnesium	20	925		951		2.8		6010C
Manganese	20	4.910		5.145		4.7		6020A
Nickel		0.14	J	0.13	J	7.4		6020A
Potassium	20	11300		11500		1.8		6010C
Selenium		2.8		3.1		10.2		6020A
Silver		0.006	U	0.007	J	200.0		6020A
Sodium	20	1510		1530		1.3		6010C
Thallium		0.0015	J	0.0018	J	18.2		6020A
Vanadium		0.007	U	0.013	J	200.0		6020A
Zinc	20	95.7		98.7		3.1		6010C

An empty field in the Control Limit column indicates the control limit is not applicable.

Metals
- 6 -
DUPLICATES

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Units: MG/KG

Project Name: Avian Tissue Project

Basis: DRY

Matrix: TISSUE

Sample Name: Bird No. 16-11 Thigh Musc

Lab Code: K1700174-011D

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	Method
Aluminum		2.9		4.0		31.9		6020A
Antimony		0.002	U	0.002	U			6020A
Arsenic		0.02	U	0.02	U			6020A
Barium		0.096		0.128		28.6		6020A
Beryllium		0.003	U	0.003	U			6020A
Cadmium		0.069		0.073		5.6		6020A
Calcium	20	152		164		7.6		6010C
Chromium	20	2.10		1.12		60.9	*	6020A
Cobalt		0.070		0.061		13.7		6020A
Copper	20	4.90		5.28		7.5		6020A
Iron	20	125.5		132.9		5.7		6020A
Lead		0.0095	J	0.0156	J	48.6		6020A
Magnesium	20	518		561		8.0		6010C
Manganese	20	5.357		5.421		1.2		6020A
Nickel		1.02		0.51		66.7		6020A
Potassium	20	7380		7920		7.1		6010C
Selenium		1.4		1.5		6.9		6020A
Silver		0.006	U	0.006	U			6020A
Sodium	20	1320		1400		5.9		6010C
Thallium		0.0010	J	0.0011	J	9.5		6020A
Vanadium		0.013	J	0.010	J	26.1		6020A
Zinc	20	119		129		8.1		6010C

An empty field in the Control Limit column indicates the control limit is not applicable.

Metals

- 7 -

LABORATORY CONTROL SAMPLE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

Aqueous LCS Source: ALS MIXED

Solid LCS Source:

Analyte	Aqueous (ug/L)			Solid (mg/kg)				
	True	Found	%R	True	Found	C	Limits	%R
Aluminum	2000.0	1800.5	90					
Antimony	500.0	485.3	97					
Arsenic	167.0	192.3	115					
Barium	1000.0	950.5	95					
Beryllium	50.0	50.4	101					
Cadmium	50.0	51.8	104					
Calcium	1667	1870	112					
Chromium	200.0	207.2	104					
Cobalt	500.0	521.2	104					
Copper	250.0	255.1	102					
Iron	1000.0	1011.7	101					
Lead	500.0	505.0	101					
Magnesium	1667	1860	112					
Manganese	500.0	453.8	91					
Nickel	500.0	514.6	103					
Potassium	1667	1960	118					
Selenium	167.0	189.0	113					
Silver	50.0	52.4	105					
Sodium	1667	1950	117					
Thallium	33.3	37.1	111					
Vanadium	500.0	518.0	104					
Zinc	500	507	101					

Metals

- 7 -

LABORATORY CONTROL SAMPLE

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

Aqueous LCS Source: ALS MIXED

Solid LCS Source:

Analyte	Aqueous (ug/L)			Solid (mg/kg)				
	True	Found	%R	True	Found	C	Limits	%R
Aluminum	2000.0	1885.0	94					
Antimony	500.0	487.3	97					
Arsenic	167.0	188.2	113					
Barium	1000.0	983.6	98					
Beryllium	50.0	48.5	97					
Cadmium	50.0	53.1	106					
Calcium	1667	1870	112					
Chromium	200.0	202.0	101					
Cobalt	500.0	516.9	103					
Copper	250.0	256.1	102					
Iron	1000.0	990.4	99					
Lead	500.0	498.0	100					
Magnesium	1667	1840	110					
Manganese	500.0	449.2	90					
Nickel	500.0	515.6	103					
Potassium	1667	1900	114					
Selenium	167.0	195.3	117					
Silver	50.0	54.1	108					
Sodium	1667	1840	110					
Thallium	33.3	36.7	110					
Vanadium	500.0	502.0	100					
Zinc	500	500	100					

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700174
Date Collected: NA
Date Received: NA
Date Extracted: 01/31/17
Date Analyzed: 02/01-02/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700174-SRM1
Test Notes: Dorm-4 Solids = 94.5%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Dorm-4

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	6.8	7.3	107	4.93-8.93	
Cadmium	PSEP Tissue	6020A	0.306	0.361	118	0.233 - 0.385	
Chromium	PSEP Tissue	6020A	1.87	2.21	118	1.37-2.44	
Copper	PSEP Tissue	6020A	15.9	17.1	108	12.0 - 20.2	
Iron	PSEP Tissue	6020A	341	351	103	251-442	
Lead	PSEP Tissue	6020A	0.416	0.380	91	0.290 - 0.563	
Nickel	PSEP Tissue	6020A	1.36	1.45	107	0.912-1.9	
Selenium	PSEP Tissue	6020A	3.56	4.26	120	2.58 - 4.68	
Zinc	PSEP Tissue	6010C	52.20	53.3	102	39.2 - 66.5	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700174
Date Collected: NA
Date Received: NA
Date Extracted: 01/31/17
Date Analyzed: 02/01-02-17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700174-SRM2
Test Notes: Tort-3 Solids = 99.1%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Tort-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	59.5	72.4	122	44.6-76.0	
Cadmium	PSEP Tissue	6020A	42.3	45.6	108	32.4-52.9	
Chromium	PSEP Tissue	6020A	1.95	1.90	97	1.37-2.63	
Copper	PSEP Tissue	6020A	497	479	96	380-623	
Iron	PSEP Tissue	6020A	179	170	95	137-224	
Lead	PSEP Tissue	6020A	0.225	0.194	86	0.166-0.292	
Manganese	PSEP Tissue	6020A	15.6	13.9	89	11.7-19.9	
Nickel	PSEP Tissue	6020A	5.3	5.2	98	4.05-6.65	
Selenium	PSEP Tissue	6020A	10.9	12.8	117	7.9-14.3	
Vanadium	PSEP Tissue	6020A	9.1	9.3	102	7.0-11.4	
Zinc	PSEP Tissue	6010C	136	138	101	104-170	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700174
Date Collected: NA
Date Received: NA
Date Extracted: 01/31/17
Date Analyzed: 02/01-02/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700174-SRM3
Test Notes: Dorm-4 Solids = 94.5%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Dorm-4

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	6.8	7.7	113	4.93-8.93	
Cadmium	PSEP Tissue	6020A	0.306	0.366	120	0.233 - 0.385	
Chromium	PSEP Tissue	6020A	1.87	1.82	97	1.37-2.44	
Copper	PSEP Tissue	6020A	15.9	16.7	105	12.0 - 20.2	
Iron	PSEP Tissue	6020A	341	369	108	251-442	
Lead	PSEP Tissue	6020A	0.416	0.358	86	0.290 - 0.563	
Nickel	PSEP Tissue	6020A	1.36	1.34	99	0.912-1.9	
Selenium	PSEP Tissue	6020A	3.56	4.43	124	2.58 - 4.68	
Zinc	PSEP Tissue	6010C	52.20	54.5	104	39.2 - 66.5	

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Oregon State University
Project: Avian Tissue Project
LCS Matrix: Tissue

Service Request: K1700174
Date Collected: NA
Date Received: NA
Date Extracted: 01/31/17
Date Analyzed: 02/01-02/17

Standard Reference Material Summary
Total Metals

Sample Name: Standard Reference Material
Lab Code: K1700174-SRM4
Test Notes: Tort-3 Solids = 99.1%

Units: mg/Kg (ppm)
Basis: Dry

Source: N.R.C.C. Tort-3

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Arsenic	PSEP Tissue	6020A	59.5	73.0	123	44.6-76.0	
Cadmium	PSEP Tissue	6020A	42.3	44.7	106	32.4-52.9	
Chromium	PSEP Tissue	6020A	1.95	1.90	97	1.37-2.63	
Copper	PSEP Tissue	6020A	497	480	97	380-623	
Iron	PSEP Tissue	6020A	179	172	96	137-224	
Lead	PSEP Tissue	6020A	0.225	0.220	98	0.166-0.292	
Manganese	PSEP Tissue	6020A	15.6	13.9	89	11.7-19.9	
Nickel	PSEP Tissue	6020A	5.3	5.4	102	4.05-6.65	
Selenium	PSEP Tissue	6020A	10.9	12.6	116	7.9-14.3	
Vanadium	PSEP Tissue	6020A	9.1	9.5	104	7.0-11.4	
Zinc	PSEP Tissue	6010C	136	137	101	104-170	

Metals

- 9 -

ICP SERIAL DILUTIONS
Client: Oregon State University

Service Request: K1700174

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Sample Name: Batch QC1L

Lab Code: K1700173-024L

Analyte	Initial Sample Result (I)		Serial Dilution Result (S)		% Differ- ence	Q	M
Aluminum	3.0	J	4.2	J	40		MS
Antimony	0.004	U	0.020	U			MS
Arsenic	0.04	U	0.20	U			MS
Barium	0.298		0.251	J	16		MS
Beryllium	0.006	U	0.030	U			MS
Cadmium	0.141		0.137	J	3		MS
Calcium	1980.0		1956.5		1.2		P
Chromium	0.53		0.47	J	11		MS
Cobalt	0.105		0.108	J	3		MS
Copper	62.64		60.43		4		MS
Iron	616.9		590.0		4		MS
Lead	0.1183		0.1250	J	6		MS
Magnesium	9248.0		9080.0		1.8		P
Manganese	9.819		10.506		7		MS
Nickel	0.28	J	0.23	J	18		MS
Potassium	112500.0		111850.0		0.6		P
Selenium	5.6		4.8	J	14		MS
Silver	0.012	U	0.060	U			MS
Sodium	15100.0		14860.0		1.6		P
Thallium	0.0029	J	0.0090	U	100.0		MS
Vanadium	0.014	U	0.070	U			MS
Zinc	956.50		931.00		2.7		P

Metals

- 9 -

ICP SERIAL DILUTIONS
Client: Oregon State University

Service Request: K1700174

Project No.: NA

Units: UG/L

Project Name: Avian Tissue Project

Sample Name: Bird No. 16-11 Thigh Muscl

Lab Code: K1700174-011L

Analyte	Initial Sample Result (I)		Serial Dilution Result (S)		% Differ- ence	Q	M
Aluminum	5.7		7.7	J	35		MS
Antimony	0.004	U	0.020	U			MS
Arsenic	0.04	U	0.20	U			MS
Barium	0.193		0.200	J	4		MS
Beryllium	0.006	U	0.030	U			MS
Cadmium	0.138		0.128	J	7		MS
Calcium	1523.0		1509.0		0.9		P
Chromium	4.20		4.25		1		MS
Cobalt	0.139		0.116	J	17		MS
Copper	9.80		9.83		0		MS
Iron	251.1		257.1		2		MS
Lead	0.0190	J	0.0202	J	6		MS
Magnesium	5183.0		5185.0		0.0		P
Manganese	10.715		10.966		2		MS
Nickel	2.04		1.86	J	9		MS
Potassium	73820.0		72200.0		2.2		P
Selenium	2.8		2.3	J	18		MS
Silver	0.012	U	0.060	U			MS
Sodium	13240.0		13080.0		1.2		P
Thallium	0.0020	J	0.0090	U	100.0		MS
Vanadium	0.026	J	0.070	U	100.0		MS
Zinc	1193.00		1138.00		4.6		P

Metals

- 10 -

DETECTION LIMITS**Client:** Oregon State University**Service Request:** K1700174**Project No.:** NA**Project Name:** Avian Tissue Project**ICP/ICP-MS ID #:****GFAA ID #:****AA ID #:**

Analyte	Wave-length (nm)	Back-ground	MRL ug/L	MDL ug/L	M
Calcium	393.3		40.0	20.0	P
Magnesium	279.5		10.0	5.0	P
Potassium	766.5		400.0	40.0	P
Sodium	589.5		200.0	20.0	P
Zinc	206.2		4.00	0.60	P

Comments:

Metals

- 10 -

DETECTION LIMITS**Client:** Oregon State University**Service Request:** K1700174**Project No.:** NA**Project Name:** Avian Tissue Project**ICP/ICP-MS ID #:** K-ICP-MS-04**GFAA ID #:****AA ID #:**

Analyte	Isotope	Back-ground	MRL ug/L	MDL ug/L	M
Aluminum	27		4.0	0.4	MS
Antimony	123		0.100	0.004	MS
Arsenic	75		1.00	0.04	MS
Barium	137		0.100	0.010	MS
Beryllium	9		0.040	0.006	MS
Cadmium	111		0.040	0.004	MS
Chromium	52		0.40	0.04	MS
Cobalt	59		0.040	0.006	MS
Copper	65		0.20	0.04	MS
Iron	56		2.0	0.4	MS
Lead	208		0.0400	0.0010	MS
Manganese	55		0.100	0.016	MS
Nickel	60		0.40	0.04	MS
Selenium	78		2.0	0.4	MS
Silver	107		0.040	0.012	MS
Thallium	205		0.0400	0.0018	MS
Vanadium	51		0.400	0.014	MS

Comments:

Metals

- 11A -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Al	Ca	Fe	Mg	Ag
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	-0.0001350	0.0000000	0.0000000
Arsenic	189.042	0.0000420	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000070	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	-0.0006190	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000620	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0000150	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	-0.0000970	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000140	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000130	0.0000000	0.0000310	0.0000000

Comments:

Metals

- 11A -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Vanadium	292.402	0.0000000	0.0000000	-0.0000420	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0001090	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		As	B	Ba	Be	Cd
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.042	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	-0.0001240
Cobalt	228.616	0.0000000	0.0000000	-0.0001140	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Co	Cr	Cu	K	Li
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	-0.0004810	0.0000000	0.0000000
Arsenic	189.042	0.0000000	0.0005710	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0025040	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0000520	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0002840	0.0000000	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0003570	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0001760	0.0000000	0.0000000
Nickel	231.604	-0.0001780	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0016430	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Service Request: K1700174

Project Name: Avian Tissue Project

K-ICP-AES-03

Vanadium	292.402	0.0000000	-0.0025430	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0007230	0.0000000	0.0000000

Form XI (PART 2) - IN

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Mn	Mo	Na	Ni	Pb
	182.034	0.0041380	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	-0.0007310	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.042	-0.0003130	0.0017060	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	-0.0000720	-0.0004190	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	-0.0019530	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	-0.0000310	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	-0.0011810	0.0000000	0.0000990	0.0000000
Copper	327.396	0.0000000	-0.0002870	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	-0.0005980	0.0000000	0.0002670	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0004730	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0123240	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0016500	0.0001830	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	-0.0005630	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0001330	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	-0.0002140	0.0000000	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	-0.0001370	0.0000000	0.0060370	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		P	Sb	Se	Si	Sn
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Arsenic	189.042	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.502	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0001370	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
		Sr	Ti	Tl	V	Zn
	182.034	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Aluminum	394.401	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	217.581	0.0000000	0.0000000	0.0000000	0.0023400	0.0000000
Arsenic	189.042	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Barium	455.403	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Beryllium	234.861	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.678	0.0000000	0.0000000	0.0000000	-0.0004790	0.0000000
Cadmium	226.502	0.0000000	0.0000240	0.0000000	0.0000000	0.0000000
Calcium	393.366	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.716	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt	228.616	0.0000000	0.0025120	0.0000000	0.0000000	0.0000000
Copper	327.396	0.0000000	0.0001450	0.0000000	-0.0001220	0.0000000
Iron	259.94	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lead	220.353	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Lithium	670.784	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	285.213	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	260.569	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.604	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Phosphorus	178.284	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.491	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.0	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silicon	251.611	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.068	0.0000000	0.0000000	0.0000000	0.0000820	0.0000000
Sodium	589.592	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Strontium	407.771	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.856	0.0000000	0.0000000	0.0000000	0.0008000	0.0000000
Tin	189.989	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	336.121	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Metals

- 11B -

ICP INTERELEMENT CORRECTION FACTORS

Client: Oregon State University **Service Request:** K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: **K-ICP-AES-03**

Vanadium	292.402	0.0000000	0.0004600	0.0000000	0.0000000	0.0000000
Zinc	213.856	0.0000000	-0.0005560	0.0000000	0.0000000	0.0000000

Comments:

Metals
 -12-
 ICP LINEAR RANGES (QUARTERLY)

Client: Oregon State University Service Request: K1700174
 Project No.: NA
 Project Name: Avian Tissue Project

ICP ID Number: K-ICP-AES-03

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	Method
Calcium	15.000	900000	6010C
Magnesium	15.000	90000	6010C
Potassium	15.000	900000	6010C
Sodium	15.000	900000	6010C
Zinc	15.000	18000	6010C

Comments:

Metals

-12-

ICP LINEAR RANGES (QUARTERLY)

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

ICP ID Number: K-ICP-MS-04

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	Method
Aluminum	45.000	18000	6020A
Antimony	45.000	900	6020A
Arsenic	45.000	3000	6020A
Barium	45.000	3000	6020A
Beryllium	45.000	900	6020A
Cadmium	45.000	3000	6020A
Chromium	45.000	3000	6020A
Cobalt	45.000	3000	6020A
Copper	45.000	3000	6020A
Iron	45.000	18000	6020A
Lead	45.000	3000	6020A
Manganese	45.000	3000	6020A
Nickel	45.000	3000	6020A
Selenium	45.000	3000	6020A
Silver	45.000	900	6020A
Thallium	45.000	3000	6020A
Vanadium	45.000	3000	6020A

Comments:

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

Method: P

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700174-001	1/31/2017	0.3000	30.0
K1700174-002	1/31/2017	0.3000	30.0
K1700174-003	1/31/2017	0.3000	30.0
K1700174-004	1/31/2017	0.3000	30.0
K1700174-005	1/31/2017	0.3000	30.0
K1700174-006	1/31/2017	0.3000	30.0
K1700174-007	1/31/2017	0.3000	30.0
K1700174-008	1/31/2017	0.3000	30.0
K1700174-009	1/31/2017	0.3000	30.0
K1700174-010	1/31/2017	0.3000	30.0
K1700174-011	1/31/2017	0.3000	30.0
K1700174-011D	1/31/2017	0.3000	30.0
K1700174-011S	1/31/2017	0.3000	30.0
K1700174-012	1/31/2017	0.3000	30.0
K1700174-013	1/31/2017	0.3000	30.0
K1700174-014	1/31/2017	0.3010	30.0
K1700174-015	1/31/2017	0.3030	30.0
K1700174-016	1/31/2017	0.3010	30.0
K1700174-017	1/31/2017	0.3000	30.0
K1700174-018	1/31/2017	0.3030	30.0
K1700174-019	1/31/2017	0.3020	30.0
K1700174-020	1/31/2017	0.3000	30.0
KQ1700985-01	1/31/2017	0.3000	30.0
KQ1700985-02	1/31/2017	30.0	30.0
KQ1700985-03	1/31/2017	0.3000	30.0
KQ1700985-04	1/31/2017	0.3000	30.0

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

Method: P

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700173-024D	1/31/2017	0.3100	30.0
K1700173-024S	1/31/2017	0.3040	30.0
K1700174-021	1/31/2017	0.3040	30.0
K1700174-022	1/31/2017	0.3230	30.0
K1700174-023	1/31/2017	0.3110	30.0
K1700174-024	1/31/2017	0.3160	30.0
K1700174-025	1/31/2017	0.3090	30.0
KQ1700987-01	1/31/2017	0.3000	30.0
KQ1700987-02	1/31/2017	30.0	30.0
KQ1700987-03	1/31/2017	0.3160	30.0
KQ1700987-04	1/31/2017	0.3240	30.0

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

Method: MS

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700174-001	1/31/2017	0.3000	30.0
K1700174-002	1/31/2017	0.3000	30.0
K1700174-003	1/31/2017	0.3000	30.0
K1700174-004	1/31/2017	0.3000	30.0
K1700174-005	1/31/2017	0.3000	30.0
K1700174-006	1/31/2017	0.3000	30.0
K1700174-007	1/31/2017	0.3000	30.0
K1700174-008	1/31/2017	0.3000	30.0
K1700174-009	1/31/2017	0.3000	30.0
K1700174-010	1/31/2017	0.3000	30.0
K1700174-011	1/31/2017	0.3000	30.0
K1700174-011D	1/31/2017	0.3000	30.0
K1700174-011S	1/31/2017	0.3000	30.0
K1700174-012	1/31/2017	0.3000	30.0
K1700174-013	1/31/2017	0.3000	30.0
K1700174-014	1/31/2017	0.3010	30.0
K1700174-015	1/31/2017	0.3030	30.0
K1700174-016	1/31/2017	0.3010	30.0
K1700174-017	1/31/2017	0.3000	30.0
K1700174-018	1/31/2017	0.3030	30.0
K1700174-019	1/31/2017	0.3020	30.0
K1700174-020	1/31/2017	0.3000	30.0
KQ1700985-01	1/31/2017	0.3000	30.0
KQ1700985-02	1/31/2017	30.0	30.0
KQ1700985-03	1/31/2017	0.3000	30.0
KQ1700985-04	1/31/2017	0.3000	30.0

Metals
-13-
PREPARATION LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Project Name: Avian Tissue Project

Method: MS

Sample ID	Preparation Date	Initial Volume	Final Volume(mL)
K1700173-024D	1/31/2017	0.3100	30.0
K1700173-024S	1/31/2017	0.3040	30.0
K1700174-021	1/31/2017	0.3040	30.0
K1700174-022	1/31/2017	0.3230	30.0
K1700174-023	1/31/2017	0.3110	30.0
K1700174-024	1/31/2017	0.3160	30.0
K1700174-025	1/31/2017	0.3090	30.0
KQ1700987-01	1/31/2017	0.3000	30.0
KQ1700987-02	1/31/2017	30.0	30.0
KQ1700987-03	1/31/2017	0.3160	30.0
KQ1700987-04	1/31/2017	0.3240	30.0

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Run Number: 020217AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 2/2/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K E	S E	A G	N A	T L	V
BLK	1.0	08:20							X						X				X			X			X
STD A	1.0	08:22							X						X										X
STD B	1.0	08:25							X						X				X			X			
ICV1	1.0	08:28							X						X										
ICV1	1.0	08:30							X						X				X			X			X
ZZZZZZ	1.0	08:32																							
ICB1	1.0	08:37							X						X				X			X			X
LLICV1	1.0	08:40							X						X				X			X			X
ZZZZZZ	1.0	08:42																							
ZZZZZZ	1.0	08:44																							
CCV1	1.0	08:47							X						X				X			X			
ZZZZZZ	1.0	08:50																							
CCV1	1.0	08:53							X						X										X
CCB1	1.0	08:55							X						X				X			X			X
ICS-A1	1.0	08:57							X						X				X			X			X
ICS-AB1	1.0	09:00							X						X				X			X			X
KQ1700987-01	1.0	09:20							X						X				X			X			X
KQ1700987-02	1.0	09:23							X						X				X			X			X
KQ1700987-03	1.0	09:25																							
KQ1700987-04	1.0	09:27																							
ZZZZZZ	1.0	09:30																							
K1700173-024L	5.0	09:32							X						X				X			X			X
K1700173-024D	1.0	09:35							X						X				X			X			X
K1700173-024S	1.0	09:37							X						X				X			X			X
ZZZZZZ	1.0	09:40																							
ZZZZZZ	1.0	09:42																							
CCV2	1.0	09:44							X						X				X			X			
CCV2	1.0	09:47							X						X										X
CCB2	1.0	09:49							X						X				X			X			X
ZZZZZZ	1.0	09:52																							
ZZZZZZ	1.0	09:54																							
ZZZZZZ	1.0	09:56																							

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Run Number: 020217AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 2/2/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
ZZZZZZ	1.0	09:59																							
ZZZZZZ	1.0	10:02																							
ZZZZZZ	1.0	10:04																							
ZZZZZZ	1.0	10:06																							
ZZZZZZ	5.0	10:09																							
K1700174-021	1.0	10:11							X						X				X			X			X
K1700174-022	1.0	10:14							X						X				X			X			X
CCV3	1.0	10:16							X						X				X			X			
CCV3	1.0	10:19							X						X										X
CCB3	1.0	10:21							X						X				X			X			X
LLCCV1	1.0	10:23							X						X				X			X			X
ZZZZZZ	1.0	10:26																							
ZZZZZZ	1.0	10:28																							
K1700174-023	1.0	10:31							X						X				X			X			X
K1700174-024	1.0	10:33							X						X				X			X			X
K1700174-025	1.0	10:36							X						X				X			X			X
ZZZZZZ	1.0	10:38																							
ZZZZZZ	1.0	10:41																							
ZZZZZZ	1.0	10:43																							
ZZZZZZ	1.0	10:46																							
CCV4	1.0	10:49							X						X				X			X			
CCV4	1.0	10:51							X						X										X
CCB4	1.0	10:53							X						X				X			X			X
ZZZZZZ	1.0	10:56																							
ZZZZZZ	5.0	10:59																							
ZZZZZZ	5.0	11:01																							
ZZZZZZ	5.0	11:03																							
ZZZZZZ	5.0	11:06																							
ZZZZZZ	5.0	11:08																							
ZZZZZZ	1.0	11:11																							
KQ1700985-02	1.0	11:13							X						X				X			X			X
KQ1700985-03	1.0	11:15																							

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Run Number: 020217AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 2/2/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K S	S E	A G	N A	T L	V
KQ1700985-04	1.0	11:18																							
CCV5	1.0	11:20							X						X				X			X			
ZZZZZZ	1.0	11:23																							
CCV5	1.0	11:33							X						X										X
ZZZZZZ	1.0	11:35																							
CCB5	1.0	11:45							X						X				X			X			X
LLCCV2	1.0	11:48													X				X			X			X
LLCCV2	1.0	12:00							X																
KQ1700985-01	1.0	12:03							X						X				X			X			X
K1700174-011	1.0	12:06							X						X				X			X			X
K1700174-011L	5.0	12:08							X						X				X			X			X
K1700174-011D	1.0	12:10							X						X				X			X			X
K1700174-011S	1.0	12:13							X						X				X			X			X
K1700174-001	1.0	12:15							X						X				X			X			X
K1700174-002	1.0	12:17							X						X				X			X			X
K1700174-003	1.0	12:20							X						X				X			X			X
K1700174-004	1.0	12:22							X						X				X			X			X
K1700174-005	1.0	12:25							X						X				X			X			X
CCV6	1.0	12:27							X						X				X			X			
CCV6	1.0	12:30							X						X										X
CCB6	1.0	12:32							X						X				X			X			X
K1700174-006	1.0	12:35							X						X				X			X			X
K1700174-007	1.0	12:37							X						X				X			X			X
K1700174-008	1.0	12:39							X						X				X			X			X
K1700174-009	1.0	12:42							X						X				X			X			X
K1700174-010	1.0	12:44							X						X				X			X			X
K1700174-012	1.0	12:47							X						X				X			X			X
K1700174-013	1.0	12:49							X						X				X			X			X
K1700174-014	1.0	12:51							X						X				X			X			X
K1700174-015	1.0	12:54							X						X				X			X			X
K1700174-016	1.0	12:56							X						X				X			X			X
CCV7	1.0	12:59							X						X				X			X			

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Run Number: 020217AICP03

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-AES-03

Method: P

Start Date: 2/2/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																							
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V	Z N	C N
CCV7	1.0	13:01							X						X										X		
CCB7	1.0	13:04							X						X				X			X			X		
K1700174-017	1.0	13:06							X						X				X			X			X		
K1700174-018	1.0	13:08							X						X				X			X			X		
K1700174-019	1.0	13:11							X						X				X			X			X		
K1700174-020	1.0	13:13							X						X				X			X			X		
ZZZZZZ	1.0	13:16																									
ZZZZZZ	1.0	13:19																									
ZZZZZZ	1.0	13:21																									
ZZZZZZ	1.0	13:23																									
ZZZZZZ	1.0	13:26																									
ZZZZZZ	5.0	13:28																									
CCV8	1.0	13:31							X						X				X			X					
CCV8	1.0	13:33							X						X										X		
CCB8	1.0	13:36							X						X				X			X			X		
LLCCV3	1.0	13:38													X							X			X		
ZZZZZZ	1.0	13:48																									
LLCCV3, 0.5	1.0	13:51							X										X								

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Run Number: 020117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/1/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
Blank	1.0	14:49		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
Standard 1	1.0	14:54		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ICV1	1.0	14:58		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
CCV1	1.0	15:03		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ICB1	1.0	15:07		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
CCB1	1.0	15:12		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZ	1.0	15:16																							
LLICVT1	1.0	15:20		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ICS-A1	1.0	15:25		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ICS-AB1	1.0	15:29		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZ	1.0	15:34																							
ZZZZZ	5.0	15:38																							
ZZZZZ	5.0	15:43																							
ZZZZZ	5.0	15:47																							
ZZZZZ	5.0	15:52																							
ZZZZZ	5.0	15:56																							
ZZZZZ	5.0	16:01																							
ZZZZZ	5.0	16:05																							
CCV2	1.0	16:10		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
CCB2	1.0	16:14		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZ	5.0	16:19																							
ZZZZZ	5.0	16:23																							
ZZZZZ	5.0	16:28																							
ZZZZZ	5.0	16:32																							
ZZZZZ	5.0	16:37																							
ZZZZZ	5.0	16:41																							
ZZZZZ	5.0	16:46																							
ZZZZZ	5.0	16:50																							
ZZZZZ	5.0	16:55																							
ZZZZZ	5.0	16:59																							
CCV3	1.0	17:04		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
CCB3	1.0	17:08		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X

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Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Run Number: 020117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/1/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
ZZZZZZ	5.0	17:13																							
ZZZZZZ	5.0	17:17																							
ZZZZZZ	5.0	17:22																							
ZZZZZZ	5.0	17:26																							
ZZZZZZ	5.0	17:31																							
ZZZZZZ	5.0	17:35																							
ZZZZZZ	5.0	17:40																							
ZZZZZZ	5.0	17:44																							
ZZZZZZ	5.0	17:49																							
ZZZZZZ	5.0	17:53																							
CCV4	1.0	17:58		X	X	X	X	X	X		X	X	X	X	X		X		X	X	X	X		X	X
CCB4	1.0	18:02		X	X	X	X	X	X		X	X	X	X	X		X		X	X	X	X		X	X
ZZZZZZ	5.0	18:07																							
ZZZZZZ	5.0	18:11																							
ZZZZZZ	5.0	18:16																							
ZZZZZZ	5.0	18:20																							
ZZZZZZ	5.0	18:25																							
ZZZZZZ	5.0	18:29																							
ZZZZZZ	5.0	18:34																							
ZZZZZZ	5.0	18:38																							
ZZZZZZ	5.0	18:43																							
ZZZZZZ	5.0	18:47																							
CCV5	1.0	18:52		X	X	X	X	X	X		X	X	X	X	X		X		X	X	X	X		X	X
ZZZZZZ	1.0	18:56																							
CCB5	1.0	19:01		X	X	X	X	X	X		X	X	X	X	X		X		X	X	X	X		X	X
LLCCVT1	1.0	19:05		X	X	X	X	X	X		X	X	X	X	X		X		X	X	X	X		X	X
ZZZZZZ	1.0	19:10																							
ZZZZZZ	5.0	19:14																							
ZZZZZZ	5.0	19:19																							
ZZZZZZ	5.0	19:23																							
ZZZZZZ	5.0	19:28																							
ZZZZZZ	5.0	19:32																							

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Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Run Number: 020117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/1/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																											
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V	Z N	C N				
ZZZZZZ	5.0	19:37																													
ZZZZZZ	5.0	19:41																													
ZZZZZZ	5.0	19:45																													
ZZZZZZ	5.0	19:50																													
ZZZZZZ	5.0	19:54																													
CCV6	1.0	19:59		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
ZZZZZZ	1.0	20:03																													
CCB6	1.0	20:08		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
ZZZZZZ	5.0	20:12																													
ZZZZZZ	5.0	20:17																													
ZZZZZZ	5.0	20:21																													
ZZZZZZ	5.0	20:26																													
ZZZZZZ	5.0	20:30																													
ZZZZZZ	5.0	20:35																													
ZZZZZZ	5.0	20:39																													
ZZZZZZ	5.0	20:44																													
ZZZZZZ	5.0	20:48																													
KQ1700985-01	5.0	20:53		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
CCV7	1.0	20:57		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
ZZZZZZ	1.0	21:02																													
CCB7	1.0	21:06		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
KQ1700985-02	5.0	21:11		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
KQ1700985-03	5.0	21:15																													
KQ1700985-04	5.0	21:20																													
K1700174-001	5.0	21:24		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
K1700174-002	5.0	21:29		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
K1700174-003	5.0	21:33		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
K1700174-004	5.0	21:38		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
K1700174-005	5.0	21:42		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
K1700174-006	5.0	21:47		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
K1700174-007	5.0	21:51		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
CCV8	1.0	21:56		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						

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Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Run Number: 020117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/1/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
ZZZZZZ	1.0	22:00																							
CCB8	1.0	22:05		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-008	5.0	22:09		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-009	5.0	22:14		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-010	5.0	22:18		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-011	5.0	22:23		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-011D	5.0	22:27		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-011L	5.0	22:32		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-011A	5.0	22:36		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-011S	5.0	22:41		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-012	5.0	22:45		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-013	5.0	22:50		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
CCV9	1.0	22:54		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	22:58																							
CCB9	1.0	23:03		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
LLCCVT2	1.0	23:07		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	23:12																							
ICS-A2	1.0	23:16		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ICS-AB2	1.0	23:21		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	23:25																							
K1700174-014	5.0	23:30		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-015	5.0	23:34		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-016	5.0	23:39		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-017	5.0	23:43		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-018	5.0	23:48		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-019	5.0	23:52		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-020	5.0	23:57		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
CCV10	1.0	00:01		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	00:06																							
CCB10	1.0	00:10		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	5.0	00:15																							
ZZZZZZ	5.0	00:19																							

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Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Run Number: 020117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/1/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																											
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V	Z N	C N				
ZZZZZZ	5.0	00:24																													
ZZZZZZ	5.0	00:28																													
ZZZZZZ	5.0	00:33																													
ZZZZZZ	5.0	00:37																													
ZZZZZZ	5.0	00:42																													
ZZZZZZ	5.0	00:46																													
ZZZZZZ	5.0	00:51																													
ZZZZZZ	5.0	00:55																													
CCV11	1.0	01:00		X	X	X	X	X	X		X	X	X	X	X		X		X	X	X		X	X							
ZZZZZZ	1.0	01:04																													
CCB11	1.0	01:08		X	X	X	X	X	X		X	X	X	X	X		X		X	X	X		X	X							
ZZZZZZ	5.0	01:13																													
ZZZZZZ	5.0	01:17																													
ZZZZZZ	5.0	01:22																													
ZZZZZZ	5.0	01:26																													
ZZZZZZ	5.0	01:31																													
ZZZZZZ	5.0	01:35																													
ZZZZZZ	5.0	01:40																													
ZZZZZZ	5.0	01:44																													
ZZZZZZ	5.0	01:49																													
ZZZZZZ	5.0	01:53																													
CCV12	1.0	01:58		X	X	X	X	X	X		X	X	X	X	X		X		X	X	X		X	X							
ZZZZZZ	1.0	02:02																													
CCB12	1.0	02:07		X	X	X	X	X	X		X	X	X	X	X		X		X	X	X		X	X							
ZZZZZZ	5.0	02:11																													
ZZZZZZ	5.0	02:16																													
ZZZZZZ	5.0	02:20																													
ZZZZZZ	5.0	02:25																													
ZZZZZZ	5.0	02:29																													
ZZZZZZ	5.0	02:34																													
ZZZZZZ	5.0	02:38																													
ZZZZZZ	5.0	02:43																													

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Run Number: 020117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/1/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V
KQ1700987-01	5.0	02:47			X	X	X		X		X	X	X	X	X				X		X	X		X	X
KQ1700987-02	5.0	02:52			X	X	X		X		X	X	X	X	X				X		X	X		X	X
CCV13	1.0	02:56		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	03:01																							
CCB13	1.0	03:05		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
LLCCVT3	1.0	03:10		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	03:14																							
KQ1700987-03	5.0	03:18																							
KQ1700987-04	5.0	03:23																							
ZZZZZZ	5.0	03:27																							
ZZZZZZ	5.0	03:32																							
ZZZZZZ	5.0	03:36																							
ZZZZZZ	5.0	03:41																							
ZZZZZZ	5.0	03:45																							
ZZZZZZ	5.0	03:50																							
ZZZZZZ	5.0	03:54																							
ZZZZZZ	5.0	03:59																							
CCV14	1.0	04:03		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	04:08																							
ZZZZZZ	1.0	04:12																							
CCB14	1.0	04:17		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	5.0	04:21																							
K1700173-024D	5.0	04:26		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700173-024L	5.0	04:30		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700173-024A	5.0	04:35		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700173-024S	5.0	04:39		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	5.0	04:44																							
K1700174-021	5.0	04:48		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-022	5.0	04:53		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-023	5.0	04:57		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
K1700174-024	5.0	05:02		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X
ZZZZZZ	1.0	05:06																							

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Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Run Number: 020117a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/1/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																											
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V	Z N	C N				
CCV15	1.0	05:10		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
CCB15	1.0	05:15		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
K1700174-025	5.0	05:20		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
ZZZZZZ	5.0	05:24																													
ZZZZZZ	5.0	05:29																													
ZZZZZZ	5.0	05:33																													
ZZZZZZ	5.0	05:37																													
ZZZZZZ	5.0	05:42																													
ZZZZZZ	1.0	05:47																													
CCV16	1.0	05:51		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
CCB16	1.0	05:55		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						
ZZZZZZ	1.0	06:00																													
LLCCVT4	1.0	06:04		X	X	X	X	X	X		X	X	X	X	X		X		X		X	X		X	X						

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

- 14 -

ANALYSIS RUN LOG

Client: Oregon State University

Service Request: K1700174

Project No.: NA

Run Number: 020217a

Project Name: Avian Tissue Project

Instrument ID Number: K-ICP-MS-04

Method: MS

Start Date: 2/2/2017

End Date: 2/2/2017

Sample No.	D/F	Time	% R	Analytes																											
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K	S E	A G	N A	T L	V	Z N	C N				
Blank	1.0	13:11		X				X									X														
Standard 1	1.0	13:14		X				X									X														
ICV2	1.0	13:17		X				X									X														
CCV1	1.0	13:20		X				X									X														
ICB2	1.0	13:23		X				X									X														
CCB1	1.0	13:27		X				X									X														
LLICVT1	1.0	13:30		X				X									X														
ICS-A1	1.0	13:33		X				X									X														
ICS-AB1	1.0	13:36		X				X									X														
ZZZZZZ	1.0	13:39																													
ZZZZZZ	5.0	13:42																													
ZZZZZZ	5.0	13:45																													
ZZZZZZ	5.0	13:48																													
ZZZZZZ	5.0	13:51																													
ZZZZZZ	5.0	13:54																													
ZZZZZZ	5.0	13:57																													
KQ1700987-01	5.0	14:01		X				X									X														
CCV2	1.0	14:04		X				X									X														
CCB2	1.0	14:07		X				X									X														
KQ1700987-02	5.0	14:10		X				X									X														
ZZZZZZ	5.0	14:13																													
ZZZZZZ	25.0	14:16																													
ZZZZZZ	25.0	14:19																													
ZZZZZZ	25.0	14:22																													
CCV3	1.0	14:25		X				X									X														
CCB3	1.0	14:28		X				X									X														
LLCCVT1	1.0	14:32		X				X									X														

* - Denotes additional elements (other than the standard CLP elements) are represented on another Form 14

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700174

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element Li6 KED1 Q	Element Ge72 KED2 Q	Element Ge72 KED3 Q	Element Sc45 STD Q	Element Rh103 KED2 Q	Element In115 KED1 Q				
Blank	Blank	1449	100	100	100	100	100	100				
Standard 1	Standard 1	1454	101	100	100	97	100	100				
ICV1	ICV	1458	102	100	99	99	97	102				
CCV1	CCV	1503	104	101	99	99	96	103				
ICB1	ICB	1507	102	99	99	97	97	102				
CCB1	CCB	1512	102	100	100	97	99	100				
ZZZZZZ	ZZZZZZ	1516										
LLICVT1	LLICVT1	1520	104	99	100	98	97	103				
ICS-A1	ICSA	1525	98	92	93	97	86	92				
ICS-AB1	ICSAB	1529	100	93	93	97	87	93				
ZZZZZZ	ZZZZZZ	1534										
ZZZZZZ	ZZZZZZ	1538										
ZZZZZZ	ZZZZZZ	1543										
ZZZZZZ	ZZZZZZ	1547										
ZZZZZZ	ZZZZZZ	1552										
ZZZZZZ	ZZZZZZ	1556										
ZZZZZZ	ZZZZZZ	1601										
ZZZZZZ	ZZZZZZ	1605										
CCV2	CCV	1610	107	99	102	100	99	108				
CCB2	CCB	1614	105	103	100	101	100	106				
ZZZZZZ	ZZZZZZ	1619										
ZZZZZZ	ZZZZZZ	1623										
ZZZZZZ	ZZZZZZ	1628										
ZZZZZZ	ZZZZZZ	1632										
ZZZZZZ	ZZZZZZ	1637										
ZZZZZZ	ZZZZZZ	1641										
ZZZZZZ	ZZZZZZ	1646										
ZZZZZZ	ZZZZZZ	1650										
ZZZZZZ	ZZZZZZ	1655										
ZZZZZZ	ZZZZZZ	1659										
CCV3	CCV	1704	109	101	97	104	102	109				
CCB3	CCB	1708	109	97	99	104	98	109				
ZZZZZZ	ZZZZZZ	1713										
ZZZZZZ	ZZZZZZ	1717										
ZZZZZZ	ZZZZZZ	1722										
ZZZZZZ	ZZZZZZ	1726										
ZZZZZZ	ZZZZZZ	1731										
ZZZZZZ	ZZZZZZ	1735										
ZZZZZZ	ZZZZZZ	1740										
ZZZZZZ	ZZZZZZ	1744										
ZZZZZZ	ZZZZZZ	1749										
ZZZZZZ	ZZZZZZ	1753										
CCV4	CCV	1758	110	100	98	104	100	111				
CCB4	CCB	1802	109	100	99	102	101	108				

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700174

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element Li6 KED1 Q	Element Ge72 KED2 Q	Element Ge72 KED3 Q	Element Sc45 STD Q	Element Rh103 KED2 Q	Element In115 KED1 Q				
ZZZZZZ	ZZZZZZ	1807										
ZZZZZZ	ZZZZZZ	1811										
ZZZZZZ	ZZZZZZ	1816										
ZZZZZZ	ZZZZZZ	1820										
ZZZZZZ	ZZZZZZ	1825										
ZZZZZZ	ZZZZZZ	1829										
ZZZZZZ	ZZZZZZ	1834										
ZZZZZZ	ZZZZZZ	1838										
ZZZZZZ	ZZZZZZ	1843										
ZZZZZZ	ZZZZZZ	1847										
CCV5	CCV	1852	113	100	99	109	103	113				
ZZZZZZ	ZZZZZZ	1856										
CCB5	CCB	1901	110	99	97	107	100	111				
LLCCVT1	LLCCVT1	1905	111	101	95	105	99	113				
ZZZZZZ	ZZZZZZ	1910										
ZZZZZZ	ZZZZZZ	1914										
ZZZZZZ	ZZZZZZ	1919										
ZZZZZZ	ZZZZZZ	1923										
ZZZZZZ	ZZZZZZ	1928										
ZZZZZZ	ZZZZZZ	1932										
ZZZZZZ	ZZZZZZ	1937										
ZZZZZZ	ZZZZZZ	1941										
ZZZZZZ	ZZZZZZ	1945										
ZZZZZZ	ZZZZZZ	1950										
ZZZZZZ	ZZZZZZ	1954										
CCV6	CCV	1959	112	101	97	112	103	114				
ZZZZZZ	ZZZZZZ	2003										
CCB6	CCB	2008	111	100	96	108	102	114				
ZZZZZZ	ZZZZZZ	2012										
ZZZZZZ	ZZZZZZ	2017										
ZZZZZZ	ZZZZZZ	2021										
ZZZZZZ	ZZZZZZ	2026										
ZZZZZZ	ZZZZZZ	2030										
ZZZZZZ	ZZZZZZ	2035										
ZZZZZZ	ZZZZZZ	2039										
ZZZZZZ	ZZZZZZ	2044										
ZZZZZZ	ZZZZZZ	2048										
KQ1700985-01	Method Blank	2053	110	99	94	104	98	114				
CCV7	CCV	2057	108	99	93	106	99	114				
ZZZZZZ	ZZZZZZ	2102										
CCB7	CCB	2106	114	101	95	109	102	114				
KQ1700985-02	Lab Control	2111	111	100	97	110	98	115				
KQ1700985-03	K1700174-SRM1	2115	112	101	96	109	95	111				
KQ1700985-04	K1700174-SRM2	2120	111	97	95	108	93	107				

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700174

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element Li6 KED1Q	Element Ge72 KED2Q	Element Ge72 KED3Q	Element Sc45 STDQ	Element Rh103 KED2Q	Element In115 KED1Q				
K1700174-001	Bird No. 16-1	2124	119	100	99	109	101	112				
K1700174-002	Bird No. 16-2	2129	114	104	100	112	100	117				
K1700174-003	Bird No. 16-3	2133	115	103	101	113	100	115				
K1700174-004	Bird No. 16-4	2138	115	108	101	118	104	119				
K1700174-005	Bird No. 16-5	2142	115	100	98	112	98	118				
K1700174-006	Bird No. 16-6	2147	119	103	101	116	104	119				
K1700174-007	Bird No. 16-7	2151	118	106	101	116	101	120				
CCV8	CCV	2156	116	102	96	111	103	117				
ZZZZZZ	ZZZZZZ	2200										
CCB8	CCB	2205	112	100	96	108	102	116				
K1700174-008	Bird No. 16-8	2209	117	102	99	113	100	118				
K1700174-009	Bird No. 16-9	2214	115	102	100	117	102	116				
K1700174-010	Bird No. 16-10	2218	116	101	99	114	97	117				
K1700174-011	Bird No. 16-11	2223	119	104	101	117	104	118				
K1700174-011D	Bird No. 16-11	2227	118	104	100	117	101	121				
K1700174-011L	Bird No. 16-11	2232	119	105	100	115	102	121				
K1700174-011A	Bird No. 16-11	2236	120	105	100	118	102	119				
K1700174-011S	Bird No. 16-11	2241	121	104	101	118	103	122				
K1700174-012	Bird No. 16-12	2245	121	106	98	114	106	121				
K1700174-013	Bird No. 16-13	2250	119	107	101	113	103	119				
CCV9	CCV	2254	119	102	98	115	102	121				
ZZZZZZ	ZZZZZZ	2258										
CCB9	CCB	2303	113	103	98	112	101	119				
LLCCVT2	LLCCVT2	2307	116	104	98	110	104	119				
ZZZZZZ	ZZZZZZ	2312										
ICS-A2	ICSA	2316	108	91	88	105	89	101				
ICS-AB2	ICSAB	2321	106	87	86	97	85	100				
ZZZZZZ	ZZZZZZ	2325										
K1700174-014	Bird No. 16-14	2330	117	104	100	102	105	115				
K1700174-015	Bird No. 16-15	2334	114	105	100	113	102	115				
K1700174-016	Bird No. 16-16	2339	111	105	99	117	104	112				
K1700174-017	Bird No. 16-17	2343	116	105	102	114	103	118				
K1700174-018	Bird No. 16-18	2348	119	103	100	119	100	122				
K1700174-019	Bird No. 16-19	2352	118	105	100	115	103	117				
K1700174-020	Bird No. 16-20	2357	119	107	100	120	102	123				
CCV10	CCV	0001	117	101	99	114	100	117				
ZZZZZZ	ZZZZZZ	0006										
CCB10	CCB	0010	117	99	97	113	102	118				
ZZZZZZ	ZZZZZZ	0015										
ZZZZZZ	ZZZZZZ	0019										
ZZZZZZ	ZZZZZZ	0024										
ZZZZZZ	ZZZZZZ	0028										
ZZZZZZ	ZZZZZZ	0033										
ZZZZZZ	ZZZZZZ	0037										

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700174

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:											
			Element Li6 KED1 Q	Element Ge72 KED2 Q	Element Ge72 KED3 Q	Element Sc45 STD Q	Element Rh103 KED2 Q	Element In115 KED1 Q						
ZZZZZZ	ZZZZZZ	0042												
ZZZZZZ	ZZZZZZ	0046												
ZZZZZZ	ZZZZZZ	0051												
ZZZZZZ	ZZZZZZ	0055												
CCV11	CCV	0100	117	99	96	112	101	113						
ZZZZZZ	ZZZZZZ	0104												
CCB11	CCB	0108	112	100	97	110	100	110						
ZZZZZZ	ZZZZZZ	0113												
ZZZZZZ	ZZZZZZ	0117												
ZZZZZZ	ZZZZZZ	0122												
ZZZZZZ	ZZZZZZ	0126												
ZZZZZZ	ZZZZZZ	0131												
ZZZZZZ	ZZZZZZ	0135												
ZZZZZZ	ZZZZZZ	0140												
ZZZZZZ	ZZZZZZ	0144												
ZZZZZZ	ZZZZZZ	0149												
ZZZZZZ	ZZZZZZ	0153												
CCV12	CCV	0158	123	101	94	115	101	115						
ZZZZZZ	ZZZZZZ	0202												
CCB12	CCB	0207	114	96	95	112	95	111						
ZZZZZZ	ZZZZZZ	0211												
ZZZZZZ	ZZZZZZ	0216												
ZZZZZZ	ZZZZZZ	0220												
ZZZZZZ	ZZZZZZ	0225												
ZZZZZZ	ZZZZZZ	0229												
ZZZZZZ	ZZZZZZ	0234												
ZZZZZZ	ZZZZZZ	0238												
ZZZZZZ	ZZZZZZ	0243												
KQ1700987-01	Method Blank	0247		113	108		108	124						
KQ1700987-02	Lab Control	0252		110	104		109	125						
CCV13	CCV	0256	121	104	97	123	101	117						
ZZZZZZ	ZZZZZZ	0301												
CCB13	CCB	0305	115	100	92	119	99	114						
LLCCVT3	LLCCVT3	0310	115	99	94	118	100	114						
ZZZZZZ	ZZZZZZ	0314												
KQ1700987-03	K1700174-SRM3	0318	111	95	92	125	93	110						
KQ1700987-04	K1700174-SRM4	0323	112	93	88	117	91	107						
ZZZZZZ	ZZZZZZ	0327												
ZZZZZZ	ZZZZZZ	0332												
ZZZZZZ	ZZZZZZ	0336												
ZZZZZZ	ZZZZZZ	0341												
ZZZZZZ	ZZZZZZ	0345												
ZZZZZZ	ZZZZZZ	0350												
ZZZZZZ	ZZZZZZ	0354												

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____
 Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700174
 ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element Li6 KED1 Q	Element Ge72 KED2 Q	Element Ge72 KED3 Q	Element Sc45 STD Q	Element Rh103 KED2 Q	Element In115 KED1 Q				
ZZZZZZ	ZZZZZZ	0359										
CCV14	CCV	0403	112	96	91	116	96	112				
ZZZZZZ	ZZZZZZ	0408										
ZZZZZZ	ZZZZZZ	0412										
CCB14	CCB	0417	109	97	92	115	96	112				
ZZZZZZ	ZZZZZZ	0421										
K1700173-024D	Batch QC1D	0426	110	97	89	117	94	110				
K1700173-024L	Batch QC1L	0430	112	96	92	113	95	114				
K1700173-024A	Batch QC1A	0435	113	95	91	117	93	114				
K1700173-024S	Batch QC1S	0439	110	98	90	118	94	112				
ZZZZZZ	ZZZZZZ	0444										
K1700174-021	Bird No. 16-21	0448	112	99	93	121	98	112				
K1700174-022	Bird No. 16-22	0453	115	97	92	121	96	115				
K1700174-023	Bird No. 16-23	0457	114	95	94	112	93	113				
K1700174-024	Bird No. 16-24	0502	113	100	95	119	96	117				
ZZZZZZ	ZZZZZZ	0506										
CCV15	CCV	0510	114	98	92	120	96	115				
CCB15	CCB	0515	114	98	90	118	100	116				
K1700174-025	Bird No. 16-25	0520	116	98	92	120	95	117				
ZZZZZZ	ZZZZZZ	0524										
ZZZZZZ	ZZZZZZ	0529										
ZZZZZZ	ZZZZZZ	0533										
ZZZZZZ	ZZZZZZ	0537										
ZZZZZZ	ZZZZZZ	0542										
ZZZZZZ	ZZZZZZ	0547										
CCV16	CCV	0551	120	97	93	123	100	113				
CCB16	CCB	0555	119	95	91	119	98	113				
ZZZZZZ	ZZZZZZ	0600										
LLCCVT4	LLCCVT4	0604	117	96	93	117	97	115				

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp.

Contract: _____

Lab Code: ALSK Case No.: _____NRAS No.: _____ SDG NO.: K1700174ICP-MS Instrument ID: K-ICP-MS-04Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:										
			Element	Q	Element	Q	Element	Q	Element	Q	Element	Q	
Blank	Blank	1449	100										
Standard 1	Standard 1	1454	102										
ICV1	ICV	1458	102										
CCV1	CCV	1503	102										
ICB1	ICB	1507	103										
CCB1	CCB	1512	102										
ZZZZZZ	ZZZZZZ	1516											
LLICVT1	LLICVT1	1520	103										
ICS-A1	ICSA	1525	98										
ICS-AB1	ICSAB	1529	100										
ZZZZZZ	ZZZZZZ	1534											
ZZZZZZ	ZZZZZZ	1538											
ZZZZZZ	ZZZZZZ	1543											
ZZZZZZ	ZZZZZZ	1547											
ZZZZZZ	ZZZZZZ	1552											
ZZZZZZ	ZZZZZZ	1556											
ZZZZZZ	ZZZZZZ	1601											
ZZZZZZ	ZZZZZZ	1605											
CCV2	CCV	1610	108										
CCB2	CCB	1614	106										
ZZZZZZ	ZZZZZZ	1619											
ZZZZZZ	ZZZZZZ	1623											
ZZZZZZ	ZZZZZZ	1628											
ZZZZZZ	ZZZZZZ	1632											
ZZZZZZ	ZZZZZZ	1637											
ZZZZZZ	ZZZZZZ	1641											
ZZZZZZ	ZZZZZZ	1646											
ZZZZZZ	ZZZZZZ	1650											
ZZZZZZ	ZZZZZZ	1655											
ZZZZZZ	ZZZZZZ	1659											
CCV3	CCV	1704	108										
CCB3	CCB	1708	108										
ZZZZZZ	ZZZZZZ	1713											
ZZZZZZ	ZZZZZZ	1717											
ZZZZZZ	ZZZZZZ	1722											
ZZZZZZ	ZZZZZZ	1726											
ZZZZZZ	ZZZZZZ	1731											
ZZZZZZ	ZZZZZZ	1735											
ZZZZZZ	ZZZZZZ	1740											
ZZZZZZ	ZZZZZZ	1744											
ZZZZZZ	ZZZZZZ	1749											
ZZZZZZ	ZZZZZZ	1753											
CCV4	CCV	1758	110										
CCB4	CCB	1802	109										

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp.

Contract: _____

Lab Code: ALSK Case No.: _____NRAS No.: _____ SDG NO.: K1700174ICP-MS Instrument ID: K-ICP-MS-04Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:										
			Element	Q	Element	Q	Element	Q	Element	Q	Element	Q	
ZZZZZZ	ZZZZZZ	1807											
ZZZZZZ	ZZZZZZ	1811											
ZZZZZZ	ZZZZZZ	1816											
ZZZZZZ	ZZZZZZ	1820											
ZZZZZZ	ZZZZZZ	1825											
ZZZZZZ	ZZZZZZ	1829											
ZZZZZZ	ZZZZZZ	1834											
ZZZZZZ	ZZZZZZ	1838											
ZZZZZZ	ZZZZZZ	1843											
ZZZZZZ	ZZZZZZ	1847											
CCV5	CCV	1852	111										
ZZZZZZ	ZZZZZZ	1856											
CCB5	CCB	1901	110										
LLCCVT1	LLCCVT1	1905	108										
ZZZZZZ	ZZZZZZ	1910											
ZZZZZZ	ZZZZZZ	1914											
ZZZZZZ	ZZZZZZ	1919											
ZZZZZZ	ZZZZZZ	1923											
ZZZZZZ	ZZZZZZ	1928											
ZZZZZZ	ZZZZZZ	1932											
ZZZZZZ	ZZZZZZ	1937											
ZZZZZZ	ZZZZZZ	1941											
ZZZZZZ	ZZZZZZ	1945											
ZZZZZZ	ZZZZZZ	1950											
ZZZZZZ	ZZZZZZ	1954											
CCV6	CCV	1959	114										
ZZZZZZ	ZZZZZZ	2003											
CCB6	CCB	2008	111										
ZZZZZZ	ZZZZZZ	2012											
ZZZZZZ	ZZZZZZ	2017											
ZZZZZZ	ZZZZZZ	2021											
ZZZZZZ	ZZZZZZ	2026											
ZZZZZZ	ZZZZZZ	2030											
ZZZZZZ	ZZZZZZ	2035											
ZZZZZZ	ZZZZZZ	2039											
ZZZZZZ	ZZZZZZ	2044											
ZZZZZZ	ZZZZZZ	2048											
KQ1700985-01	Method Blank	2053	110										
CCV7	CCV	2057	112										
ZZZZZZ	ZZZZZZ	2102											
CCB7	CCB	2106	112										
KQ1700985-02	Lab Control	2111	113										
KQ1700985-03	K1700174-SRM1	2115	112										
KQ1700985-04	K1700174-SRM2	2120	112										

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp.

Contract: _____

Lab Code: ALSK Case No.: _____NRAS No.: _____ SDG NO.: K1700174ICP-MS Instrument ID: K-ICP-MS-04Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
K1700174-001	Bird No. 16-1	2124	Lu175 KED	116								
K1700174-002	Bird No. 16-2	2129		115								
K1700174-003	Bird No. 16-3	2133		117								
K1700174-004	Bird No. 16-4	2138		116								
K1700174-005	Bird No. 16-5	2142		114								
K1700174-006	Bird No. 16-6	2147		119								
K1700174-007	Bird No. 16-7	2151		117								
CCV8	CCV	2156		115								
ZZZZZZ	ZZZZZZ	2200										
CCB8	CCB	2205		112								
K1700174-008	Bird No. 16-8	2209		117								
K1700174-009	Bird No. 16-9	2214		116								
K1700174-010	Bird No. 16-10	2218		116								
K1700174-011	Bird No. 16-11	2223		117								
K1700174-011D	Bird No. 16-11	2227		115								
K1700174-011L	Bird No. 16-11	2232		118								
K1700174-011A	Bird No. 16-11	2236		117								
K1700174-011S	Bird No. 16-11	2241		119								
K1700174-012	Bird No. 16-12	2245		119								
K1700174-013	Bird No. 16-13	2250		119								
CCV9	CCV	2254		118								
ZZZZZZ	ZZZZZZ	2258										
CCB9	CCB	2303		115								
LLCCVT2	LLCCVT2	2307		116								
ZZZZZZ	ZZZZZZ	2312										
ICS-A2	ICSA	2316		105								
ICS-AB2	ICSAB	2321		104								
ZZZZZZ	ZZZZZZ	2325										
K1700174-014	Bird No. 16-14	2330		116								
K1700174-015	Bird No. 16-15	2334		114								
K1700174-016	Bird No. 16-16	2339		114								
K1700174-017	Bird No. 16-17	2343		116								
K1700174-018	Bird No. 16-18	2348		118								
K1700174-019	Bird No. 16-19	2352		119								
K1700174-020	Bird No. 16-20	2357		119								
CCV10	CCV	0001		116								
ZZZZZZ	ZZZZZZ	0006										
CCB10	CCB	0010		114								
ZZZZZZ	ZZZZZZ	0015										
ZZZZZZ	ZZZZZZ	0019										
ZZZZZZ	ZZZZZZ	0024										
ZZZZZZ	ZZZZZZ	0028										
ZZZZZZ	ZZZZZZ	0033										
ZZZZZZ	ZZZZZZ	0037										

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp.

Contract: _____

Lab Code: ALSK Case No.: _____NRAS No.: _____ SDG NO.: K1700174ICP-MS Instrument ID: K-ICP-MS-04Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
ZZZZZZ	ZZZZZZ	0042										
ZZZZZZ	ZZZZZZ	0046										
ZZZZZZ	ZZZZZZ	0051										
ZZZZZZ	ZZZZZZ	0055										
CCV11	CCV	0100	108									
ZZZZZZ	ZZZZZZ	0104										
CCB11	CCB	0108	109									
ZZZZZZ	ZZZZZZ	0113										
ZZZZZZ	ZZZZZZ	0117										
ZZZZZZ	ZZZZZZ	0122										
ZZZZZZ	ZZZZZZ	0126										
ZZZZZZ	ZZZZZZ	0131										
ZZZZZZ	ZZZZZZ	0135										
ZZZZZZ	ZZZZZZ	0140										
ZZZZZZ	ZZZZZZ	0144										
ZZZZZZ	ZZZZZZ	0149										
ZZZZZZ	ZZZZZZ	0153										
CCV12	CCV	0158	111									
ZZZZZZ	ZZZZZZ	0202										
CCB12	CCB	0207	106									
ZZZZZZ	ZZZZZZ	0211										
ZZZZZZ	ZZZZZZ	0216										
ZZZZZZ	ZZZZZZ	0220										
ZZZZZZ	ZZZZZZ	0225										
ZZZZZZ	ZZZZZZ	0229										
ZZZZZZ	ZZZZZZ	0234										
ZZZZZZ	ZZZZZZ	0238										
ZZZZZZ	ZZZZZZ	0243										
KQ1700987-01	Method Blank	0247	113									
KQ1700987-02	Lab Control	0252	114									
CCV13	CCV	0256	113									
ZZZZZZ	ZZZZZZ	0301										
CCB13	CCB	0305	108									
LLCCVT3	LLCCVT3	0310	108									
ZZZZZZ	ZZZZZZ	0314										
KQ1700987-03	K1700174-SRM3	0318	109									
KQ1700987-04	K1700174-SRM4	0323	108									
ZZZZZZ	ZZZZZZ	0327										
ZZZZZZ	ZZZZZZ	0332										
ZZZZZZ	ZZZZZZ	0336										
ZZZZZZ	ZZZZZZ	0341										
ZZZZZZ	ZZZZZZ	0345										
ZZZZZZ	ZZZZZZ	0350										
ZZZZZZ	ZZZZZZ	0354										

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____

Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700174

ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 02/01/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
ZZZZZZ	ZZZZZZ	0359										
CCV14	CCV	0403	108									
ZZZZZZ	ZZZZZZ	0408										
ZZZZZZ	ZZZZZZ	0412										
CCB14	CCB	0417	107									
ZZZZZZ	ZZZZZZ	0421										
K1700173-024D	Batch QC1D	0426	109									
K1700173-024L	Batch QC1L	0430	107									
K1700173-024A	Batch QC1A	0435	108									
K1700173-024S	Batch QC1S	0439	111									
ZZZZZZ	ZZZZZZ	0444										
K1700174-021	Bird No. 16-21	0448	110									
K1700174-022	Bird No. 16-22	0453	111									
K1700174-023	Bird No. 16-23	0457	110									
K1700174-024	Bird No. 16-24	0502	111									
ZZZZZZ	ZZZZZZ	0506										
CCV15	CCV	0510	109									
CCB15	CCB	0515	111									
K1700174-025	Bird No. 16-25	0520	113									
ZZZZZZ	ZZZZZZ	0524										
ZZZZZZ	ZZZZZZ	0529										
ZZZZZZ	ZZZZZZ	0533										
ZZZZZZ	ZZZZZZ	0537										
ZZZZZZ	ZZZZZZ	0542										
ZZZZZZ	ZZZZZZ	0547										
CCV16	CCV	0551	108									
CCB16	CCB	0555	108									
ZZZZZZ	ZZZZZZ	0600										
LLCCVT4	LLCCVT4	0604	107									

Metals

15-IN

ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY

Lab Name: ALS Group USA, Corp. Contract: _____
 Lab Code: ALSK Case No.: _____ NRAS No.: _____ SDG NO.: K1700174
 ICP-MS Instrument ID: K-ICP-MS-04 Start Date: 02/02/2017 End Date: 02/02/2017

Sample No.	Client ID	Time	Internal Standards %RI For:									
			Element Li6 KED1	Q	Element Ge72 STD	Q	Element	Q	Element	Q	Element	Q
Blank	Blank	1311	100		100							
Standard 1	Standard 1	1314	104		99							
ICV2	ICV	1317	105		101							
CCV1	CCV	1320	102		98							
ICB2	ICB	1323	101		101							
CCB1	CCB	1327	99		101							
LLICVT1	LLICVT1	1330	100		102							
ICS-A1	ICSA	1333	96		90							
ICS-AB1	ICSAB	1336	98		93							
ZZZZZZ	ZZZZZZ	1339										
ZZZZZZ	ZZZZZZ	1342										
ZZZZZZ	ZZZZZZ	1345										
ZZZZZZ	ZZZZZZ	1348										
ZZZZZZ	ZZZZZZ	1351										
ZZZZZZ	ZZZZZZ	1354										
ZZZZZZ	ZZZZZZ	1357										
KQ1700987-01	Method Blank	1401	105		101							
CCV2	CCV	1404	106		99							
CCB2	CCB	1407	104		102							
KQ1700987-02	Lab Control	1410	105		101							
ZZZZZZ	ZZZZZZ	1413										
ZZZZZZ	ZZZZZZ	1416										
ZZZZZZ	ZZZZZZ	1419										
ZZZZZZ	ZZZZZZ	1422										
CCV3	CCV	1425	102		103							
CCB3	CCB	1428	103		104							
LLCCVT1	LLCCVT1	1432	104		97							

K1700174

Running number	ID	Weight (g)	Sex (m/f)	Liver	Kidney	GI tract	GI contents	Breast muscle	Thigh muscle	Bone (including marrow)
1	16-1	1772	m	x	x	x	x	x	x	x
2	16-2	2475	m	x	x	x	x	x	x	x
3	16-3	1964	m	x	x	x	x	x	x	x
4	16-4	2419	m	x	x	x	x	x	x	x
5	16-5	2887	m	x	x	x	x	x	x	x
6	16-6	1893	m	x	x	x	x	x	x	x
7	16-7	2317	f	x	x	x	x	x	x	x
8	16-8	2518	m	x	x	x	x	x	x	x
9	16-9	2274	f	x	x	x	x	x	x	x
10	16-10	2521	m	x	x	x	x	x	x	x
11	16-11	2152	m	x	x	x	x	x	x	x
12	16-12	1864	f	x	x	x	x	x	x	x
13	16-13	2170	f	x	x	x	x	x	x	x
14	16-14	1941	f	x	x	x	x	x	x	x
15	16-15	1973	m	x	x	x	x	x	x	x
16	16-16	2532	f	x	x	x	x	x	x	x
17	16-17	2624	m	x	x	x	x	x	x	x
18	16-18	2445	m	x	x	x	x	x	x	x
19	16-19	2418	f	x	x	x	x	x	x	x
20	16-20	2197	m	x	x	x	x	x	x	x
21	16-21	1537	f	x	x	x	x	x	x	x
22	16-22	1741	m	x	x	x	x	x	x	x
23	16-23	1853	f	x	x	x	x	x	x	x
24	16-24	1795	m	x	x	x	x	x	x	x
25	16-25	1838	m	x	x	x	x	x	x	x



Cooler Receipt and Preservation Form

PC GS

Client OSU USFW

Service Request K1700174

Received: 12-29-16 Opened: 12-29-16 By: eg Unloaded: 12-29-16 By: eg

1. Samples were received via? Mail Fed Ex UPS DHL PDX Courier Hand Delivered
2. Samples were received in: (circle) Cooler Box Envelope Other NA
3. Were custody seals on coolers? NA Y N If yes, how many and where? NA
- If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID	Tracking Number	NA	Filed
-10.8	-10.8	-	-	<u>Q</u>	361	NA	12 788 146 01 4816	NA	114

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

Sample ID on Bottle	Sample ID on COC	Identified by:

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

Notes, Discrepancies, & Resolutions:

Laboratory Management Program LaMP Chain of Custody Record

K1700175 Page 1 of 1

BP Site Node Path: 

Req Due Date (mm/dd/yy): Rush TAT: Yes No

BP Facility No: BMFOU

Lab Work Order Number: _____

Lab Name: Oregon Vet. Diagnostic Lab - Oregon State University	Facility Address: BMFOU	Consultant/Contractor: Pioneer Technical Services
Lab Address: Magruder Hall, Rm 134 700 SW 30th St. Corvallis OR	City, State, ZIP Code: Butte, MT, 59701	Consultant/Contractor Project No:
Lab PM: Dr. Christine Loehr	Lead Regulatory Agency: _____	Address: 307 East Park Ave, Anaconda, MT 59711
Lab Phone: office: 541-737-3261	California Global ID No.: _____	Consultant/Contractor PM: Rich Keeland
Lab Shipping Acct: N/A	Enfos Proposal No: _____	Phone: 406-723-1947 Email: richkeeland@pioneer-technical.com
Lab Bottle Order No: N/A	Accounting Mode: Provision _____ OOC-BU _____ OOC-RM _____	Email EDD To: richkeeland@pioneer-technical.com and to lab_enfosdoc@bp.com
Other Info: N/A	Stage: _____ Activity: _____	Invoice To: BP <u>x</u> Contractor _____

[illegible]

Sampler's Name: Tim Hilmc		Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Company: RWH Engineering		Tim Hilmc / AR	12-8-16	10:01	Rich Kerkand / PTS	12-8-16	10:01
Shipment Method: UPS	Ship Date: 12/17/16	Rich Kerkand / PTS	12/17/16	2:00pm	Travis Feldsher / OVDL	12-20-16	1:00pm
Shipment Tracking No:		Janna Dherp / OVDL	12/28/16	2:05pm	ALS	12/29/16	1020
Special Instructions:							
THIS LINE - LAB USE ONLY: Custody Seals In Place: Yes / No		Temp Blank: Yes / No	Cooler Temp on Receipt: _____ °F/C		Trip Blank: Yes / No	MS/MSD Sample Submitted: Yes / No	

**Laboratory Management Program LaMP Chain of Custody Record**

101700175 Page 1 of 1

BP Site Node Path: _____

Req Due Date (mm/dd/yy): Rush TAT: Yes No

BP Facility No: BMFOU

Lab Work Order Number: _____

Lab Name: Oregon Vet. Diagnostic Lab - Oregon State University		Facility Address: BMFOU		Consultant/Contractor: Pioneer Technical Services						
Lab Address: Magruder Hall, Rm 134 700 SW 30th St. Corvallis OR		City, State, ZIP Code: Butte, MT, 59701		Consultant/Contractor Project No:						
Lab PM: Dr. Christine Loehr		Lead Regulatory Agency:		Address: 307 East Park Ave, Anaconda, MT 59711						
Lab Phone: office: 541-737-3261		California Global ID No.:		Consultant/Contractor PM: Rich Keeland						
Lab Shipping Acct: N/A		Enfos Proposal No:		Phone: 406-723-1947 Email: richkeeland@pioneer-technical.com						
Lab Bottle Order No: N/A		Accounting Mode: Provision ___ OOC-BU ___ OOC-RM ___		Email EDD To: richkeeland@pioneer-technical.com and to lab.enfosdoc@bp.com						
Other Info: N/A		Stage: N/A Activity: N/A		Invoice To: BP ☒ Contractor ___						
BP Project Manager (PM): Tim Hilmo				Report Type & QC Level						
BP PM Phone: 406-490-4375				Standard ___						
BP PM Email: tim.hilmo@bp.com				Full Data Package ___						
Lab No.	Sample Description	Date	Time	Matrix	No. Containers / Preservative	Requested Analyses	Comments			
				Specimen	No. Containers	Tissue/Organ Sample	Note: If sample not collected, indicate "No Sample" in comments and single-strike out and initial any preprinted sample description.			
	BIRD No 23	12/19/16	12:30pm		1	1	PERMIT			
	BIRD No 24	12/19/16	12:30pm		1	1	MS14733C-D			
	BIRD No 25	12/19/16	12:30pm		1	1	MT PERMIT			
							2016-113-W			
Sampler's Name: R. Keeland				Relinquished By / Affiliation		Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Company: Pioneer				R. Keeland / Pioneer		12/19/16	2:30pm	Travis Feltz / OVDL	12/19/16	11:00am
Shipment Method: UPS Ship Date: 12/19/16				Jamm Shoup / OVDL		12/24/16	2:00pm	ALS	12/29/16	10:20
Shipment Tracking No:										
Special Instructions:										
THIS LINE - LAB USE ONLY: Custody Seals In Place: Yes / No				Temp Blank: Yes / No		Cooler Temp on Receipt: °F/C		Trip Blank: Yes / No		MS/MSD Sample Submitted: Yes / No

K1700175

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3	16-3	1964	m	x	x	x	x	x	x	x
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8	16-8	2518	m	x	x	x	x	x	x	x
9	16-9	2274	f	x	x	x	x	x	x	x
10	16-10	2521	m	x	x	x	x	x	x	x
11	16-11	2152	m	x	x	x	x	x	x	x
12	16-12	1864	f	x	x	x	x	x	x	x
13	16-13	2170	f	x	x	x	x	x	x	x
14	16-14	1941	f	x	x	x	x	x	x	x
15	16-15	1973	m	x	x	x	x	x	x	x
16	16-16	2532	f	x	x	x	x	x	x	x
17	16-17	2624	m	x	x	x	x	x	x	x
18	16-18	2445	m	x	x	x	x	x	x	x
19	16-19	2418	f	x	x	x	x	x	x	x
20	16-20	2197	m	x	x	x	x	x	x	x
21	16-21	1537	f	x	x	x	x	x	x	x
22	16-22	1741	m	x	x	x	x	x	x	x
23	16-23	1853	f	x	x	x	x	x	x	x
24	16-24	1795	m	x	x	x	x	x	x	x
25	16-25	1838	m	x	x	x	x	x	x	x



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Sample ID on Bottle	Sample ID on COC	Identified by:

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

Notes, Discrepancies, & Resolutions:

ARCO, Inc.

Anaconda, Montana

Oral Toxicity of Berkeley Pit
(Butte, Montana) Water to
Snow Geese
(*Chén caerulésens*)

ENSR

August 1996

Document Number 0480-375

0480-375

STUDY TITLE

Oral Toxicity of Berkeley Pit (Butte, Montana)
Water to Snow Geese (*Chén caerulésceus*)

STUDY COMPLETION

March 18, 1996

Prepared for:

ARCO, Inc.
307 East Park Avenue, Suite 301
P.O. Box 1491
Anaconda, Montana 59711

Prepared by:

ENSR Corporation
4303 West LaPorte Avenue
Fort Collins, CO 80521

Genesis Laboratories, Inc.
10122 N.E. Frontage Road
Wellington, Colorado 80549

August 1996

QUALITY ASSURANCE STATEMENT

This study was monitored by the Quality Assurance Unit of Genesis Laboratories, Inc. The study was inspected at different critical phases. The dates of inspections and the dates of submission of the reports to the study director are listed below. The report describes the methods and procedures used in the study and the reported results accurately reflect the raw data of the study.

INSPECTION DATE	DATE INSPECTION REPORTS SUBMITTED TO STUDY DIRECTOR
2/5/96	2/5/96
2/6/96	2/6/96
2/21/96	2/21/96

Paula Reichert
Quality Assurance Officer

Date

TABLE OF CONTENTS

1.0 INTRODUCTION	1-1
2.0 SINGLE DOSE ORAL TOXICITY TEST	2-1
2.1 Scope	2-1
2.2 Test Samples	2-1
2.2.1 Sample Collection	2-1
2.2.2 Sample Storage	2-1
2.3 Test Animals	2-1
2.4 Test Procedures	2-2
2.5 Test Results	2-3
2.6 Protocol Deviations	2-4
3.0 AD LIBITUM ORAL TOXICITY TEST I	3-1
3.1 Scope	3-1
3.2 Test Samples	3-1
3.2.1 Sample Collection	3-1
3.2.2 Sample Storage	3-1
3.3 Test Animals	3-1
3.4 Test Procedures	3-2
3.5 Test Results	3-3
3.6 Protocol Deviations	3-4
4.0 AD LIBITUM ORAL TOXICITY TEST II	4-1
4.1 Scope	4-1
4.2 Test Samples	4-1
4.2.1 Sample Collection	4-1
4.2.2 Sample Storage	4-1
4.3 Test Animals	4-1
4.4 Test Procedures	4-2
4.5 Test Results	4-3
4.6 Protocol Deviations	4-4
5.0 AD LIBITUM ORAL TOXICITY TEST III	5-1
5.1 Scope	5-1
5.2 Test Samples	5-1
5.2.1 Sample Collection	5-1
5.2.2 Sample Storage	5-1
5.3 Test Animals	5-1
5.4 Test Procedures	5-2
5.5 Test Results	5-3
5.6 Protocol Deviations	5-4

TABLE OF CONTENTS (Continued)

6.0 REFERENCES	6-1
APPENDIX A - PROTOCOLS	A-1
APPENDIX B - TEST ROOM TEMPERATURE AND RELATIVE HUMIDITY	B-1
APPENDIX C - BLOOD AND URINE SAMPLING LOG	C-1
APPENDIX D - OBSERVATIONS	D-1
APPENDIX E - NECROPSY AND CLINICAL CHEMISTRY RAW DATA	E-1

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1-1	Berkeley Pit Water - Chemistry Characteristics.	1-2
2-1	Body Weights of Snow Geese Dosed with Berkeley Pit Water at 1% Body Weight . .	2-5
2-2	Daily Feed Consumption of Snow Geese Dosed with Berkeley Pit Water at 1% Body Weight.	2-6
2-3	Hematology Results on Initial (I) and Final Blood (F) Samples from Snow Geese Dosed with Berkeley Pit Water at 1% Body Weight.	2-7
2-4	Clinical Chemistry Results on Initial (I) and Final (F) Blood Samples from Snow Geese Dosed with Berkeley Pit Water at 1% Body Weight	2-8
2-5	Blood Gas Results on Initial (I) and Final (F) Blood Samples from Snow Geese Dosed with Berkeley Pit Water at 1% Body Weight.	2-9
2-6	Tissue Metals Concentrations in Snow Geese Dosed with Berkeley Pit Water at 1% Body Weight (Dry Weight Analysis, ppm)	2-10
3-1	Percent Change in Body Weights of Snow Geese Receiving <i>Ad Libitum</i> Exposure to Berkeley Pit Water for 31 Hours	3-6
3-2	Daily Feed Consumption of Snow Geese Receiving <i>Ad Libitum</i> Exposure of Berkeley Pit Water for 31 Hours.	3-7
3-3	Daily Water Consumption of Snow Geese Receiving <i>Ad Libitum</i> Exposure of Berkeley Pit Water for 31 Hours.	3-8
3-4	Hematology Results on Initial (I), Post-Exposure (PE), and Final Blood Samples from Snow Geese Receiving <i>Ad Libitum</i> Exposure to Berkeley Pit Water for 31 Hours	3-9
3-5	Clinical Chemistry Results on Initial (I), Post-Exposure (PE), and Final (F) Blood Samples from Snow Geese Receiving <i>Ad Libitum</i> Exposure to Berkeley Pit Water for 31 Hours.	3-10
3-6	Blood Gas Results on Initial (I), Post-Exposure (PE), and Final (F) Blood Samples from Snow Geese Receiving <i>Ad Libitum</i> Exposure to Berkeley Pit Water for 31 Hours.	3-11
3-7	Tissue Metals Concentrations in Snow Geese Receiving <i>Ad Libitum</i> Exposure to Berkeley Pit Water for 31 Hours (Dry Weight Analysis, ppm)	3-12
4-1	Body Weights of Snow Geese Receiving <i>Ad Libitum</i> Exposure to Berkeley Pit Water for 3 Days	4-6
4-2	Hourly Feed Consumption of Snow Geese Receiving <i>Ad Libitum</i> Exposure of Berkeley Pit Water for 3 Days.	4-7
4-3	Hourly Water Consumption of Snow Geese Receiving <i>Ad Libitum</i> Exposure of Berkeley Pit Water for 3 Days.	4-8
4-4	Clinical Chemistry Results on Pre-Fast (PF), Initial (I), and Final (F) Blood Samples from Snow Geese Receiving <i>Ad Libitum</i> Exposure to Berkeley Pit Water for 3 Days (Control Group)	4-9

LIST OF TABLES (Continued)

<u>Table</u>		<u>Page</u>
4-5	Clinical Chemistry Results on Pre-Fast (PF), Initial (I), and Final (F) Blood Samples from Snow Geese Receiving <i>Ad Libitum</i> Exposure to Berkeley Pit Water for 3 Days (Treatment Group).	4-11
4-6	Clinical Chemistry Results on Urine Samples from Snow Geese Receiving <i>Ad Libitum</i> Exposure to Berkeley Pit Water for 3 Days.	4-13
4-7	Tissue Metals Concentrations in Snow Geese Receiving <i>Ad Libitum</i> Exposure to Berkeley Pit Water for 3 Days (Dry Weight Analysis, ppm).	4-14
5-1	Body Weights of Snow Geese Receiving <i>Ad Libitum</i> Exposure to Berkeley Pit Water for 24 Hours	5-5
5-2	Daily Feed Consumption of Snow Geese Receiving <i>Ad Libitum</i> Exposure of Berkeley Pit Water for 24 Hours	5-6
5-3	Hourly Water Consumption of Snow Geese Receiving <i>Ad Libitum</i> Exposure of Berkeley Pit Water for 24 Hours	5-7
5-4	Clinical Chemistry Results on Initial (I), Post-Exposure (PE), and Final (F) Blood Samples Collected from Snow Geese Receiving <i>Ad Libitum</i> Exposure of Berkeley Pit Water for 24 Hours	5-8
5-5	Tissue Metals Concentrations in Snow Geese Receiving <i>Ad Libitum</i> Exposure to Berkeley Pit Water for 24 Hours (Dry Weight Analysis, ppm)	5-10

1.0 INTRODUCTION

During November 1995, 342 snow geese were found dead in the area of Berkeley Pit in Butte, Montana. In response to this event, several studies were conducted to evaluate the toxicity of the water in Berkeley Pit. All toxicity tests were conducted using the snow goose (*Chén caerulésceus*). Specific studies were as follows:

- Toxic effects when dosed with pit water by oral gavage at 1% body weight after fasting for 48 hours (USEPA Standard Method)
- Toxic effects when allowed *ad libitum* exposure to pit water for 31 hours after fasting for 48 hours
- Toxic effects when allowed *ad libitum* exposure to pit water for 3 days after fasting for 48 hours
- Toxic effects when allowed *ad libitum* exposure to pit water for 24 hours with no fasting

These four toxicity studies were conducted during the period February 5, 1996 through March 18, 1996. Methods and results for each study are outlined separately in the sections that follow.

On February 19, 1996, two samples of the test substance, one collected November 17, 1995 and the other collected February 13, 1996, were submitted to Columbia Analytical Services (Kelso, Washington) for determination of several water chemistry characteristics. Because an insufficient volume of sample was collected in November 1995, additional sample was collected in February 1996 to complete the necessary studies; therefore, aliquots of both samples were submitted for analysis. Results of these analyses are summarized in Table 1-1.

All original raw data generated and the final report for these studies are stored at ENSR's Fort Collins Environmental Toxicology Laboratory, 4303 West LaPorte Avenue, Fort Collins, Colorado.

Table 1-1
Berkeley Pit Water - Chemistry Characteristics

Analyte	Sample		Analyte	Sample	
	GL-N-96004 ¹	GL-N-96010 ²		GL-N-96004 ¹	GL-N-96010 ²
pH (units)	2.69	2.73	Lead (µg/L)	64	56
Bicarbonate Alkalinity as CaCO ₃ (mg/L)	ND	ND	Lithium (µg/L)	373	298
Carbonate Alkalinity as CaCO ₃ (mg/L)	ND	ND	Magnesium (µg/L)	522000	426000
Chloride (mg/L)	55.0	19.0	Manganese (µg/L)	242000	204000
Nitrate as Nitrogen (mg/L)	<2.0	<1.0	Mercury (µg/L)	ND	ND
Sulfate (mg/L)	7900	5900	Molybdenum (µg/L)	ND	ND
Aluminum (µg/L)	342000	260000	Nickel (µg/L)	1370	1030
Arsenic (µg/L)	57	484	Potassium (µg/L)	6960	4340
Barium (µg/L)	8	12	Silicon, as SiO ₂ (µg/L)	101000	73800
Beryllium (µg/L)	64	51	Silver (µg/L)	ND	ND
Boron (µg/L)	216	178	Sodium (µg/L)	69600	54000
Cadmium (µg/L)	2400	1850	Strontium (µg/L)	1450	1160
Calcium (µg/L)	457000	393000	Titanium (µg/L)	10	13
Chromium (µg/L)	59	44	Vanadium (µg/L)	ND	29
Cobalt (µg/L)	1650	1350	Zinc (µg/L)	533000	428000
Copper (µg/L)	176000	177000	Zirconium (µg/L)	0.6	0.5
Iron (µg/L)	388000	408000			

ND = Not Detected

¹Sample collected November 17, 1995.

²Sample collected February 13, 1996.

2.0 SINGLE DOSE ORAL TOXICITY TEST

2.1 Scope

A single dose study was conducted to determine if acute exposure to large volumes of Berkeley Pit water would have toxic effects on snow geese. Study dates were February 5 to February 19, 1996. Test procedures were designed after available guidance (ASTM 1993 and USEPA 1985); the protocol for this study is provided in Appendix A.

2.2 Test Samples

2.2.1 Sample Collection

Water samples used in this study were collected November 17, 1995 as grab samples from the Berkeley Pit in Butte, Montana. Approximately 2.0 gallons of sample were collected in four plastic cubitainers; samples were composited prior to testing.

2.2.2 Sample Storage

The sample was shipped to ENSR's Fort Collins Toxicology Laboratory; the sample was then taken to Genesis Laboratories in Wellington, Colorado on February 5, 1996. Prior to and during testing, the water samples were maintained under refrigeration at approximately 4°C. The refrigerator temperature was monitored and recorded daily with a calibrated digital minimum-maximum thermometer.

2.3 Test Animals

Geese were captured, under Federal and State Permits, using a rocket net system at Bosque del Apache Refuge, San Antonio, New Mexico, on January 18, 1996. All geese collected were young adults less than one year of age; age determination was based on plumage characteristics. Geese were loaded into individual cages and transported via truck/trailer to Genesis Laboratories' toxicology laboratory in Wellington, Colorado. Geese were received at the laboratory the evening of January 18, 1996.

Upon arrival at the laboratory, the geese were individually housed in 61 x 76 x 46 cm (W x L x H) plastic coated wire pens which were suspended over metal collection pans. Individual cages were divided by solid stainless steel panels. Two geese died early in the acclimation period, apparently due to captivity stress. Following consultations with waterfowl biologists, gamebird breeders, and veterinarians, the interior partitions were removed from the cage racks to create 4 cages measuring 122 X 76 X 46 cm (L x W x H). The geese were allowed to acclimate to the cages and the laboratory diet for a 15-day period prior to test initiation. The photoperiod was maintained on an 8-hour light, 16-hour dark cycle. Room temperature during testing ranged from 16 to 22°C; relative humidity ranged from 11 to 44% (Appendix B). Other housing and physical conditions are outlined in the enclosed protocol (Appendix A).

2.4 Test Procedures

Eight geese were individually identified with uniquely numbered aluminum leg bands, and were placed randomly into cages (four geese per cage). The study consisted of a control group and a treatment group with four geese per group. Following the housing changes, no mortality occurred prior to test initiation.

Prior to and during the 14-day study, geese were fed a diet of 16% Protein Layer Feed Complete (Ranch-Way Feed Mill, Fort Collins, Colorado); a daily ration of assorted greens (e.g., lettuce, spinach) was provided to supplement the dry feed. Feed and water were available *ad libitum* throughout the study.

Body weights were recorded for individual birds at test initiation, on day 7, and at test termination. Consumption of the diet was measured daily from day 0 through day 14 (end of observation period). Spillage was assumed to be proportional to consumption and was not measured. Because the birds were group housed, individual consumption could not be determined; therefore, diet consumption values represent the mean of all birds in a group. Consumption of greens was not measured in this phase of the study.

All feed and water were removed from the geese approximately 48 hours prior to dose administration. At test initiation, geese were individually weighed and dosages were calculated such that each bird received an equivalent amount of test substance per unit body weight. Test material was administered by oral gavage at 1% body weight. Negative control group geese received municipal tap water (Northern Colorado Water Association) via oral gavage. Food and tap water were returned to the control and treatment group birds 4 hours following dosing.

At study initiation, blood samples were collected from all geese immediately prior to dosing. Blood samples were then collected from treatment group geese again at test termination (blood sampling log is included as Appendix C). Blood samples were drawn from the jugular or wing veins using heparin-treated syringes. Approximately 2.5 cc were collected at each sampling. Blood samples were then delivered to the Colorado State University Veterinary Diagnostic Laboratory for measurement of clinical parameters. Clinical parameters evaluated on initial and terminal samples were as follows:

White Blood Count	Cholesterol	Icterus
Plasma Protein	Creatine Kinase (CK)	Barometric Pressure
Packed Cell Volume (PCV)	Aspartate Aminotransferase (AST)	Hemoglobin (Hgb)
Glucose	Alkaline Phosphatase (ALP)	pH
Uric Acid	Sodium	Carbon Dioxide Pressure (pCO ₂)
Creatine	Potassium	Oxygen Pressure (pO ₂)
Total Protein	Calcium	Bicarbonate (HCO ₃)

Albumin	Phosphorus	Actual Base Excess (ABE)
Globulin	Lipemia	Percent Oxygen Saturation (SAT)
Albumin/Globulin (A/G) Ratio	Hemolysis	Total Oxygen Content (O ₂ CT)

Overt signs of toxicity and mortality were recorded twice daily throughout the study. At test termination, all surviving treatment group geese were sacrificed by decapitation and exsanguination. Because control group geese were needed for subsequent studies, geese were not sacrificed as part of this study; however, for comparative purposes, necropsy results from control birds in Phase III will be presented herein.

Following termination of the study, treatment group birds were necropsied; and complete gross post-mortem examinations were performed. Since there was no mortality during the study, in-life phase necropsy of dead birds was unnecessary. Gross examinations of the liver, bile, kidney, esophagus, trachea, adrenal glands, thymus, bursa, brain, lung, bone marrow, eye, skin, abdominal fat, heart, skeletal muscle, sciatic nerve, proventriculus, ventriculus, gastrointestinal tract, spleen, reproductive organs, glycogen body and all gross lesions were performed. Weights were measured on the heart, liver, kidney, and brain; tissues sampled from the liver and kidney were analyzed by dry weight analysis for copper, cadmium, lead, mercury, selenium, zinc, iron, arsenic, and manganese. The following tissues were taken for histopathological evaluation: adrenal gland, heart, sciatic nerve, brain, kidney, skeletal muscle, bursa, liver, skin, cloaca, lung/air sacs, spinal cord, eye, nasal turbinates, spleen, gall bladder, pancreas, trachea, gastrointestinal tract, preen gland, ureters, gross lesions, reproductive organs, web of foot, glycogen body, and salt gland.

2.5 Test Results

No mortalities or grossly observable signs of toxicity were noted during the 14-day observation period (observations can be found in Appendix D). At the end of the observation period, body weights were obtained from the control group birds; however, due to technician error, body weights were not obtained from the treatment group birds until February 21, 1996 (day 16). Even so, there were no statistical differences ($p=0.05$) in body weights between the control and treatment groups (Table 2-1). Additionally, there were no apparent differences in feed consumption between test group and control geese (Table 2-2).

No observable, consistent differences in the hematology, clinical chemistry, or blood gas parameters were noted between the treatment and control groups (Tables 2-3, 2-4, and 2-5, respectively).

Although the end of the observation period was February 19, 1996, treatment group geese were not sacrificed until February 23, 1996 due to backlog at the diagnostic laboratory. Nonetheless, post-mortem examinations indicated that all treatment group birds were in good body condition with no apparent gross lesions. Histopathology conducted on control geese showed no specific lesions. In the treatment group, three of the four birds showed mild adenitis of the mucous glands of the distal esophagus. No other significant lesions were noted.

No differences were noted in metals concentrations measured in kidney and liver tissues from birds in treatment and control groups (Table 2-6).

Data for all necropsy, blood, and tissue analyses are included as Appendix E.

2.6 Protocol Deviations

The following deviations from test protocol (Appendix A) occurred during this study:

- Room temperature during two days of testing was 16°C rather than 22 ± 4°C.
- Relative humidity of the testing room was out of range (11%) on the first two days of testing
- Due to technician error, testing groups consisted of four geese per group rather than 3 geese per group as stated in the protocol.
- Due to technician error, body weights for treatment group geese were taken on day 16 rather than at the end of the observation period on day 14.
- Initial hematology analysis was not able to be conducted on bird #9882 due to insufficient sample.
- Blood for analysis of blood gases was only taken at test initiation and termination; due to technician error, samples were not taken following dosing.
- Due to backlog at the diagnostic laboratory, treatment group geese were not sacrificed until day 18 rather than at the end of the observation period.
- Due to technician error, organ weights were not obtained from any control or treatment group bird.

Table 2-1

Body Weights of Snow Geese Dosed with
Berkeley Pit Water at 1% Body Weight

Bird Number		Body Weight (g)			Percent Change
		Day 0	Day 7	Day 14	Day 0 - 14
Control ¹	9870	1750	2050	2025	15.71
	9874	1550	1600	1500	-3.22
	9878	1700	1950	1900	11.76
	9882	1500	1625	1550	3.33
Treatment ²	9871	1600	1750	1875	17.19
	9887	1750	2100	2300	31.43
	9879	1750	2050	2150	22.86
	9869	1550	1725	1625	4.84

¹ All control group birds were re-assigned to subsequent phases for acclimation on test day 4; however, body weights were monitored during this time. Weight loss observed on day 14 was most likely due to fasting for the next study.

²Body weights for treatment group birds were taken on day 16, rather than day 14.

Table 2-2

**Daily Feed Consumption of Snow Geese Dosed
with Berkeley Pit Water at 1% Body Weight**

Date	Grams/Bird/Day	
	Treatment	Control
2/06/96	628	597
2/07/96	593	568
2/08/96	605	598
2/09/96	614	613 ¹
2/10/96	624	---
2/11/96	621	---
2/12/96	541	---
2/13/96	383	---
2/14/96	538	---
2/15/96	595	---
2/16/96	569	---
2/17/96	580	---
2/18/96	601	---
2/19/96	649	---

Note: Spillage was not accounted for when calculating feed consumption.

¹On 2/9/96 all birds from Control Group were moved to acclimation for Phase III of this study.

Table 2- 3

**Hematology Results on Initial (I) and Final Blood (F) Samples from Snow Geese
Dosed with Berkeley Pit Water at 1% Body Weight**

Group	Control Group			Treatment Group							
Bird # : Initial (I) or Final (F)	9870-I	9874-I	9878-I	9871-I	9871-F	9887-I	9887-F	9879-I	9879-F	9869-I	9869-F
Draw Date	02/05/96	02/05/96	02/05/96	02/05/96	02/23/96	02/05/96	02/23/96	02/05/96	02/23/96	02/05/96	02/23/96
WhiteBlood Count x 10-3 uL	8.1	5	3.5	6.3	— ¹	9.6	9.4 ²	3.3	4.3 ²	4.7	8.3 ²
Heterophils x 10-3 uL (% of total)	5.7 (70%)	3.4 (69%)	1.9 (56%)	4.4 (70%)	(63%)	4.2 (44%)	6.5 (69%)	1.8 (56%)	1.9 (45%)	2.8 (60%)	5.8 (70%)
Lymphocytes x 10-3 uL (% of total)	2.2 (27%)	1.4 (29%)	1.3 (38%)	1.1 (18%)	(30%)	4.6 (48%)	2.2 (23%)	1.1 (35%)	2.1 (48%)	1.2 (25%)	2.3 (28%)
Monocytes x 10-3 uL (% of total)	0.1 (0.1%)	0.0 (1%)	0.1 (4%)	0.2 (3%)	(6%)	0.5 (5%)	0.5 (5%)	0.2 (5%)	0.3 (7%)	0.2 (5%)	0.2 (2%)
Eosinophiles x 10-3 uL (% of total)	—	—	—	—	—	—	—	—	—	—	—
Basophiles x 10-3 uL (% of total)	0.2 (2%)	0.0 (1%)	0.1 (2%)	0.6 (9%)	(1%)	0.3 (3%)	0.3 (3%)	0.1 (4%)	—	0.5 (10%)	—
Plasma Protein (g/dl)	6.7	5.3	5.3	5.9	4.6	6.1	4.8	6.3	4.2	5.3	4.3
PCV (%)	55	52	51	53	46	52	47	54	48	55	43
Hemopathology ³	C/A	C/A	C/A	C		C	C/A	C/A	C	C/A	C/A
Reticulocytes (%)	8.3	7.6	11.6	6.6	5	4.6	5.6	9.2	8.4	10.2	5.2

¹White blood cell count not conducted due to large clumps on hemacytometer.

²White blood cells clumped on hemacytometer, count may not be accurate.

³C = Clumped thrombocytes; A = Adequate thrombocytes

Note: Initial hematology was unable to be conducted on control group bird #9882 due to insufficient sample.

Table 2-4

**Clinical Chemistry Results on Initial (I) and Final (F) Blood Samples from Snow Geese
Dosed with Berkeley Pit Water at 1% Body Weight**

Group	Control Group				Treatment Group							
Bird # : Initial (I) or Final (F)	9870-I	9874-I ¹	9882-I	9878-I	9871-I	9871-F ²	9887-I	9887-F ²	9879-I	9879-F ²	9869-I	9869-F ²
Draw Date	02/05/96	02/05/96	02/05/96	02/05/96	02/05/96	02/23/96	02/05/96	02/23/96	02/05/96	02/23/96	02/05/96	02/23/96
Glucose (mg/dl)	233	168	187	201	225	191	195	210	216	212	218	179
Uric Acid (mg/dl)	15.1	7.8	7.5	8.2	13	5	11.8	8.3	6.1	7.5	8.6	5.4
Creatine (mg/dl)	13.67	7.26	7.49	7.72	8.26	1.27	11.52	1.3	4.84	1.77	6.88	2.02
Total Protein (gm/dl)	5.6	4.4	4.3	4.6	4.9	4.1	5.2	4.3	5.4	3.6	4.5	3.8
Albumin (gm/dl)	2.5	2.2	1.8	2.1	1.9	1.7	2.2	2.1	2.5	1.7	1.7	1.7
Globulin (gm/dl)	3.1	2.2	2.5	2.5	3	2.4	3	2.2	2.9	1.9	2.8	2.1
A/G Ratio	0.8	1	0.7	0.8	0.6	0.7	0.7	1	0.9	0.9	0.6	0.8
Cholesterol (mg/dl)	306	337	290	243	394	207	300	184	385	181	272	178
CK (IU/l)	166	368	270	288	233	192	115	245	108	350	151	975
AST (IU/l)	14	45	23	21	30	17	11	30	10	27	17	29
ALP (IU/l)	211	114	167	143	157	323	228	170	201	307	169	421
Sodium (meq/l)	165	162	168	155	158	151	156	148	163	147	163	146
Potassium (meq/l)	2.8	4	2.6	2	2.1	2	2.3	1.7	2.7	2.2	2.8	1.7
Calcium (mg/dl)	12.2	8.9	10	10.7	10.9	10.2	11.7	10.1	12.2	9.7	10.6	9.7
Phosphorus (mg/dl)	8.7	7.6	10.4	5.1	4.4	2.2	7.6	2.6	6.9	1.4	7.2	2.4
Lipemia (mg/dl)	5	9	1	11	19	11	5	0	14	15	3	15
Hemolysis (mg/dl)	17	176	24	9	3	5	8	19	0	16	15	10
Icterus (mg/dl)	0	1	1	0	0	1	0	1	1	1	0	0

¹Sample grossly hemolyzed.

²Plasma and heparin present.

Table 2-5

**Blood Gas Results on Initial (I) and Final (F) Blood Samples from Snow Geese
Dosed with Berkeley Pit Water at 1% Body Weight**

Group	Control Group				Treatment Group							
Bird # : Initial (I) or Final (F)	9870-I	9874-I	9882-I	9878-I	9871-I	9871-F	9887-I	9887-F	9879-I	9879-F	9869-I	9869-F
Draw Date	02/05/96	02/05/96	02/05/96	02/05/96	02/05/96	02/23/96	02/05/96	02/23/96	02/05/96	02/23/96	02/05/96	02/23/96
Bar Pressure (mmHG)	643	643	643	643	643	634	643	634	643	634	643	634
Hgb (G%)	18.9	19.3	18.2	17.9	18.4	16.2	18.3	15	17.9	16.7	19.5	14.4
pH	7.12	7.25	7.16	7.35	7.41	7.42	7.27	7.46	7.24	7.49	7.25	7.36
pCO ₂ (mmHG)	49.7	21.7	33.7	28.9	25.5	30	34.8	28.9	36.9	30	28.2	34.5
pO ₂ (mmHG)	28.8	47.8	45.4	39.7	39.7	40.2	42.8	43.5	31.6	42.6	42.7	42.4
HCO ₃ (mm/L)	15.4	9.2	11.5	15.6	15.9	19.2	15.7	20.4	15.3	22.9	12.1	19.3
ABE (mm/L)	-15.1	-16.6	-17	-8.3	-6.5	-3.7	-10.2	-2	-11.4	0.9	-13.8	-5
SAT (%)	35.1	75.7	66.9	71.4	75	76.3	71	82.1	49.2	82.7	69.6	75.9
O ₂ CT (Vol%)	9.3	20.5	17.1	17.9	19.3	17.3	18.2	17.3	12.3	19.3	19	15.3

Table 2-6

**Tissue Metals Concentrations in Snow Geese Dosed with
Berkeley Pit Water at 1% Body Weight
(Dry Weight Analysis, ppm)**

Tissue	Group	Bird #	As	Cd	Cu	Fe	Pb	Mn	Hg	Se	Zn
Kidney	Control	9874	0.02	0.5	19.0	577	2	4.06	0.55	1.48	67.7
		9882	0.04	0.9	10.9	641	2.2	5.04	0.06	3.08	67.8
	Treatment	9869	0.01	0.7	18.2	874	1.1	4.99	0.03	2.44	80.6
		9871	0.01	0.8	15.9	514	1.0	4.38	0.05	3.03	70.6
		9879	0.06	0.4	28.6	890	1	5.30	0.05	2.69	139
		9887	0.28	0.4	11.5	355	41	6.37	0.07	3.04	76.4
Liver	Control	9874	<0.01	0.3	80.6	983	0.7	12.2	0.12	3.5	117
		9882	0.02	0.5	113	635	0.6	10.6	0.11	4.3	106
	Treatment	9869	<0.01	0.3	68.0	819	0.3	8.36	0.09	1.7	73.9
		9871	0.01	0.4	39.1	702	0.6	10.8	0.08	2.8	68.4
		9879	0.05	0.2	48.8	184	0.5	8.70	0.07	2.5	60.1
		9887	0.02	0.4	29.0	791	0.5	10.1	0.07	3.1	80.2

3.0 *AD LIBITUM* ORAL TOXICITY TEST I

3.1 Scope

This study was conducted to determine if extended, *ad libitum* exposure to Berkeley Pit water would have toxic effects on snow geese. Study dates were February 6 to February 20, 1996. Test procedures were designed after available guidance (ASTM 1993 and USEPA 1985); the protocol for this study is provided in Appendix A.

3.2 Test Samples

3.2.1 Sample Collection

Water samples used in this study were collected November 17, 1995 as grab samples from the Berkeley Pit in Butte, Montana. Approximately 2 gallons of sample was collected in four plastic cubitainers; samples were composited prior to testing.

3.2.2 Sample Storage

The sample was shipped to ENSR's Fort Collins Toxicology Laboratory; the sample was then taken to Genesis Laboratories in Wellington, Colorado on February 5, 1996. Prior to and during testing, the water samples were maintained under refrigeration at approximately 4°C. The refrigerator temperature was monitored and recorded daily with a calibrated digital minimum-maximum thermometer.

3.3 Test Animals

Geese were captured, under Federal and State Permitting, using a rocket net system at Bosque del Apache Refuge, San Antonio, New Mexico, on January 18, 1996. All geese collected were young adults less than one year of age; age determination was based on plumage characteristics. Geese were loaded into individual cages and transported via truck/trailer to Genesis Laboratories' toxicology laboratory in Wellington, Colorado. Geese were received at the laboratory the evening of January 18, 1996.

Upon arrival at the laboratory, the geese were individually housed in 61 x 76 x 46 cm (W x L x H) plastic coated wire pens which were suspended over metal collection pans. Individual cages were divided by solid stainless steel panels. Two geese died early in the acclimation period, apparently due to captivity stress. Following consultations with waterfowl biologists, gamebird breeders, and veterinarians, the interior partitions were removed from the cage racks to create 4 cages measuring 122 X 76 X 46 cm (L x W x H). The geese were allowed to acclimate to the cages and the laboratory diet for a 16-day period prior to test initiation. The photoperiod was maintained on an 8-hour light, 16-hour dark cycle. Room temperature during testing ranged from 16 to 22°C; relative humidity ranged from 11 to 44% (Appendix B). Other housing and physical conditions are outlined in the enclosed protocol (Appendix A).

3.4 Test Procedures

Eight geese were individually identified with uniquely numbered aluminum leg bands, and were placed randomly into cages (four geese per cage). The study consisted of a control group and a treatment group with four geese per group. Following the housing changes, no mortality was noted prior to test initiation.

Prior to and during the 14-day study, geese were fed a diet of 16% Protein Layer Feed Complete (Ranch-Way Feed Mill, Fort Collins, Colorado); a daily ration of assorted greens (e.g., lettuce, spinach) was provided to supplement the dry feed. Feed and water (treatment or control) were available *ad libitum* throughout the study.

Body weights were recorded for individual birds at test initiation, on day 7, and at test termination. Consumption of the diet was measured daily from day 0 through day 14 (end of observation period). Spillage was assumed to be proportional to consumption and was not measured. Because the birds were group housed, individual consumption could not be determined; therefore, diet consumption values represent the mean of all birds in a group. Consumption of greens was not measured in this study. Water consumption was measured daily during the exposure period for treatment and control geese.

All feed and water were removed from the geese approximately 48 hours prior to pit water exposure. At test initiation, geese were individually weighed and the test material was introduced. Treatment group birds were to have *ad libitum* exposure to the test substance for a period of three days; however, the supply of test material was depleted after 31 hours of exposure. After this time, the treatment birds had *ad libitum* exposure to municipal tap water. Negative control group geese received municipal tap water *ad libitum* throughout the test period.

At study initiation, blood samples were collected from all geese immediately prior to dosing to evaluate clinical parameters. Blood samples were then collected again following the exposure period (31 hours) and at test termination or immediately prior to death (blood sampling log included as Appendix C). Blood samples were drawn from the jugular or wing veins using heparin-treated syringes. Approximately 2.5 cc was collected at each sampling. Blood samples were submitted to the Colorado State University Veterinary Diagnostic Laboratory for measurement of clinical parameters. Clinical parameters evaluated on all samples were as follows:

✓ White Blood Count	Cholesterol ✓	Icterus ✓
✓ Plasma Protein	• Creatine Kinase (CK) ✓	Barometric Pressure
✓ Packed Cell Volume (PCV)	◊ Aspartate Aminotransferase (AST)	Hemoglobin (Hgb)
✓ Glucose	◊ Alkaline Phosphatase (ALP) ✓	pH ✓
✓ Uric Acid	◊ Sodium ✓	Carbon Dioxide Pressure (pCO ₂) ✓
✓ Creatinine	◊ Potassium ✓	Oxygen Pressure (pO ₂) ✓

Total Protein ✓	Calcium ✓	Bicarbonate (HCO ₃) ✓
Albumin ✓	Phosphorus ✓	Actual Base Excess (ABE) ✓
Globulin ✓	Lipemia ✓	Percent Oxygen Saturation (SAT) ✓
Albumin/Globulin (A/G) Ratio ✓	Hemolysis ✓	Total Oxygen Content (O ₂ CT) ✓

Overt signs of toxicity and mortality were recorded twice daily throughout the study. At test termination, all surviving treatment geese were sacrificed by decapitation and exsanguination. Because control group geese were needed for subsequent studies, geese were not sacrificed as part of this study; however, for comparative purposes, necropsy results from control birds in Phase III will be presented herein.

Birds dying or sacrificed during the study or at test termination were necropsied and complete gross post-mortem examinations were performed. Gross examinations of the liver, bile, kidney, esophagus, trachea, adrenal glands, thymus, bursa, brain, lung, bone marrow, eye, skin, abdominal fat, heart, skeletal muscle, sciatic nerve, proventriculus, ventriculus, gastrointestinal tract, spleen, reproductive organs, glycogen body and all gross lesions were performed. Weights were measured on the heart, liver, kidney, and brain; tissues sampled from the liver and kidney were analyzed for copper, cadmium, lead, mercury, selenium, zinc, iron, arsenic, and manganese. The following tissues taken for histopathological evaluation: adrenal gland, heart, sciatic nerve, brain, kidney, skeletal muscle, bursa, liver, skin, cloaca, lung/air sacs, spinal cord, eye, nasal turbinates, spleen, gall bladder, pancreas, trachea, gastrointestinal tract, preen gland, ureters, gross lesions, reproductive organs, web of foot, glycogen body, and salt gland.

3.5 Test Results

Two treatment group geese died during this study. Bird #9873 appeared normal during the first day of the exposure period, but died overnight on February 6, 1996. The necropsy, conducted by the Colorado State University Veterinary Diagnostic Laboratory, suggested the mortality resulted from acute renal tubular epithelial degeneration and necrosis. Bird #9877 began showing clinical signs of toxicosis approximately 6 hours after introduction of the test substance. On February 8, 1996, two days after introduction of the test substance, the bird appeared close to death and, therefore, the bird was euthanized. Primary cause of illness in this bird was likely associated with acute metabolic disturbances.

During the exposure period, the remaining two birds in the treatment group showed some sign of toxicity; however, following the exposure period, birds were given tap water and the surviving geese appeared to recover quickly and remained healthy for the remainder of the 14-day observation period (observations can be found in Appendix D).

Final body weights taken on the birds that died early in the study (bird #'s 9873 and 9877) showed weight loss from the time body weights were initially taken. Surviving treatment group birds and control group birds gained weight by the end of the observation period again suggesting a rapid

recovery from any observed effects. Body weights varied widely among surviving birds and there was no statistical difference ($p=0.05$) in body weight between groups (Table 3-1).

During the exposure period, feed consumption by the treatment group birds was considerably less than that of control birds (Table 3-2). Once treatment group birds were returned to tap water following the exposure period, food consumption immediately increased and was comparable to that in the control group. During the exposure period, water consumption was measured daily. During this time, water consumption was considerably higher (4-6x) in the treatment group than in the control group (Table 3-3).

No apparent differences in hematological parameters were observed between treatment and control birds during this study (Table 3-4). However, clinical chemistry results showed blood samples taken from the three surviving treatment birds immediately following the exposure period on February 7, 1996 contained elevated levels of uric acid, creatine, CK, and AST. By test termination on February 21, 1996, these parameters returned to values consistent with pre-test (or control) samples in the two surviving birds. Bird #9877 was euthanized on February 8, 1996 and at this time the CK and AST levels had increased (Table 3-5). No apparent differences in blood gas parameters were observed between treatment and control birds during this study (Table 3-6).

Although the end of the observation period was February 20, 1996, the surviving treatment birds were not sacrificed until February 21, 1996 at which time complete post-mortem examinations were performed. Both remaining birds were in good body condition with no gross lesions; however, in bird #9881, there was yellow discoloration to the nasal mucosa.

No differences were noted in metals concentrations measured in kidney and liver tissues from surviving treatment birds and control group birds; however, elevated levels of copper, manganese, and zinc were detected in bird #'s 9873 and 9877 (Table 3-7).

Histopathology conducted on control geese showed no specific lesions. In the treatment group, the geese that died during the study (#9873 and #9877) both showed acute renal tubular degeneration and necrosis; additionally, individual cell necrosis was observed in the liver and pancreas. Histology performed on surviving geese (#9881 and #9885) showed few lesions in the kidney, liver, and skeletal and heart muscle. These lesions were relatively mild and appeared to be healing. Degeneration of muscle of the ventriculus was also observed in both geese. Bird #9881 also had mild degeneration of the mucous glands of the esophagus. Histopathology results can be found in more detail in Appendix E.

Data for all necropsy, blood, and tissue analyses are included as Appendix E.

3.6 Protocol Deviations

The following deviations from test protocol (Appendix A) occurred during this study:

- Dosing for this study occurred one day later than that stated in the protocol.

- Room temperature was 16°C during two days of testing rather than $22 \pm 4^\circ\text{C}$.
- Relative humidity of the testing room was out of range (11%) on the first day of testing.
- Due to technician error, testing groups consisted of four geese per group rather than five geese per group as stated in the protocol.
- The test substance depleted 31 hours into the exposure period; therefore, the exposure period was only 31 hours, rather than 3 days.
- Post-exposure hematology and clinical chemistry analyses on bird #9881 and final blood gas analysis on bird # 9877 were unable to be conducted due to insufficient sample.
- Due to backlog at the diagnostic laboratory, treatment group geese were not sacrificed until day 15 rather than at the end of the observation period.
- Due to technician error, organ weights were not obtained from the two surviving geese sacrificed at test termination, or from the control geese. Because no comparisons could be made between the treatment and control group and, therefore, no conclusions could be made about the effect of the test substance on organ weights, these data were not included.

Table 3-1

**Percent Change in Body Weights of Snow Geese Receiving
Ad Libitum Exposure to Berkeley Pit Water for 31 Hours**

Bird Number		Body Weight (g)				Percent Change
		Day 0	Day 7	Day 14	At Death	Day 0-14
Control	9872	1625	1850	1850	NA	13.85
	9876 ¹	1300	1550	---	NA	19.23
	9880 ¹	2000	2125	---	NA	6.25
	9884	2000	2000	2250	NA	12.50
Treatment	9873 ²	1500	---	---	1425	-5.00
	9877 ²	1850	---	---	1775	-4.05
	9881	1650	2175	2325	NA	40.91
	9885	1750	1850	1900	NA	8.57

¹Birds moved to subsequent phases prior to test termination and, therefore, weights were not obtained on day 14; percent change is for day 0-7.

²Birds died prior to day 7; percent change is for day 0 to day of death.

NA = Not Applicable

Table 3-2

**Daily Feed Consumption of Snow Geese Receiving
Ad Libitum Exposure of Berkeley Pit Water for 31 Hours**

Date	Grams/Bird/Day	
	Treatment	Control
2/07/96	62	612
2/08/96	166	478
2/09/96	607	515
2/10/96	412	782
2/11/96	527	372
2/12/96	431	312
2/13/96	468	345
2/14/96	253	404
2/15/96	430	431
2/16/96	482	408
2/17/96	475	366
2/18/96	463	375
2/19/96	389	359
2/20/96	465	428

Note: Spillage was not accounted for when calculating feed consumption.
Shaded area represents exposure period.

Table 3-3

**Daily Water Consumption of Snow Geese Receiving
Ad Libitum Exposure of Berkeley Pit Water for 31 Hours**

Group	Date	Total Water Added (ml)	Total Water Removed (ml)	Total Consumption (ml)	Number of Birds	Total # Hours Exposed ¹	ml/Bird/Hr
Treatment	2/07/96	2500	0	2500	4	22.00	28
	2/07/96	3000	1300 ²	1700	3 ³	9.00	63
Control	2/07/96	2000	300	1700	4	26.00	16
	2/08/96	2000	850	1150	4	22.58	13
	2/09/96	2000	1050	950	4	24.00	10

¹Water was initially offered to Treatment Group on 2/6/96 at 0940 hours. Water consumption was calculated at 0730 hours on 2/7/96 and at 1630 hours on 2/7/96. At 1630 hours all the test substance was consumed and the birds were offered NCWA water. The total exposure period to Berkeley Pit water was 31 hours. For Control Group, NCWA water was initially offered on 2/6/96 at 0940 hours. Water consumption was calculated at 1140 hours on 2/7/96, at 1015 hours on 2/8/96, and at 1010 hours on 2/9/96.

²The birds consumed all but 300 ml of water that was offered to them. Spillage collected in a pan was estimated at 1000 ml.

³One bird died sometime between 2200 hours on 2/6/96 and 0730 hours on 2/7/96.

Note: Exposure hours and minutes are converted to a decimal equivalent:
Decimal Value = Hours + (Minutes past the hour / 60 minutes)

Table 3-4

**Hematology Results on Initial (I), Post-Exposure (PE), and Final Blood Samples from
Snow Geese Receiving *Ad Libitum* Exposure to Berkeley Pit Water for 31 Hours**

Group	Control Group				Treatment Group								
Bird # - Initial (I), Post-Exposure (PE), or Final (F)	9872-I	9876-I	9880-I	9884-I	9873-I	9877-I	9877-PE	9877-F	9881-I	9881-F	9885-I	9885-PE	9885-F
Draw Date	02/06/96	02/06/96	02/06/96	02/06/96	02/06/96	02/06/96	02/07/96	02/08/96	02/06/96	02/21/96	02/06/96	02/07/96	02/21/96
White Blood Count x 10 ³ uL	11.8	6.7	11.5 ¹	7.8	11.2 ²	6.7 ¹	4 ³	5.9 ⁴	6.8	8.4	5.8	5.4 ²	4.7
Heterophils x 10 ³ uL (% of total)	6.4 (54%)	3.7 (56%)	6.0 (52%)	4.6 (59%)	5.9 (53%)	4.4 (65%)	3.5 (88%)	3.4 (58%)	5.1 (73%)	4.4 (53%)	3.3 (60%)	4.3 (80%)	2.2 (46%)
Lymphocytes x 10 ³ uL (% of total)	4.4 (37%)	2.1 (32%)	4.1 (36%)	2.9 (37%)	4.0 (36%)	1.8 (27%)	0.4 (9%)	1.9 (32%)	1.2 (17%)	3.2 (38%)	1.7 (31%)	0.7 (13%)	2.2 (47%)
Monocytes x 10 ³ uL (% of total)	0.8 (7%)	0.7 (10%)	1.4 (12%)	0.2 (3%)	1.1 (10%)	0.3 (4%)	0.0 (1%)	0.3 (5%)	0.3 (5%)	0.3 (3%)	0.4 (7%)	0.2 (4%)	0.2 (5%)
Eosinophiles x 10 ³ uL (% of total)	—	—	—	—	—	—	—	—	0.1 (1%)	0.3 (3%)	—	0.2 (3%)	—
Basophiles x 10 ³ uL (% of total)	0.2 (2%)	0.1 (2%)	—	0.1 (1%)	0.1 (1%)	0.3 (4%)	0.1 (2%)	0.3 (5%)	0.3 (4%)	0.3 (3%)	0.1 (2%)	—	0.1 (2%)
Plasma Protein (g/dl)	5.7	5.7	6	6.2	6.9	6	4.9	3.9	5.7	5.4	6.7	5.3	5.7
PCV (%)	55	50	58	52	57	51	50	41	51	52	55	58	50
Hemopathology ⁵	C,A	C,A	C,A	C,A	C,A	C,A	C,A	C	C,A	C,A	C,A	C,A	C
Reticulocyte (%)	8.8	11.9	6.7	9.9	8	8.2	2.1		9.2	7.2	7.6	0.6	11.4

¹Thrombocytes and white blood cells clumped on smear, may affect differential results.

²White blood cell count and differential may be inaccurate due to WBC clumps on hemacytometer and smear.

³Clumps on hemacytometer, many smudge cells present.

⁴White blood cells clumped on smear.

⁵C = Clumped Thrombocytes, A = Adequate Thrombocytes.

Note: Only initial results are available for bird #9873 because the bird died early into the exposure period before a final sample could be taken.
Post-exposure hematology on treatment bird #9881 was unable to be conducted due to insufficient sample.

Table 3-5

**Clinical Chemistry Results on Initial (I), Post-Exposure (PE), and Final (F) Blood Samples from
Snow Geese Receiving *Ad Libitum* Exposure to Berkeley Pit Water for 31 Hours**

Group	Control Group				Treatment Group								
Bird # - Initial (I), Post-Exposure (PE), or Final (F)	9872-I ¹	9876-I ¹	9880-I ¹	9884-I ¹	9873-I ¹	9877-I ¹	9877-PE	9877-F ¹	9881-I ¹	9881-F ¹	9885-I	9885-PE	9885-F ¹
Draw Date	02/06/96	02/06/96	02/06/96	02/06/96	02/06/96	02/06/96	02/07/96	02/08/96	02/06/96	02/21/96	02/06/96	02/07/96	02/21/96
Glucose (mg/dl)	184	195	186	176	192	166	293	196	200	209	188	231	199
Uric Acid (mg/dl)	10.2	10.2	6.5	9.5	12.7	6.7	19.1	17.3	9	10.2	6.1	23.4	5.2
Creatine (mg/dl)	11.69	3.96	5.44	4.57	6.84	6.73	14.94	12.45	4.93	5.03	8.06	18.17	3.31
Total Protein(gm/dl)	4.8	4.8	5.2	5.4	5.9	5.4	4.2	3.3	5	4.4	5.7	3.5	5.1
Albumin (gm/dl)	2	2.2	2.1	2.2	2.3	2.3	2.2	1.5	2.2	1.7	2	1.3	1.8
Globulin (gm/dl)	2.8	2.6	3.1	3.2	3.6	3.1	2	1.8	2.8	2.7	3.7	2.2	3.3
A/G Ratio	0.7	0.8	0.7	0.7	0.6	0.7	1.1	0.8	0.8	0.6	0.5	0.6	0.5
Cholesterol (mg/dl)	242	390	307	366	393	315	240	218	328	282	431	272	275
CK (IU/l)	267	365	294	460	118	109	378	1897	198	330	190	4019	312
AST (IU/l)	23	21	12	18	17	9	41	73	27	41	27	52	23
ALP (IU/l)	123	144	114	111	167	263	152	284	150	293	196	113	169
Sodium (meq/l)	167	162	160	160	154	157	143	132	152	150	161	143	150
Potassium (meq/l)	3.8	2.7	2.9	2.7	2.2	2.5	3	1.4	2	3.2	3.3	2.4	2.2
Calcium (mg/dl)	11.7	11.9	10.9	11.2	11.5	11.2	10.3	10.3	10.4	10.1	12.2	11	11.3
Phosphorus (mg/dl)	10.5	8.6	5.9	5.8	5.2	8.8	5.6	3.2	4.6	6.4	6.4	10.1	3.6
Lipemia (mg/dl)	9	6	14	15	14	7	5	0	4	8	12	10	3
Hemolysis (mg/dl)	31	13	22	0	1	6	32	24	19	12	7	16	17
Icterus (mg/dl)	0	1	0	0	1	0	0	0	0	0	1	0	1

¹Plasma and heparin present.

Note: Only initial results are available for bird #9873 because the bird died early into the exposure period before a final sample could be taken.
Post-exposure clinical chemistry on treatment bird #9881 was unable to be conducted due to insufficient sample.

Table 3-6

Blood Gas Results on Initial (I), Post-Exposure (PE), and Final (F) Blood Samples from
Snow Geese Receiving *Ad Libitum* Exposure to Berkeley Pit Water for 31 Hours

Group	Control Group				Treatment Group								
Bird # - Initial (I), Post-Exposure (PE), or Final (F)	9872-I	9876-I	9880-I	9884-I	9873-I	9877-I	9877-PE	9881-I	9881-PE	9881-F	9885-I	9885-PE	9885-F
Draw Date	02/06/96	02/06/96	02/06/96	02/06/96	02/06/96	02/06/96	02/07/96	02/06/96	02/07/96	02/21/96	02/06/96	02/07/96	02/21/96
BarPressure (mmHG)	638	638	638	638	638	638	634	638	634	635	638	634	635
Hgb (G%)	19.3	14.1	20.1	18.5	19.8	17.1	15.9	18.1	16.4	17.6	19.4	20.2	16.8
pH	7.10	7.26	7.36	7.34	7.37	7.32	7.51	7.47	7.25	7.17	7.28	7.41	7.36
pCO ₂ (mmHG)	36.8	31.9	29.2	32.3	29.7	31.1	26.6	26	33.8	36.7	31.4	32.1	34.8
pO ₂ (mmHG)	41.6	39.2	43.4	38.9	46.7	37.7	24.9	40.6	41.7	46.2	41	42.4	37.7
HCO ₃ (mm/L)	11	13.9	16	17.3	16.7	15.6	21.2	18.8	14.5	12.8	14.5	19.9	19.5
ABE (mm/L)	-19.4	-12	-7.6	-7	-6.8	-9.1	-0.1	-2.6	-11.7	-15.6	-10.9	-3.2	-4.8
SAT (%)	57.4	64.7	76.6	69.9	80.7	66.2	53	79.6	68	68.5	69.1	78.3	69.4
O ₂ CT (Vol%)	15.5	12.9	21.6	18.1	22.3	15.8	11.8	20.2	15.7	16.9	18.7	22.1	16.4

Note: Only initial results are available for bird #9873 because the bird died early into the exposure period before a final sample could be taken.
Final blood gas on treatment bird #9877 was unable to be conducted due to insufficient sample.

Table 3-7

**Tissue Metals Concentrations in Snow Geese Receiving
Ad Libitum Exposure to Berkeley Pit Water for 31 Hours
(Dry Weight Analysis, ppm)**

Tissue	Group	Bird #	As	Cd	Cu	Fe	Pb	Mn	Hg	Se	Zn
Kidney	Control	9876	0.02	0.6	35.9	548	0.9	3.17	0.16	2.55	56.2
	Treatment	9873	<0.01	0.6	91.2	1170	<0.2	295	<0.01	2.48	294
		9877	<0.01	0.7	100	541	0.3	44.5	<0.01	2.69	470
		9881	0.22	0.4	18.8	470	1.1	6.94	0.04	2.76	84.9
		9885	0.05	1.4	15.6	658	0.9	5.28	0.05	2.25	70.1
Liver	Control	9876	0.02	0.4	90	992	0.6	13.8	0.06	2.30	108
	Treatment	9873	<0.01	1.0	352	4830	<0.2	63.6	<0.01	3.26	428
		9877	<0.01	2.1	541	712	1.5	22.3	0.04	4.39	638
		9881	0.04	0.3	26.4	144	0.5	11.2	0.11	1.79	67.5
		9885	0.03	1.9	178	678	0.6	14.7	0.08	4.87	135

4.0 *AD LIBITUM* ORAL TOXICITY TEST II

4.1 Scope

This study was conducted to determine if extended exposure to Berkeley Pit water would have toxic effects on snow geese. This study was conducted subsequent to an initial study of similar design in which insufficient sample was available and the study was terminated prematurely. Study dates were February 19 to February 21, 1996. Test procedures were designed after available guidance (ASTM 1993 and USEPA 1985); the protocol for this study is provided in Appendix A.

4.2 Test Samples

4.2.1 Sample Collection

Water samples used in this study were collected February 13, 1996 as grab samples from the Berkeley Pit in Butte, Montana. Samples were collected in three 5-gallon plastic cubitainers and were composited prior to testing.

4.2.2 Sample Storage

The samples were received at ENSR's Fort Collins Environmental Toxicology Laboratory on February 14, 1996. The samples were then transported to Genesis Laboratories in Wellington, Colorado, where they were received on February 19, 1996. Prior to and during testing, the water samples were maintained under refrigeration at approximately 4°C. The refrigerator temperature was monitored and recorded daily with a calibrated digital minimum-maximum thermometer.

4.3 Test Animals

Geese used in this study were obtained from control group geese not sacrificed during the previous two tests and from two extra geese not initially used for testing. The control group for this study consisted of three birds: bird #9876 from *Ad Libitum* Toxicity Test 1 control group and bird #'s 9874 and 9882 from Single Dose Oral Toxicity Test control group. The treatment group was also comprised of three birds: bird #9878 from Single Dose Oral Toxicity Test control group and bird #'s 9886 and 9888 (extra geese not yet used in testing).

The geese were individually housed in 61 x 76 x 46 cm (W x L x H) plastic coated wire pens which were suspended over metal collection pans. Individual cages were divided by wire mesh partitions. The geese were allowed to acclimate to the cages for a 10-day period prior to test initiation. The photoperiod was maintained on an 8-hour light, 16-hour dark cycle. Room temperature during testing ranged from 20 to 22°C; relative humidity ranged from 23 to 45% (Appendix B). Other housing and physical conditions are outlined in the enclosed protocol (Appendix A).

4.4 Test Procedures

Six geese were individually identified with uniquely numbered aluminum leg bands, and were placed randomly into cages (one goose per cage). The study consisted of a control group and treatment group, with three geese per group. No mortality was noted prior to test initiation, and any unsuitable birds (i.e., sick, injured, or deformed, etc.) were eliminated from the test.

Prior to and during the study, geese were fed a diet of 16% Protein Layer Feed Complete (Ranch-Way Feed Mill, Fort Collins, Colorado); a daily ration of assorted greens (e.g., lettuce, spinach) was provided to supplement the dry feed. Feed and water (treatment or control) were available *ad libitum* throughout the study.

Body weights were recorded for individual birds at test initiation, on day 7, and at test termination. Consumption of the diet and greens was measured daily during the study. Spillage was assumed to be proportional to consumption and was not measured. Water consumption was measured daily during the exposure period for treatment and control geese. Spillage was collected in pans beneath the trough and accounted for when calculating consumption.

All feed and water were removed from the geese approximately 48 hours prior to pit water exposure. At test initiation, geese were individually weighed and the test material was introduced. Treatment group birds had *ad libitum* exposure to the test substance for a period of three days. After this time, the treatment birds were provided municipal tap water. Negative control group geese received municipal tap water, *ad libitum*, throughout the exposure and subsequent observation period.

Blood samples were collected from all geese prior to fasting, immediately prior to dosing, and then collected again at test termination or immediately prior to death (blood sampling log is included as Appendix C). Blood samples were drawn from the jugular or wing veins using heparin-treated syringes. Approximately 2.5 cc was collected at each sampling. Blood samples were submitted to the Colorado State University Veterinary Diagnostic Laboratory for measurement of clinical parameters. Clinical parameters evaluated on all samples were as follows:

White Blood Count	Cholesterol	Icterus
Plasma Protein	Creatine Kinase (CK)	Barometric Pressure
Packed Cell Volume (PCV)	Aspartate Aminotransferase (AST)	Hemoglobin (Hgb)
Glucose	Alkaline Phosphatase (ALP)	pH
Uric Acid	Sodium	Carbon Dioxide Pressure (pCO ₂)
Creatine	Potassium	Oxygen Pressure (pO ₂)
Total Protein	Calcium	Bicarbonate (HCO ₃)
Albumin	Phosphorus	Actual Base Excess (ABE)

Globulin	Lipemia	Percent Oxygen Saturation (SAT)
Albumin/Globulin (A/G) Ratio	Hemolysis	Total Oxygen Content (O ₂ CT)

In addition to blood samples, urine samples were collected prior to fasting, immediately prior to the start of the exposure period, and at approximately 6 hour intervals thereafter until the test was terminated (urine collection log is provided in Appendix C). Samples were collected from clean metal bedding pans placed under each bird approximately 1 hour before each planned collection time. Samples were drawn into plastic disposable pipets, placed into plastic bags, and packed on wet ice or refrigerated until delivery to the Colorado State University Veterinary Diagnostic Laboratory. Urine samples were analyzed for n-acetylglucosamine (nag) and creatine concentrations.

Overt signs of toxicity and mortality were recorded hourly during the exposure period. At test termination, all control geese were sacrificed by decapitation and exsanguination.

Birds dying or sacrificed during the study or at test termination were necropsied and complete gross post-mortem examinations were performed. Gross examinations of the liver, bile, kidney, esophagus, trachea, adrenal glands, thymus, bursa, brain, lung, bone marrow, eye, skin, abdominal fat, heart, skeletal muscle, sciatic nerve, proventriculus, ventriculus, gastrointestinal tract, spleen, reproductive organs, glycogen body and all gross lesions were performed. Weights were measured on the heart, liver, kidney, and brain; tissues sampled from the liver and kidney were analyzed for copper, cadmium, lead, mercury, selenium, zinc, iron, arsenic, and manganese. The following tissues were taken for histopathological evaluation: adrenal gland, heart, sciatic nerve, brain, kidney, skeletal muscle, bursa, liver, skin, cloaca, lung/air sacs, spinal cord, eye, nasal turbinates, spleen, gall bladder, pancreas, trachea, gastrointestinal tract, preen gland, ureters, gross lesions, reproductive organs, web of foot, glycogen body, and salt gland.

4.5 Test Results

All three treatment group geese died or were sacrificed in a moribund condition during this study. These birds began showing clinical signs of toxicosis 3 to 8 hours after being introduced to the test substance and died within 21 hours of exposure (observations included in Appendix D). Necropsies, conducted by the Colorado State University Veterinary Diagnostic Laboratory, showed prominent lesions of the digestive system, kidneys, and skeletal and heart muscle in these birds.

Treatment group birds maintained their body weight or lost weight during the course of the study while control group birds gained weight (Table 4-1).

During the exposure period, feed consumption by the treatment group birds was considerably less than that in the control group (Table 4-2). During this same time, water consumption was comparable between the control and treatment groups with the exception of one treatment group bird (#9888). This bird consumed a considerably larger quantity of water compared to the other birds (Table 4-3).

Clinical chemistry results on blood samples showed final samples taken from all treatment birds on February 20, 1996 contained elevated levels of uric acid, creatine, CK, AST, potassium, and phosphorus when compared to pre-fasting and initial blood samples (Table 4-5). No other apparent differences in clinical chemistry blood parameters were observed between treatment and control birds during this study (Table 4-4 and 4-5). Clinical chemistry results on urine samples are inconclusive because many urine samples were not analyzed, due to technician error and/or insufficient sample volume. However, the final urine sample collected from bird #9888 showed an increased level of creatine when compared to initial samples.

When compared to the control group, kidney and liver tissue samples of treatment group birds contained somewhat elevated levels of copper, manganese, and zinc (Table 4-6). Bird #9888, which consumed copious amounts of the test substance, had the highest levels of copper in liver tissue, manganese in kidney tissue, and zinc in both tissues when compared to the other birds.

Post-mortem examinations of control group geese showed the geese to be in good body condition with no significant lesions found. Gross examination of the treatment group geese showed prominent lesions of the gastrointestinal tract in all three birds. There was yellowish discoloration to the oral mucosa. The esophageal mucosa was also yellow and contained a few areas of necrosis. The ventricular koilin layer was a dark green. The entire small intestines appeared to be dilated and filled with a gray watery mucoid material (mucoid enteritis). The large intestines were also dilated and filled with a black watery material. In addition to lesions in the gastrointestinal tract, yellow to gray discoloration of the trachea, larynx, and nasal orifices and mucosa was observed in the treatment group birds.

Histopathology conducted on control geese showed no specific lesions. In the treatment group, many significant lesions were observed in these birds; these can be found in detail in Appendix E. The more prominent lesions consisted of the following: esophagitis with some necrosis of the mucous glands and formation of blisters, tubular necrosis of the kidneys, rhinitis of the nasal turbinates, and lymphoid depletion with lympholysis of the lymphoid tissue of the esophageal proventricular junction and spleen.

Data for all necropsy, blood, urine, and tissue analyses are included as Appendix E.

4.6 Protocol Deviations

The following deviations from test protocol (Appendix A) occurred during this study:

- Dosing for this study was on February 19, 1996 rather than February 15, 1996.
- Because treatment group birds died within 21 hours after being exposed to the test substance, the test was terminated on February 20, 1996 and control group birds were sacrificed; therefore, a 14 day observation period was not conducted.
- Due to technician error and/or insufficient amount sample, analysis of many urine samples was not conducted.

- Due to technician error, organ weights were not measured in the control group birds. Because no comparisons could be made between the treatment and control group and, therefore, no conclusions could be made about the effect of the test substance on organ weights, these data were not included.

Table 4-1

**Body Weights of Snow Geese Receiving
Ad Libitum Exposure to Berkeley Pit Water for 3 Days**

Group	Bird #	Body Weight (g)			Percent Change Day 0- Death
		Pre-Fasting	Day 0	At Death	
Control	9874	1625	1550	1575	1.61
	9876	1600	1500	1550	3.33
	9882	1650	1550	1600	3.22
Treatment	9878	2025	1900	1900	0.00
	9886	1800	1725	1700	-1.45
	9888	2600	2325	2250	-3.23

Table 4-2

Hourly Feed Consumption of Snow Geese Receiving
Ad Libitum Exposure of Berkeley Pit Water for 3 Days

Group	Bird Number	Exposure Period (Hours) ¹	Consumption (g)		Grams/Bird/Hour	
			Diet	Greens	Diet	Greens
Control	9876	25.08	193.0	147	7.7	5.9
	9874	25.08	372.0	125	14.8	5.0
	9882	25.08	252.0	150	10.1	6.0
Treatment	9878	13.93	31.0	101	2.2	7.3
	9886	10.25	47.0	85	4.6	8.3
	9888	20.83	20.0	44	1.0	2.1

Exposure hours and minutes are converted to a decimal equivalent:
Decimal Value = Hours + (Minutes past the hour / 60 minutes)

Table 4-3

Hourly Water Consumption of Snow Geese Receiving
Ad Libitum Exposure of Berkeley Pit Water for 3 Days

Group	Bird Number	Exposure Period (Hours) ¹	Consumption (ml) ²	ml/Bird/Hour
Control	9876	25.08	800	31.9
	9874	25.08	1000	39.9
	9882	25.08	550	21.9
Treatment	9878	13.93	495	35.5
	9886	10.25	375	36.6
	9888	20.83	1580	75.9

¹ Exposure hours and minutes are converted to a decimal equivalent:
Decimal Value = Hours + (Minutes past the hour / 60 minutes)

² Spillage which was absorbed into the birds' plumage on the breast was not accounted for.

Table 4-4

**Clinical Chemistry Results on Pre-Fast (PF), Initial (I), and Final (F) Blood Samples from Snow Geese
Receiving *Ad Libitum* Exposure to Berkeley Pit Water for 3 Days (Control Group)**

Bird # - Pre-fast (PF), Initial (I), and Final (F)		9874-PF	9874-I	9874-F ¹	9876-PF	9876-I	9876-F ¹	9882-PF	9882-I	9882-F ¹
Draw Date		02/15/96	02/19/96	02/20/96	02/15/96	02/19/96	02/20/96	02/15/96	02/19/96	02/20/96
White Blood Count	x 10-3 uL	5 ²	9.3	6.3	10.2	3.8	5	12.5	5.8 ³	7
Heterophils	x 10-3 uL (% of total)	3.2 (63%)	3.3 (36%)	4.2 (66%)	4.4 (43%)	2.1 (55%)	2.7 (53%)	6.2 (50%)	3.8 (65%)	5.2 (75%)
Lymphocytes	x 10-3 uL (% of total)	1.5 (30%)	5.0 (54%)	1.7 (27%)	5.2 (51%)	1.5 (40%)	2.0 (40%)	4.5 (36%)	2.0 (35%)	1.7 (24%)
Monocytes	x 10-3 uL (% of total)	0.3 (6%)	0.6 (6%)	0.3 (4%)	0.2 (2%)	0.1 (2%)	0.2 (3%)	1.5 (12%)	—	0.1 (1%)
Eosinophiles	x 10-3 uL (% of total)	—	—	—	0.1 (1%)	0.0 (1%)	—	—	—	—
Basophiles	x 10-3 uL (% of total)	0.1 (1%)	0.4 (4%)	0.2 (3%)	0.3 (3%)	0.1 (2%)	0.2 (4%)	0.2 (2%)	—	—
Plasma Protein	g/dl	5.6	6.1	4.6	5.3	5.8	4.6	5.1	4.4	4.2
PCV	%	50	54	46	43	48	42	47	44	42
Hemopathology ⁴		C,A	C,A	C,A	C,A	C	C,A	C,A	—	C,A
Reticulocyte	%	6.4	10	9.3	6	13.4	8.9	7.4	9.3	7
Glucose	mg/dl	199	224	187	181	187	226	172	155	205
Uric Acid	mg/dl	6.5	8	3.8	8.1	5.6	6	5	6.2	4.6
Creatine	mg/dl	2.06	8.24	3.85	1.52	5.87	3.98	3.69	6.62	2.07
Total Protein	gm/dl	4.9	6	4	4.6	4.8	4	4.5	3.6	3.6
Albumin	gm/dl	2.1	2	2	2	2.1	1.9	1.8	2	1.7
Globulin	gm/dl	2.8	4	2	2.6	2.7	2.1	2.7	1.6	1.9
A/G Ratio	ratio	0.7	0.5	1	0.8	0.8	0.9	0.7	1.3	0.9
Cholesterol	mg/dl	295	416	219	236	339	233	228	255	191
CK	IU/l	576	508	4392	204	210	201	291	444	427
AST	IU/l	30	52	128	16	28	29	15	28	21
ALP	IU/l	229	144	117	257	183	175	159	150	203
Sodium	meq/l	154	144	151	157	161	148	150	161	148
Potassium	meq/l	1.6	3.2	2.2	1.8	2.2	2	2.2	2.2	2.1
Calcium	mg/dl	10.6	10.8	9.5	10.1	10.6	8.8	10.3	8.3	8.7
Phosphorus	mg/dl	3.1	5.2	2.7	2.6	5.2	3.3	3.3	4.7	4.1
Lipemia	mg/dl	0	0	2	0	0	7	13	0	4
Hemolysis	mg/dl	59	67	15	41	60	9	50	70	35
Icterus	mg/dl	2	1	1	2	1	1	1	1	1

¹Plasma and heparin present.

²Moderate sized clot in sample; white cells clumped on smear.

³White blood cells clumped on hemacytometer, count may not be accurate.

⁴C = Clumped Thrombocytes, A = Adequate Thrombocytes

Table 4-4 (continued)

**Clinical Chemistry Results on Pre-Fast (PF), Initial (I), and Final (F) Blood Samples from Snow Geese
Receiving *Ad Libitum* Exposure to Berkeley Pit Water for 3 Days (Control Group)**

Bird # - Pre-fast (PF), Initial (I), and Final (F)		9874-PF	9874-I	9874-F	9876-PF	9876-I	9876-F	9882-PF	9882-I	9882-F
Draw Date		02/15/96	02/19/96	02/20/96	02/15/96	02/19/96	02/20/96	02/15/96	02/19/96	02/20/96
Temperature	°C	—	—	37	—	—	37	—	—	37
Bar. Pressure	mmHG	642	628	632	641	628	632	641	628	632
Hgb	G%	17.5	18.4	16.3	15.4	17.4	14.7	16.6	16.8	15.3
pH	units	7.24	7.15	7.32	7.33	7.32	7.56	7.33	7.31	7.33
pCO ₂	mmHG	30.4	48.3	33.2	19.8	25.7	18.5	37.8	25.5	27
pO ₂	mmHG	51.6	15.7	42.7	53.8	43	39.7	36.8	44.1	52.1
HCO ₃	mm/L	12.5	16	16.6	10.3	12.9	16.7	19.3	12.5	13.9
ABE	mm/L	-13.9	-13.6	-8.3	-13.7	-11.4	-3.1	-5.9	-12	-10.4
SAT	%	78.6	12.7	73.6	85	74	83	65.3	74.8	83.5
O ₂ CT	Vol%	19.2	3.3	16.8	18.4	18	17.1	15.2	17.6	18

Table 4-5

**Clinical Chemistry Results on Pre-Fast (PF), Initial (I), and Final (F) Blood Samples from Snow Geese
Receiving *Ad Libitum* Exposure to Berkeley Pit Water for 3 Days (Treatment Group)**

Bird # - Pre-fast (PF), Initial (I), and Final (F)		9878-PF	9878-I	9878-F ¹	9886-PF	9886-I	9886-F ¹	9888-PF	9888-I	9888-F ¹	9888-F ¹
Draw Date		02/15/96	02/19/96	02/20/96	02/15/96	02/19/96	02/20/96	02/15/96	02/19/96	02/20/96@0115	02/20/96@0810
White Blood Count	x 10 ⁻³ uL	9.7 ²	6.3 ³	13 ⁴	9.7	10.1	11.4 ^{3,4}	9.4	11.5	6.2 ⁴	6.4 ⁴
Heterophils	x 10 ⁻³ uL (% of total)	4.5 (46%)	3.0 (47%)	10.5 (81%)	4.4 (45%)	4.2 (41%)	9.8 (86%)	4.2 (45%)	8.0 (69%)	5.5 (89%)	5.7 (89%)
Lymphocytes	x 10 ⁻³ uL (% of total)	4.8 (49%)	2.9 (46%)	1.7 (13%)	4.3 (44%)	5.3 (52%)	1.5 (13%)	4.8 (51%)	2.9 (25%)	0.5 (8%)	0.4 (6%)
Monocytes	x 10 ⁻³ uL (% of total)	0.3 (3%)	0.3 (4%)	—	1.1 (11%)	0.5 (5%)	0.1 (1%)	0.3 (3%)	0.3 (3%)	0.1 (1%)	0.1 (2%)
Eosinophiles	x 10 ⁻³ uL (% of total)	—	0.1 (1%)	—	—	—	—	—	—	—	—
Basophiles	x 10 ⁻³ uL (% of total)	0.2 (2%)	0.1 (2%)	0.8 (6%)	—	0.2 (2%)	—	0.1 (1%)	0.3 (3%)	0.1 (2%)	0.2 (3%)
Plasma Protein	g/dl	6.2	5.5	6.2	4.4	4.4	5	5	5.2	5.5	5.3
PCV	%	50	51	63	42	43	67	42	40	52	52
Hemopathology ⁵		C,A	C	C	C,A	C	C	C,A	C,A	C,A	C,A
Reticulocyte	%	7.3	8	13.4	6.7	7	7.4	7.9	10.7	9.8	9.2
Glucose	mg/dl	174	205	128	234	174	0	183	194	159	146
Uric Acid	mg/dl	8.7	7.7	15.9	5.4	4.3	43.1	8.1	6.3	50.6	105
Creatine	mg/dl	2.56	7.52	17.29	3.27	1.81	2.45	3.63	5.3	17.84	28.88
Total Protein	gm/dl	5.3	4.8	4.9	3.8	3.7	QNS	4.2	4.6	3.8	3.7
Albumin	gm/dl	2.5	2.1	2.9	1.6	1.7	QNS	1.6	2.7	2.4	2.3
Globulin	gm/dl	2.8	2.7	2	2.2	2	QNS	2.6	1.9	1.4	1.4
A/G Ratio	ratio	0.9	0.8	1.5	0.7	0.9	QNS	0.6	1.4	1.7	1.6
Cholesterol	mg/dl	237	265	241	203	265	QNS	246	266	224	201
CK	IU/l	327	252	4635	237	431	7119	421	667	6570	16307
AST	IU/l	17	15	161	13	24	320	23	24	151	283
ALP	IU/l	212	139	163	177	111	—	297	390	383	326
Sodium	meq/l	154	156	164	150	157	154	148	152	140	136
Potassium	meq/l	2.1	1.7	5.1	2.1	2.8	13.4	1.9	3.8	3.5	6.1
Calcium	mg/dl	11.5	10.8	12.7	9.1	9.4	—	10.2	9.9	9.4	11
Phosphorus	mg/dl	5.1	3.7	24.2	2.5	3.6	18.3	5.7	4.6	10.3	13.1
Lipemia	mg/dl	10	0	1	1	0	QNS	11	8	2	5
Hemolysis	mg/dl	63	39	106	26	67	QNS	54	194	30	22
Icterus	mg/dl	1	1	0	1	1	QNS	1	0	0	0

¹Plasma and heparin present.²Small sized clot in sample.³White blood cells clumped on hemacytometer, count may not be accurate.⁴Grossly hemolyzed.⁵C = Clumped Thrombocytes, A = Adequate Thrombocytes

QNS = Quantitatively not sufficient

Table 4-5 (continued)

**Clinical Chemistry Results on Pre-Fast (PF), Initial (I), and Final (F) Blood Samples from Snow Geese
Receiving *Ad Libitum* Exposure to Berkeley Pit Water for 3 Days (Treatment Group)**

Bird # - Pre-fast (PF), Initial (I), and Final (F)		9878-PF	9878-I	9878-F	9886-PF	9886-I	9886-F ¹	9888-PF	9888-I	9888-F	9888-F
Draw Date		02/15/96	02/19/96	02/20/96	02/15/96	02/19/96	02/20/96	02/15/96	02/19/96	02/20/96 @ 0115	02/20/96 @ 0810
VENOUS BLOOD											
Bar Pressure	mmHG	641	628	631	641	628	631	641	628	631	631
Hgb	G%	16.9	18.2	19.4	14.9	16.2	20.4	16	14.4	13.6	3
pH		7.23	7.30	6.98	7.41	7.42	7.12	7.32	7.39	7.47	7.47
pCO ₂	mmHG	32.9	28.2	47.4	30.1	29	54.7	30.1	29.2	25.3	21.3
pO ₂	mmHG	40.1	47.9	16.5	44.2	27.4	8.1	46.3	46.1	30.4	11.2
HCO ₃	mm/L	13.4	13.6	10.6	19	18.7	16.9	15.3	17.4	18.2	15.4
ABE	mm/L	-13.1	-11.2	-23.9	-4.1	-4.1	-14.5	-9.2	-6.1	-3.8	-8.2
SAT	%	64.3	78.6	10.1	80.6	52.9	3.9	78.2	81.3	63	13.2
O ₂ CT	Vol%	15.2	20	2.8	16.9	12	1.1	17.6	16.4	12	0.6
HEART BLOOD											
Bar Pressure	mmHG			631			631				
Hgb	G%			22.3			20.1				
pH				6.93			7.13				
pCO ₂	mmHG			39.4			54.9				
pO ₂	mmHG			42.7			0				
HCO ₃	mm/L			7.8			17.3				
ABE	mm/L			NV			-13.8				
SAT	%			46.6			0				
O ₂ CT	Vol%			14.6			0				
HEART											
Bar Pressure	mmHG			631			631				
Hgb	G%			22.3			19.8				
pH				6.84			6.95				
pCO ₂	mmHG			50.3			67.7				
pO ₂	mmHG			48.9			34.2				
HCO ₃	mm/L			7.9			14				
ABE	mm/L			NV			-22.8				
SAT	%			48.4			34.3				
O ₂ CT	Vol%			15.1			9.6				

¹Data not labeled as venous, heart blood, or heart.

NV = No Value,

Table 4-6

**Clinical Chemistry Results on Urine Samples from Snow Geese Receiving
Ad Libitum Exposure to Berkeley Pit Water for 3 Days**

Bird Number	Group	Sample Date	Sample Time	n-acetylglucosamine (IU/L)	Creatine (mg/dL)
9874	Control	02/15/96	pre	8.2	17.64
		02/19/96	11:00	NV	NV
		02/19/96	18:00	2.8	26.74
		02/19/96	24:00	NV	NV
		02/20/96	06:30	2.1	21.63
		02/20/96	11:30	NV	NV
9876	Control	02/15/96	pre	12.2	11.87
		02/19/96	11:00	NV	NV
		02/19/96	18:00	17.6	11.29
		02/19/96	24:00	NV	NV
		02/20/96	12:00	5.3	85.1
		02/20/96	06:30	1.1	22.58
9882	Control	02/15/96	06:00	7.4	150.82
		02/19/96	11:00	NV	NV
		02/19/96	18:00	NV	NV
		02/19/96	24:00	NV	NV
		02/20/96	12:00	0.4	3.68
		02/20/96	06:30	0.8	24.47
9878	Treatment	02/15/96	pre	15.5	14.93
		02/19/96	11:00	NV	NV
		02/19/96	18:00	NV	NV
		02/19/96	24:00	NV	NV
9886	Treatment	02/15/96	pre	11.9	167.89
		02/19/96	11:00	NV	NV
		02/19/96	18:00	3.6	8.56
		02/19/96	22:00	NV	NV
9888	Treatment	02/15/96	pre	20.6	60.84
		02/19/96	11:00	NV	NV
		02/19/96	18:00	11.5	188.18
		02/19/96	24:00	NV	NV
		02/20/96	06:30	14.1	327.13

NV = No Value (due to insufficient sample and/or technician error)

Table 4-7

**Tissue Metals Concentrations in Snow Geese Receiving
Ad Libitum Exposure to Berkeley Pit Water for 3 Days
(Dry Weight Analysis, ppm)**

Tlssue	Group	Blrđ #	As	Cd	Cu	Fe	Pb	Mn	Hg	Se	Zn
Kidney	Control	9874	0.02	0.5	19.0	577	2.0	4.06	0.55	1.48	67.7
		9876	0.02	0.6	35.9	548	0.9	3.17	0.16	2.55	56.2
		9882	0.04	0.9	10.9	641	2.2	5.04	0.06	3.08	67.8
	Treatment	9878	0.05	0.5	62.5	720	0.9	31.2	0.08	1.83	138
		9886	0.02	0.8	38.4	604	83.0	165	0.29	2.59	175
		9888	0.47	0.8	64.6	578	1.1	371	0.04	1.94	303
Liver	Control	9874	<0.01	0.3	81	983	0.7	12.2	0.12	3.50	117
		9876	0.02	0.4	90	992	0.6	13.8	0.06	2.30	108
		9882	0.02	0.5	113	635	0.6	10.6	0.11	4.32	106
	Treatment	9878	0.10	0.5	160	926	0.8	38.8	0.18	3.01	300
		9886	0.05	1.2	135	779	1.0	62.3	0.15	3.12	146
		9888	0.05	1.9	442	948	0.6	67.3	0.15	2.94	344

5.0 *AD LIBITUM* ORAL TOXICITY TEST III

5.1 Scope

This study was conducted to determine the toxic effects of Berkeley Pit water to snow geese that were not fasted and had 24 hours of exposure to the pit water; this test builds on previous studies in which birds were fasted and were exposed to the pit water for longer periods of time. Study dates were March 4 to March 18, 1996. Test procedures were designed after available guidance (ASTM 1993 and USEPA 1985); the protocol for this study is provided in Appendix A.

5.2 Test Samples

5.2.1 Sample Collection

Water samples used in this study were collected February 13, 1996 as grab samples from the Berkeley Pit in Butte, Montana. Samples were collected in three 5-gallon plastic cubitainers and were composited prior to testing.

5.2.2 Sample Storage

The samples were received at ENSR Consulting and Engineering's Fort Collins Environmental Toxicology Laboratory on February 14, 1996. The samples were then transported to Genesis Laboratories in Wellington, Colorado, where they were received on February 19, 1996. Prior to and during testing, the water samples were maintained under refrigeration at approximately 4°C. The refrigerator temperature was monitored and recorded daily with a calibrated digital minimum-maximum thermometer.

5.3 Test Animals

Geese used in this study were obtained from control group geese not sacrificed during the previous tests. Bird #'s 9884, 9872, and 9880 were obtained from *Ad Libitum* Toxicity Test 1 control group and bird #9870 was obtained from Single Dose Oral Toxicity Test control group.

The geese were individually housed in 61 x 76 x 46 cm (W x L x H) plastic coated wire pens which were suspended over metal collection pans. Individual cages were divided by wire mesh partitions. The geese were allowed to acclimate to the cages for a 10-day period prior to test initiation. The photoperiod was maintained on an 8-hour light, 16-hour dark cycle. Room temperature during testing ranged from 19 to 24°C; relative humidity ranged from 12 to 34% (Appendix B). Other housing and physical conditions are outlined in the enclosed protocol (Appendix A).

5.4 Test Procedures

Four geese were individually identified with uniquely numbered aluminum leg bands, and were placed randomly into cages (one goose per cage). The study consisted of a treatment group only. No mortality was noted prior to test initiation, and any unsuitable birds (i.e., sick, injured, or deformed, etc.) were eliminated from the test.

Prior to and during the study, geese were fed a diet of 16% Protein Layer Feed Complete (Ranch-Way Feed Mill, Fort Collins, Colorado); a daily ration of assorted greens (e.g., lettuce, spinach) was provided to supplement the dry feed. Feed and water (treatment or control) were available *ad libitum* throughout the study. Birds were not fasted prior to or during this study.

Body weights were recorded for individual birds at test initiation, on day 7, and at test termination. Consumption of the diet and greens was measured daily during the study. Spillage was assumed to be proportional to consumption and was not measured. Water consumption was measured during the exposure period. Spillage was collected in pans beneath the trough and accounted for when calculating consumption.

At test initiation, geese were individually weighed and the test material was introduced. Treatment group birds had *ad libitum* exposure to the test substance for a 24-hour period. After this time, Berkeley Pit water was replaced with municipal tap water; birds were provided access to this water throughout the remainder of the study.

Blood samples were collected from all geese immediately prior to dosing, following the exposure period, and then again at test termination or immediately prior to death (blood collection log is provided in Appendix C). Blood samples were drawn from the jugular or wing veins using heparin-treated syringes. Approximately 2.5 cc was collected at each sampling. Blood samples were submitted to the Colorado State University Veterinary Diagnostic Laboratory for measurement of clinical parameters. Clinical parameters evaluated on all samples were as follows:

White Blood Count	Creatine Kinase (CK)	Icterus
Plasma Protein	Aspartate Aminotransferase (AST)	Barometric Pressure
Packed Cell Volume (PCV)	Alanine Aminotransferase (ALT)	Hemoglobin (Hgb)
Glucose	Alkaline Phosphatase (ALP)	pH
Uric Acid	Sodium	Carbon Dioxide Pressure (pCO ₂)
Creatine	Potassium	Oxygen Pressure (pO ₂)
Total Protein	Calcium	Bicarbonate (HCO ₃)
Albumin	Phosphorus	Actual Base Excess (ABE)
Globulin	Lipemia	Percent Oxygen Saturation (SAT)

Albumin/Globulin (A/G) Ratio	Hemolysis	Total Oxygen Content (O ₂ CT)
Cholesterol		

Overt signs of toxicity and mortality were recorded hourly during the exposure period. At test termination, all surviving geese were sacrificed by decapitation and exsanguination.

Birds dying or sacrificed during the study or at test termination were necropsied and complete gross post-mortem examinations were performed. Gross examinations of the liver, bile, kidney, esophagus, trachea, adrenal glands, thymus, bursa, brain, lung, bone marrow, eye, skin, abdominal fat, heart, skeletal muscle, sciatic nerve, proventriculus, ventriculus, gastrointestinal tract, spleen, reproductive organs, glycogen body and all gross lesions were performed. Weights were measured on the heart, liver, kidney, and brain; tissues sampled from the liver and kidney were analyzed for copper, cadmium, lead, mercury, selenium, zinc, iron, arsenic, and manganese. The following tissues were taken for histopathological evaluation: adrenal gland, heart, sciatic nerve, brain, kidney, skeletal muscle, bursa, liver, skin, cloaca, lung/air sacs, spinal cord, eye, nasal turbinates, spleen, gall bladder, pancreas, trachea, gastrointestinal tract, preen gland, ureters, gross lesions, reproductive organs, web of foot, glycogen body, and salt gland.

5.5 Test Results

One treatment group goose died approximately 18 hours into the exposure period; clinical signs of toxicosis were observed approximately 3 hours after introduction of the test substance. The necropsy, conducted by the Colorado State University Veterinary Diagnostic Laboratory, showed multiple lesions of the digestive system, including pancreas and kidneys.

The three surviving geese appeared healthy throughout the observation period, only occasionally showing mild signs of toxicity (shivering; see Appendix D). All surviving birds gained weight by test termination; the amount of weight gained varied widely among birds (Table 5-1).

Feed consumption by the treatment group birds appeared to be very slight during the exposure period, but increased once the birds were removed from the test substance (Table 5-2). During this same time, water consumption was comparable between geese with the exception of the one treatment group bird (#9884) which died. This bird consumed a considerably larger quantity of water compared to the other birds (Table 5-3).

Clinical chemistry results on blood samples showed final samples taken from bird #9884 on March 5, 1996 contained elevated levels of uric acid, creatine, CK, AST, ALT, phosphorus, and potassium when compared to initial blood samples and when compared to the surviving birds (Table 5-4). Post-exposure blood samples taken from bird #9872 showed a slightly elevated level of CK; this value decreased by test termination. No other apparent differences in clinical chemistry blood parameters were observed between treatment birds during this study.

When compared to the surviving birds, kidney and liver tissue samples of bird #9884 contained somewhat elevated levels of copper, manganese, and zinc (Table 5-5).

Post-mortem examinations of the three surviving geese showed the geese to be in good body condition with no significant lesions found. Gross examination of bird #9884 showed severe yellow discoloration of the esophagus, pharynx, and focal areas within the nasal mucosal tissues. The small intestines contained an excessive amount of mucus and water. The cecal contents were black and watery, and had a foul odor.

Histopathology conducted on the surviving geese showed little or no significant lesions. In bird #9870 mild adenitis was observed in the mucous glands of distal esophagus; minimal tubular degeneration of the kidneys occurred in bird #9872; no specific lesions were found in bird #9880.

In bird #9884, histopathology showed severe necrosis of the mucous glands of esophagus, of the mucosal layer of proventriculus, and of the trachea. Mild necrosis of the pancreas was observed. Other significant lesions observed in this bird are provided in Appendix E and included myopathy with necrosis in the smooth muscle of the ventriculus, tubular necrosis of the kidney, and lymphoid necrosis of the spleen.

Data for all necropsy, blood, urine, and tissue analyses are included as Appendix E.

5.6 Protocol Deviations

The following deviations from test protocol (Appendix D) occurred during this study:

- Relative humidity in the testing room ranged from 11 to 34% rather than $55 \pm 35\%$.
- Final hematology and blood gas analyses on bird #9884 could not be conducted due to insufficient sample.
- Due to technician error, organ weights were not measured on bird #9884. Because organ weights were not obtained from all birds in this study, these data were not included.

Table 5-1

Body Weights of Snow Geese Receiving
Ad Libitum Exposure to Berkeley Pit Water for 24 Hours

Bird #	Body Weight (g)			Percent Change
	Day 0	Day 7	Day 14 (or At Death)	Day 0-14 (or Day 0-Death)
9884	2350	*	2265	-3.62
9872	1950	1935	1957	0.36
9870	2025	2152	2240	10.62
9880	2200	2248	2341	6.41

*Bird died prior to this time.

Table 5-2

**Daily Feed Consumption of Snow Geese Receiving
Ad Libitum Exposure of Berkeley Pit Water for 24 Hours**

DAY	Diet (g)				Greens ¹ (g)			
	9884	9872	9870	9880	9884	9872	9870	9880
1	12	18	26	79	67	55	102	150
2	-	27	47	111	-	68	62	150
3	-	90	100	210	-	57	58	150
4	-	94	131	185	-	67	49	150
5	-	160	152	299	-	90	80	150
6	-	130	180	290	-	70	60	150
7	-	275	167	102	-	100	70	150
8	-	48	102	177	-	103	51	150
9	-	109	130	146	-	127	50	150
10	-	164	146	166	-	140	98	150
11	-	162	147	243	-	137	85	150
12	-	158	142	184	-	132	56	150
13	-	185	193	163	-	129	68	150
14	-	204	198	213	-	150	116	150

¹Possible moisture loss of un-consumed greens was not determined.

Table 5-3

Hourly Water Consumption of Snow Geese Receiving
Ad Libitum Exposure of Berkeley Pit Water for 24 Hours

Bird Number	Total Consumption (ml)	Total Time Exposed (Hours)	ml/Bird/Hour
9884	950 ¹	18.00	52.8
9872	150	24.00	6.3
9870	250	24.00	10.4
9880	100	24.00	4.2

¹ Spillage also occurred down the birds' neck and onto it's plumage which was not accounted for in this calculation.

Table 5-4

**Clinical Chemistry Results on Initial (I), Post-Exposure (PE), and Final (F) Blood Samples Collected from
Snow Geese Receiving *Ad Libitum* Exposure of Berkeley Pit Water for 24 Hours**

Bird # - Initial (I), Post-Exposure (PE), or Final (F)		9870-I	9870-PE	9870-F	9872-I	9872-PE	9872-F	9880-I	9880-PE	9880-F	9884-I	9884-F
Draw Date		03/04/96	03/05/96	03/18/96	03/04/96	03/05/96	03/18/96	03/04/96	03/05/96	03/18/96	03/04/96	03/05/96
White Blood Count	x 10 ³ uL	7.2	14.7	4.6 ¹	14.6	14.8 ²	6.3 ¹	8.7 ³	10.5	— ⁴	14.3	—
Heterophils	x 10 ³ uL (% of total)	3.0 (42%)	7.5 (36%)	3.2 (71%)	7.7 (53%)	7.0 (47%)	4.0 (64%)	6.5 (75%)	5.9 (56%)	62%	5.6 (39%)	—
Lymphocytes	x 10 ³ uL (% of total)	3.2 (44%)	5.1 (35%)	1.0 (23%)	5.8 (40%)	6.5 (44%)	1.8 (29%)	1.4 (16%)	3.5 (33%)	25%	6.3 (44%)	—
Monocytes	x 10 ³ uL (% of total)	0.9 (12%)	1.8 (12%)	0.1 (3%)	1.0 (7%)	1.2 (8%)	0.4 (6%)	0.3 (4%)	0.9 (9%)	7%	1.7 (12%)	—
Eosinophiles	x 10 ³ uL (% of total)	0.1 (1%)	0.1 (1%)	—	—	—	—	—	0.1 (1%)	—	0.1 (1%)	—
Basophiles	x 10 ³ uL (% of total)	0.1 (1%)	0.1 (1%)	0.1 (3%)	—	0.1 (1%)	0.1 (1%)	0.4 (5%)	0.1 (1%)	6%	0.6 (4%)	—
Plasma Protein	g/dl	4.8	4.3	4.8	5.7	5.3	5	5.7	5	4.3	5.9	—
PCV	%	45	42	47	50	47	50	52	50	47	47	—
Hemopathology ²		C,A	C,A	C,A	C,A	C,A	C,A	C	C,A	C,A	C	—
Reticulocyte	%	6.4	10.6	4.7	5.8	7.3	4.1	1.6	8.5	3.9	5.2	—
Glucose	mg/dl	224	260	216	156	215	256	155	202	208	240	2
Uric Acid	mg/dl	7.4	5.3	3.9	6.9	10.2	5.6	6	4.8	6.6	5.7	69.6
Creatine	mg/dl	1.68	5.04	2.97	3.24	11.78	4.68	2.21	1.44	3.5	2.68	50.17
Total Protein	gm/dl	4.1	3.6	4.2	4.9	4.6	4.4	5	4.2	3.7	5	5.2
Albumin	gm/dl	1.9	1.8	2	2.4	2.5	2	2.3	2	1.6	2.1	2.5
Globulin	gm/dl	2.2	1.8	2.2	2.5	2.1	2.4	2.7	2.2	2.1	2.9	2.7
A/G Ratio	ratio	0.9	1	0.9	1	1.2	0.8	0.9	0.9	0.8	0.7	0.9
Cholesterol	mg/dl	178	175	156	210	212	179	219	232	168	277	291
CK	IU/l	300	323	1	408	2686	997	343	400	270	291	30038
AST	IU/l	23	23	37	23	57	51	32	20	25	11	1611
ALT	IU/l	8	8	0	9	25	6	10	8	5	11	157
ALP	IU/l	231	155	202	183	111	147	194	143	142	176	99
Sodium	meq/l	152	151	151	157	160	149	151	156	149	150	113
Potassium	meq/l	2.1	2.2	2.1	2.3	2.8	1.9	2	2	2.1	2.1	32.4
Calcium	mg/dl	9.4	9.2	9.3	10.9	11.1	10.2	10.3	9.8	8.8	10.1	9.7
Phosphorus	mg/dl	1.4	2.4	2.2	3.4	10.3	1.4	2.4	3.5	0.3	3.5	39.6
Lipemia	mg/dl	21	9	18	28	16	17	21	7	15	5	30
Hemolysis	mg/dl	90	38	31	126	216	12	248	63	3	31	516
Icterus	mg/dl	0	0	0	0	0	0	0	0	0	0	0

¹White blood cells clumped on hemacytometer, count may not be accurate.

²Moderately hemolyzed ooc. WBC clumps on smear.

³Clot in tube.

⁴Unable to perform WBC count due to large clumps on hemacytometer.

⁵C = Clumped Thrombocytes; A = Adequate Thrombocytes.

Table 5-4 (continued)

**Clinical Chemistry Results on Initial (I), Post-Exposure (PE), and Final (F) Blood Samples Collected from
Snow Geese Receiving *Ad Libitum* Exposure of Berkeley Pit Water for 24 Hours**

Bird # - Initial (I), Post-Exposure (PE), or Final (F)		9870-I	9870-PE	9870-F	9872-I	9872-PE	9872-F	9880-I	9880-PE	9880-F	9884-I	9884-F
Draw Date		03/04/96	03/05/96	03/18/96	03/04/96	03/05/96	03/18/96	03/04/96	03/05/96	03/18/96	03/04/96	03/05/96
Temperature	°C	—	—	37	—	—	37	—	—	37	—	—
Bar Pressure	mmHG	631	628	641	631	628	641	631	628	641	631	—
Hgb	G%	15.9	14.8	16.3	17.5	17	17.9	18.8	18.1	17.2	16.7	—
pH		7.35	7.37	7.34	7.21	7.06	7.50	7.41	7.40	7.67	7.34	—
pCO ₂	mmHG	32.9	26.6	36.2	36.1	31.9	25.3	24.6	21.3	16.2	32.5	—
pO ₂	mmHG	49.3	49.6	37.2	50.6	60.4	49.1	51.5	55.2	38.2	46.2	—
HCO ₃	mm/L	17.9	15.1	19.2	14	8.7	19.8	15.4	13.1	18.8	17	—
ABE	mm/L	-6.4	-8.4	-5.6	-13.3	-22	-1.1	-6.9	-9.2	1.4	-7.4	—
SAT	%	82.4	83.4	67	76.4	77.1	88.2	86.4	88.3	85.9	78.7	—
Q _{CT}	Vol%	18.4	17.3	15.3	18.7	18.4	22	22.8	22.4	20.6	18.4	—

Note: Complete clinical chemistry results not available for bird #9884 due to insufficient sample.

Table 5-5

**Tissue Metals Concentrations in Snow Geese Receiving
Ad Libitum Exposure to Berkeley Pit Water for 24 Hours
(Dry Weight Analysis, ppm)**

Bird #	Tissue	As	Cd	Cu	Fe	Pb	Mn	Hg	Se	Zn
9880	Kidney	1.16	0.6	43.7	827	0.7	6.38	<0.01	4.03	84.4
9884	Kidney	0.18	0.5	65.5	659	0.9	325	0.05	1.96	200
9872	Kidney	<0.01	0.7	31.0	769	0.7	6.94	0.04	3.21	81.0
9870	Kidney	0.02	0.3	24.6	738	0.9	7.60	0.02	2.78	64.9
9880	Liver	0.03	0.2	73.7	325	0.4	7.67	0.05	3.96	74.0
9884	Liver	0.02	0.9	291	1630	0.4	74.6	<0.01	3.37	202
9872	Liver	0.02	0.2	84.9	792	0.5	7.16	0.09	2.75	78.3
9870	Liver	0.01	0.1	94.7	302	0.3	6.73	0.08	2.42	59.4

6.0 REFERENCES

- ASTM. 1993. Standard Guide for Conducting Subacute Dietary Toxicity Tests with Avian Species. E857-87(1993). Annual Book of ASTM Standards, Volume 11.04, Section 11, Water and Environment Technology.
- USEPA. 1985. Avian Single Dose Oral LD₅₀ and Avian Dietary LC₅₀ Test. Hazard Evaluation Division. Standard Evaluation Procedure. EPA-540/9-85-007 and 008. June 1985.

APPENDIX A
PROTOCOLS

SNOW GOOSE ORAL TOXICITY
TEST PROTOCOL

January 1996
Page 1 of 8

TITLE: Avian Acute Oral Toxicity Test

PURPOSE: This study is designed to evaluate the toxicity of a water sample collected from the Berkeley Pit, Butte, Montana, when given as a single oral dose or multiple oral doses to snow geese.

TEST SUBSTANCE:

Identification:	Berkeley Pit water
Chemical name:	None applicable
Purity:	Pure - as collected
Physical appearance:	Clear liquid
Storage:	Under refrigeration at 4°C

SPONSOR: ENSR Consulting and Engineering
4413 West LaPorte Ave.
Fort Collins, CO 80521

TEST FACILITY: Genesis Laboratories, Inc.
10122 NE Frontage Road
Wellington, CO 80549

PERSONNEL:

Study Director:	John Baroch
Quality Assurance:	Paula Richart/Anita Barth
Sponsor's Study Monitor:	Dr. William Stubblefield
ARCO's Technical Representative:	Dr. Eugene Mancini
Pathology Support:	Dr. Terry Spraker, Dr. David Getzy

PROPOSED DATES:

Initiation of dosing:	5 February 1996
Termination of dosing:	7 February 1996
Necropsy scheduled:	27 February 1996
Submission of Final Report:	27 March 1996

TEST ANIMALS:

Species/strain:	Snow Goose (<i>Chen caerulescens</i>)
Supplier:	Field Collected at the Bosque del Apache Wildlife Refuge, San Antonio, New Mexico. Federal Collection Permit #PRT-809748. New Mexico Collection Permit #2891.

NUMBER BIRDS ON STUDY: 16 (*Exposure 1*: 3/group; one treatment and control group
Exposure 2: 5/group; one treatment and control group).

AGE: Test birds will be young adults. All test birds young adults <1 year

SNOW GOOSE ORAL TOXICITY
TEST PROTOCOL

January 1996
Page 2 of 8

old (age determination made based on plumage characteristics).

IDENTIFICATION:

Each bird will be identified with a band (leg or wing) bearing its permanent identification number. This number together with the project number will comprise a unique identification number for each bird.

HUSBANDRY:

Housing:

Treatment groups of 4 birds each will be group housed in 183 x 76 x 46 cm (W x L x H), plastic coated wire cages. If necessary, due to injuries or social interactions which prevent group housing, birds may housed singly. Bedding (pine shavings) will be cleaned at least twice weekly.

Food:

A maintenance diet consisting of 3 parts Ranchway 16% Poultry Layer Complete and 1 part Ranchway Hen Scratch will be available *ad libitum*, except during fasting periods prior to dosing. (Supplier, a nutrient analysis, and a list of ingredients supplied by the report). The diet shall be supplemented with fresh greens (assorted lettuce varieties and spinach) to be provided daily, also *ad libitum*, except during fasting periods. The same blend of greens in approximately the same proportions shall be provided to each group each day.

Water:

Northern Colorado Water Association (NCWA) municipal water, *ad libitum*, except during pre-dosing and dosing phases. This water will serve as the untreated vehicle for dosing the control group birds. A copy of the most recent contaminant screening reports from the NCWA and from Genesis Laboratories will be included in the final report.

**Light/dark
cycle:**

Automatic timer 8 hours light/16 hours dark.

Temperature:

72° ± 4°F

Humidity:

55 ± 35%

**Acclimation
Period:**

Test birds will be acclimated to the laboratory environment for a minimum of 7 days prior to dosing. The acclimation period may be extended if needed.

**Selection/
randomization:**

Test birds will be examined by a veterinarian before the pre-dosing

SNOW GOOSE ORAL TOXICITY TEST PROTOCOL

January 1996
Page 3 of 8

phase of the study to determine suitability for testing. Those birds of questionable health (i.e., deformed, abnormal, sick, or injured) will be eliminated from inclusion in the study.

EXPERIMENTAL PROCEDURE:

Test substance administration/ preparation of animals:

After acclimation, feed and water will be withheld from all test groups for 48 hours prior to the administration of the test substance or placebo. The initial day of dosing shall be considered "Day 0."

Exposure Group 1: Doses will be administered by single oral dose.

Control Group 1: Sham doses (i.e., NCWA municipal water) will be administered by single oral dose.

Exposure Group 2: Test material will be provided as the drinking water source to the geese over a three-day exposure period.

Control Group 2: Control water (NCWA municipal water) will be provided as the drinking water source to the geese over a three-day period.

Preparation of dosing solutions:

No special preparation of the test material will be required; test material will be considered as 100% active ingredient for dosing purposes.

Exposure Group 1: Appropriate amounts of test material will be measured in a syringe yielding a total dose volume of 1% of the birds body weight.

Control Group 1: Control group birds will receive NCWA municipal water as a single oral bolus injection; total dose volume will equal 1% of the birds body weight.

Exposure Group 2: Test material will be provided via water bottle, *ad libitum*, as a drinking water source over the three day exposure period.

Control Group 2: Control group birds will receive NCWA municipal

SNOW GOOSE ORAL TOXICITY
TEST PROTOCOL

January 1996
Page 4 of 8

water, *ad libitum*, as a drinking water source over the three day exposure period.

Dose groups: Two exposure methods will be used. The birds in Exposure Group 1 be dosed with the test material at 1% of body weight (10 mL/kg body weight). Dosing in Exposure Group 2 will be *ad libitum*. The volume of water consumed will be estimated throughout the 3-day exposure period.

Treatment: Exposure Group 1, Control Group 1 : The test material will be administered by oral intubation as a single dose to each test animal in the exposure group. NCWA water will be administered to each bird in the control group. Food NCWA water will be returned hours post-dosing, and will be available *ad libitum* for the remainder of the observation period.

Exposure Group 2, Control Group 2 : Food test substance water will be available *ad libitum* to Exposure Group 2 for the 3-day exposure period. Following the 3-day exposure period, the test substance water will be removed and NCWA water will be provided *ad libitum* thereafter throughout the observation period. Food and NCWA water will be available to Control Group 2 *ad libitum* for the 3-day exposure period and thereafter throughout the observation period.

Observation Period: Exposure and control groups shall be held for an observation period of 14 days following the last day of test substance (or vehicle control) exposure. Control groups shall be held for a corresponding period. If mortality occurs during the last three days of the observation period, or if toxic signs are still apparent, the observation period will be extended to 21 days.

EXPERIMENTAL OBSERVATIONS
AND MEASUREMENTS:

Parameter	Time Interval
Viability check/observations for gross signs of pharmacologic and toxicologic effects	Twice daily (once on weekends and holidays).
Body Weights and	Prior to test material dosing, day 7 (156-180 h post-dose) study termination (also weekly if study runs

SNOW GOOSE ORAL TOXICITY TEST PROTOCOL

January 1996
Page 5 of 8

more than eight days). All birds dying *in extremis* will be weighed when found.

Feed Consumption

To be measured daily. It is assumed that spillage will be proportional to food consumption for each bird. No attempt will be made to quantify spillage.

Clinical Chemistry:

At study initiation birds will be evaluated for clinical parameters. Blood will be taken from each of these birds at study initiation, and at study termination, or immediately prior to the time of death. Clinical parameters to be evaluated include: red cell count, white cell count, differential count, total hemoglobin, hematocrit, reticulocyte count, AST (SGOT), uric acid, total protein, albumin, CPK, ALT (SGPT), alkaline phosphatase, calcium, creatine, chloride, glucose, potassium, sodium, cholesterol, total bilirubin. Blood for analysis of blood gases (i.e., pH, Pco₂, Po₂, HCO₃, base excess, anion gap, O₂ saturation) will be taken at study initiation and at completion of the dosing phase (4h following dosing in *Exposure 1* and following removal of test water on day 3 in *Exposure 2*), or at the time of grossly observable signs of toxicity, whichever is sooner.

EXPERIMENTAL DESIGN - STUDY TIME SCHEDULE:

Study Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Time (h)	0	24	48	72	96	120	144	168	192	216	240	264	288	312	336

Time 0 (h): Initial body weight and clinical chemistry; oral dosing (*Exposure 1* and 2).
 Time 72 (h): Removal of test water (*Exposure 2*).
 Time 168 (h): 7-day post-dose body weight (>156 h, <180 h).
 Time 336 (h): Final body weight; sacrifice (if study runs 21 days, final sacrifice will be > 504 h).

POST-MORTEM EXAMINATIONS:

Time: At study termination (day 15, >336 h, or 22, >504 h).

Sacrifice
Method: Decapitation and exsanguination

**SNOW GOOSE ORAL TOXICITY
TEST PROTOCOL**

January 1996

Page 6 of 8

Gross examination: Complete gross post-mortem examinations will be performed on all survivors in the treatment and control groups at termination. All birds dying spontaneously or killed *in extremis* during the course of the study will also be examined.

Tissues: Liver, kidney, adrenal, thymus, bursa, brain, lung, bone marrow, eye, skin, heart, skeletal muscle, gastrointestinal tract, spleen, reproductive organs, and all gross lesions will be taken at the time of necropsy and stored in 10% neutral buffered formalin. Liver, kidney, and brain will be weighed prior to being stored in formalin. Subsections of the liver, kidney, and gastrointestinal tract will be taken for dry weight determination of copper, zinc, iron, arsenic, and manganese concentration.

Histopathology: Histopathologic evaluation of selected tissues will be conducted on all treatment and control animals. Selection of the specific tissues to be evaluated will be made by the study director, study pathologist, sponsor's study monitor, and ARCO's technical representative.

**STATISTICAL
ANALYSIS:**

Parameters to be compared among treatment groups will include, but not be limited to, feed consumption per unit body weight, body weight at dosing and day 7 and test termination, and percent change in body weight during the dosing and observation periods. All dose groups will then be compared using Bartlett's test of equal variance (Snedecor and Cochran, 1971) to determine if dose groups have equal variances. If variances are equal then analyses will be conducted using one-way analysis of variance followed by William's test (Williams, 1971, 1972). If variances are not equal, Kruskal-Wallis' test followed by Dunn's Summed Rank test will be used (Hollander and Wolfe, 1973). All analysis will be conducted using TOXSTAT® software supplied by West Inc., Cheyenne, WY.

REPORT: A final comprehensive report will be submitted following termination of the study. This report will include, but not necessarily be limited to the following information:

1. Identification of the test material, source, batch number, purity, or other appropriate characteristics.
2. The name of the sponsor, study director, and the names of all other professional personnel involved in the study.

SNOW GOOSE ORAL TOXICITY
TEST PROTOCOL

January 1996
Page 7 of 8

3. A description of the methods used, including:
 - a. A description of housing conditions, type, size, and material of pens and the approximate test room temperature, humidity, and photoperiod.
 - b. Acclimation procedures and methods of assigning birds to test pens and test pens to dose levels.
 - c. Frequency, duration, and methods of observations.
4. A description of the test system used, including the scientific name of the test species, numbers used, age at the beginning of the test, source and identification procedures, and individual body weights.
5. Reported observations will include:
 - a. A description of toxic signs and abnormal behavior, including time of onset, duration, severity, and numbers affected for each dose level and control each test day.
6. A description of the transformations, calculations, or operations performed on the data, a summary analysis of the data, and a statement of the conclusions drawn from the analysis.
7. A description of all circumstances that may have affected the quality or integrity of the data.
8. The locations where all specimens, raw data, and the final report are stored.
9. The statement prepared and signed by the quality assurance unit.

REFERENCES:

Sokal, R.R. and F. J. Rohlf, 1969. **Biometry**. N.H. Freeman and Company, San Francisco, CA.

Williams, D.A., 1971. A test for differences between treatment means when several dose levels are compared with a zero dose control. *Biometrics* 27:103-117.

Williams, D.A., 1972. A comparison of several dose levels with a zero dose control. *Biometrics* 28:519-531.

SNOW GOOSE ORAL TOXICITY
TEST PROTOCOL

January 1996
Page 8 of 8

Snedecor, G.W. and W.G. Cochran, 1971. **Statistical Methods**, 6th Edition. The Iowa State University Press, Ames. IA.

Hollander, M. and D.A. Wolfe, 1973. **Nonparametric Statistical Methods**. John Wiley and Sons, New York, NY.

PREPARED BY: _____
DATE: _____

APPROVED BY: *György A. Mányi*
DATE: 1/31/96

**SNOW GOOSE ORAL TOXICITY
TEST PROTOCOL**

January 1996
Page 1 of 7

TITLE: Avian Acute Oral Toxicity Test

PURPOSE: This study is designed to evaluate the toxicity of a water sample collected from the Berkeley Pit, Butte, Montana, when given as a single oral dose or multiple oral doses to snow geese.

TEST SUBSTANCE:

Identification:	Berkeley Pit water
Chemical name:	None applicable
Purity:	Pure - as collected
Physical appearance:	Clear liquid
Storage:	Under refrigeration at 4°C

SPONSOR: ENSR Consulting and Engineering
4413 West LaPorte Ave.
Fort Collins, CO 80521

TEST FACILITY: Genesis Laboratories, Inc.
10122 NE Frontage Road
Wellington, CO 80549

PERSONNEL:

Study Director:	John Baroch
Quality Assurance:	Paula Richart/Anita Barth
Sponsor's Study Monitor:	Dr. William Stubblefield
ARCO's Technical Representative:	Dr. Eugene Mancini
Pathology Support:	Dr. Terry Spraker, Dr. David Getzy

PROPOSED DATES:

Initiation of dosing:	15 February 1996
Termination of dosing:	18 February 1996
Necropsy scheduled:	2 March 1996
Submission of Final Report:	15 June 1996

TEST ANIMALS:

Species/strain: Snow Goose (*Chen caerulescens*)

Supplier: Field Collected at the Bosque del Apache Wildlife Refuge, San Antonio, New Mexico. Federal Collection Permit #PRT-809748. New Mexico Collection Permit #2891.

**NUMBER BIRDS
ON STUDY:** 6 (3/group; one treatment and control group)

AGE: Test birds will be young adults. All test birds young adults <1 year old (age determination made based on plumage characteristics).

**SNOW GOOSE ORAL TOXICITY
TEST PROTOCOL**

January 1996
Page 2 of 7

IDENTIFICATION:	Each bird will be identified with a band (leg or wing) bearing its permanent identification number. This number together with the project number will comprise a unique identification number for each bird.
HUSBANDRY:	
Housing:	Treatment groups of 3 birds each will be individually housed in 61 x 76 x 46 cm (W x L x H), plastic coated wire cages. If necessary, due to injuries or social interactions which prevent group housing, birds may housed singly. Bedding (pine shavings) will be cleaned at least twice weekly.
Food:	A maintenance diet consisting of 3 parts Ranchway 16% Poultry Layer Complete and 1 part Ranchway Hen Scratch will be available <i>ad libitum</i> , except during fasting periods prior to dosing. (Supplier, a nutrient analysis, and a list of ingredients supplied by the report). The diet shall be supplemented with fresh greens (assorted lettuce varieties and spinach) to be provided daily, also <i>ad libitum</i> , except during fasting periods. The same blend of greens in approximately the same proportions shall be provided to each group each day.
Water:	Northern Colorado Water Association (NCWA) municipal water, <i>ad libitum</i> , except during pre-dosing and dosing phases. This water will serve as the untreated vehicle for dosing the control group birds. A copy of the most recent contaminant screening reports from the NCWA and from Genesis Laboratories will be included in the final report.
Light/dark cycle:	Automatic timer 8 hours light/16 hours dark.
Temperature:	72° ± 4°F
Humidity:	55 ± 35%
Acclimation Period:	Test birds will be acclimated to the laboratory environment for a minimum of 7 days prior to dosing. The acclimation period may be extended if needed.
Selection/ randomization:	Test birds will be examined by a veterinarian before the pre-dosing phase of the study to determine suitability for testing. Those birds of questionable health (i.e., deformed, abnormal, sick, or injured) will be eliminated from inclusion in the study.

**SNOW GOOSE ORAL TOXICITY
TEST PROTOCOL**

January 1996
Page 3 of 7

EXPERIMENTAL PROCEDURE:

**Test substance
administration/
preparation of
animals:**

After acclimation, feed and water will be withheld from all test groups for 48 hours prior to the administration of the test substance or placebo. The initial day of dosing shall be considered "Day 0."

Exposure Group: Test material will be provided as the drinking water source to the geese over a three-day exposure period.

Control Group: Control water (NCWA municipal water) will be provided as the drinking water source to the geese over a three-day period.

**Preparation
of dosing
solutions:**

No special preparation of the test material will be required; test material will be considered as 100% active ingredient for dosing purposes.

Exposure Group: Test material will be provided via water bottle, *ad libitum*, as a drinking water source over the three day exposure period.

Control Group: Control group birds will receive NCWA municipal water, *ad libitum*, as a drinking water source over the three day exposure period.

Dose groups:

Dosing will be *ad libitum*. The volume of water consumed will be estimated throughout the 3-day exposure period.

Treatment:

Exposure Group, Control Group : Food test substance water will be available *ad libitum* to Exposure Group for the 3-day exposure period. Following the 3-day exposure period, the test substance water will be removed and NCWA water will be provided *ad libitum* thereafter throughout the observation period. Food and NCWA water will be available to Control Group *ad libitum* for the 3-day exposure period and thereafter throughout the observation period.

**Observation
Period:**

Exposure and control groups shall be held for an observation period of 14 days following the last day of test substance (or vehicle control) exposure. Control groups shall be held for a corresponding period. If mortality occurs during the last three days of the observation period,

**SNOW GOOSE ORAL TOXICITY
TEST PROTOCOL**

January 1996
Page 4 of 7

or if toxic signs are still apparent, the observation period will be extended to 21 days.

**EXPERIMENTAL OBSERVATIONS
AND MEASUREMENTS:**

<u>Parameter</u>	<u>Time Interval</u>
Viability check/observations for gross signs of pharmacologic and toxicologic effects	Twice daily (once on weekends and holidays).
Body Weights and	Prior to test material dosing, day 7 (156-180 h post-dose) study termination (also weekly if study runs more than eight days). All birds dying <i>in extremis</i> will be weighed when found.
Feed Consumption	To be measured daily. It is assumed that spillage will be proportional to food consumption for each bird. No attempt will be made to quantify spillage.
Clinical Chemistry:	At study initiation birds will be evaluated for clinical parameters. Blood will be taken from each of these birds prior to fasting, at study initiation, and at study termination, or immediately prior to the time of death. Clinical parameters to be evaluated include: red cell count, white cell count, differential count, total hemoglobin, hematocrit, reticulocyte count, AST (SGOT), uric acid, total protein, albumin, CPK, ALT (SGPT), alkaline phosphatase, calcium, creatine, chloride, glucose, potassium, sodium, cholesterol, total bilirubin. Blood for analysis of blood gases (i.e., pH, Pco ₂ , Po ₂ , HCO ₃ , base excess, anion gap, O ₂ saturation) will be taken at study initiation and at completion of the dosing phase (4h following dosing in <i>Exposure 1</i> and following removal of test water on day 3 in <i>Exposure 2</i>), or at the time of grossly observable signs of toxicity, whichever is sooner.

SNOW GOOSE ORAL TOXICITY TEST PROTOCOL

January 1996
Page 5 of 7

EXPERIMENTAL DESIGN - STUDY TIME SCHEDULE:

Study Day		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Time (h)	0	24	48	72	96	120	144	168	192	216	240	264	288	312	336

Time 0 (h): Initial body weight and clinical chemistry; oral dosing (*Exposure 1* and 2).
Time 72 (h): Removal of test water (*Exposure 2*).
Time 168 (h): 7-day post-dose body weight (>156 h, <180 h).
Time 336 (h): Final body weight; sacrifice (if study runs 21 days, final sacrifice will be > 504 h).

POST-MORTEM EXAMINATIONS:

Time: At study termination (day 15, >336 h, or 22, >504 h).

Sacrifice
Method: Decapitation and exsanguination

Gross
examination: Complete gross post-mortem examinations will be performed on all survivors in the treatment and control groups at termination. All birds dying spontaneously or killed *in extremis* during the course of the study will also be examined.

Tissues: Liver, kidney, adrenal, thymus, bursa, brain, lung, bone marrow, eye, skin, heart, skeletal muscle, gastrointestinal tract, spleen, reproductive organs, and all gross lesions will be taken at the time of necropsy and stored in 10% neutral buffered formalin. Liver, kidney, and brain will be weighed prior to being stored in formalin. Subsections of the liver, kidney, and gastrointestinal tract will be taken for dry weight determination of copper, zinc, iron, arsenic, and manganese concentration.

Histopathology: Histopathologic evaluation of selected tissues will be conducted on all treatment and control animals. Selection of the specific tissues to be evaluated will be made by the study director, study pathologist, sponsor's study monitor, and ARCO's technical representative.

STATISTICAL ANALYSIS:

Parameters to be compared among treatment groups will include, but not be limited to, feed consumption per unit body weight, body weight at dosing and day 7 and test termination, and percent change in body weight during the dosing and observation periods. All dose groups will then be compared using Bartlett's test of equal variance (Snedecor and Cochran, 1971) to determine if dose groups have

SNOW GOOSE ORAL TOXICITY TEST PROTOCOL

**January 1996
Page 6 of 7**

equal variances. If variances are equal then analyses will be conducted using one-way analysis of variance followed by William's test (Williams, 1971, 1972). If variances are not equal, Kruskal-Wallis' test followed by Dunn's Summed Rank test will be used (Hollander and Wolfe, 1973). All analysis will be conducted using TOXSTAT® software supplied by West Inc., Cheyene, WY.

REPORT:

A final comprehensive report will be submitted following termination of the study. This report will include, but not necessarily be limited to the following information:

1. Identification of the test material, source, batch number, purity, or other appropriate characteristics.
2. The name of the sponsor, study director, and the names of all other professional personnel involved in the study.
3. A description of the methods used, including:
 - a. A description of housing conditions, type, size, and material of pens and the approximate test room temperature, humidity, and photoperiod.
 - b. Acclimation procedures and methods of assigning birds to test pens and test pens to dose levels.
 - c. Frequency, duration, and methods of observations.
4. A description of the test system used, including the scientific name of the test species, numbers used, age at the beginning of the test, source and identification procedures, and individual body weights.
5. Reported observations will include:
 - a. A description of toxic signs and abnormal behavior, including time of onset, duration, severity, and numbers affected for each dose level and control each test day.
6. A description of the transformations, calculations, or operations performed on the data, a summary analysis of the data, and a statement of the conclusions drawn from the analysis.
7. A description of all circumstances that may have affected the quality or integrity of the data.
8. The locations where all specimens, raw data, and the final report are stored.

**SNOW GOOSE ORAL TOXICITY
TEST PROTOCOL**

January 1996
Page 7 of 7

9. The statement prepared and signed by the quality assurance unit.

REFERENCES:

Sokal, R.R. and F. J. Rohlf, 1969. **Biometry**. N.H. Freeman and Company, San Francisco, CA.

Williams, D.A., 1971. A test for differences between treatment means when several dose levels are compared with a zero dose control. *Biometrics* 27:103-117.

Williams, D.A., 1972. A comparison of several dose levels with a zero dose control. *Biometrics* 28:519-531.

Snedecor, G.W. and W.G. Cochran, 1971. **Statistical Methods**, 6th Edition. The Iowa State University Press, Ames. IA.

Hollander, M. and D.A. Wolfe, 1973. **Nonparametric Statistical Methods**. John Wiley and Sons, New York, NY.

PREPARED BY: _____

DATE: 16 Feb 96

APPROVED BY: _____

DATE: 2/15/96

**SNOW GOOSE ORAL TOXICITY
TEST PROTOCOL**

**March 1996
Page 1 of 6**

TITLE: Avian Acute Oral Toxicity Test

PURPOSE: This study is designed to evaluate the toxicity of a water sample collected from the Berkeley Pit, Butte, Montana, when provided *ad libitum* over a 24-hour exposure period to snow geese.

TEST SUBSTANCE: Identification: Berkeley Pit water
Chemical name: None applicable
Purity: Pure - as collected
Physical appearance: Clear liquid
Storage: Under refrigeration at 4°C

SPONSOR: ENSR Consulting and Engineering
4413 West LaPorte Ave.
Fort Collins, CO 80521

TEST FACILITY: Genesis Laboratories, Inc.
10122 NE Frontage Road
Wellington, CO 80549

PERSONNEL: Study Director: John Baroch
Quality Assurance: Paula Richart/Anita Barth
Sponsor's Study Monitor: Dr. William Stubblefield
ARCO's Technical Representative: Dr. Eugene Mancini
Pathology Support: Dr. Terry Spraker, Dr. David Getzy

PROPOSED DATES: Initiation of dosing: 4 March 1996
Termination of dosing: 5 March 1996
Necropsy scheduled: 18 March 1996
Submission of Final Report: 1 April 1996

TEST ANIMALS: Species/strain: Snow Goose (*Chen caerulescens*)

Supplier: Field Collected at the Bosque del Apache Wildlife Refuge, San Antonio, New Mexico. Federal Collection Permit #PRT-809748. New Mexico Collection Permit #2891.

**NUMBER BIRDS
ON STUDY:** 4

AGE: Test birds will be young adults. All test birds young adults <1 year old (age determination made based on plumage characteristics).

**SNOW GOOSE ORAL TOXICITY
TEST PROTOCOL**

**March 1996
Page 2 of 6**

IDENTIFICATION:	Each bird will be identified with a band (leg or wing) bearing its permanent identification number. This number together with the project number will comprise a unique identification number for each bird.
HUSBANDRY:	
Housing:	A single treatment group of 4 birds will be individually housed in 61 x 76 x 46 cm (W x L x H), plastic coated wire cages. Bedding (pine shavings) will be cleaned at least twice weekly.
Food:	A maintenance diet consisting of 3 parts Ranchway 16% Poultry Layer Complete and 1 part Ranchway Hen Scratch will be available <i>ad libitum</i> , through the study. (Supplier, a nutrient analysis, and a list of ingredients supplied by the report). The diet shall be supplemented with fresh greens (assorted lettuce varieties and spinach) to be provided daily, also <i>ad libitum</i> . The same blend of greens in approximately the same proportions shall be provided each day.
Water:	Northern Colorado Water Association (NCWA) municipal water, <i>ad libitum</i> , except during the dosing phase. A copy of the most recent contaminant screening reports from the NCWA and from Genesis Laboratories will be included in the final report.
Light/dark cycle:	Automatic timer 8 hours light/16 hours dark.
Temperature:	72° ± 4°F
Humidity:	55 ± 35%
Acclimation Period:	Test birds will be acclimated to the laboratory environment for a minimum of 7 days prior to dosing. The acclimation period may be extended if needed.
Selection/ randomization:	Test birds will be examined by a veterinarian before the pre-dosing phase of the study to determine suitability for testing. Those birds of questionable health (i.e., deformed, abnormal, sick, or injured) will be eliminated from inclusion in the study.

**SNOW GOOSE ORAL TOXICITY
TEST PROTOCOL**

March 1996
Page 3 of 6

EXPERIMENTAL PROCEDURE:

Test substance administration/preparation of animals:	Test material will be provided as the drinking water source to the geese over a 24-hour exposure period. The initial day of dosing shall be considered "Day 0."
Preparation of dosing solutions:	No special preparation of the test material will be required; test material will be considered as 100% active ingredient for dosing purposes.
Treatment:	Food and test water will be available <i>ad libitum</i> to test birds for the 24-hour exposure period. Following the exposure period, the test water will be removed and NCWA water will be provided <i>ad libitum</i> thereafter throughout the observation period. The volume of test water consumed by each test bird
Observation Period:	Test birds shall be held for an observation period of 14 days following the last day of test substance (or vehicle control) exposure. If mortality occurs during the last three days of the observation period, or if toxic signs are still apparent, the observation period will be extended to 21 days.

**EXPERIMENTAL OBSERVATIONS
AND MEASUREMENTS:**

<u>Parameter</u>	<u>Time Interval</u>
Viability check/observations for gross signs of pharmacologic and toxicologic effects	Twice daily (once on weekends and holidays).
Body Weights and	Prior to test material dosing, day 7 (156-180 h post-dose) study termination (also weekly if study runs more than eight days). All birds dying <i>in extremis</i> will be weighed when found.
Feed Consumption	To be measured daily. It is assumed that spillage will be proportional to food consumption for each bird. No attempt will be made to quantify spillage.

SNOW GOOSE ORAL TOXICITY TEST PROTOCOL

March 1996
Page 4 of 6

Clinical Chemistry:

At study initiation birds will be evaluated for clinical parameters. Blood will be taken from each of these birds at study initiation, and at study termination, or immediately prior to the time of death. Clinical parameters to be evaluated include: red cell count, white cell count, differential count, total hemoglobin, hematocrit, reticulocyte count, AST (SGOT), uric acid, total protein, albumin, CPK, ALT (SGPT), alkaline phosphatase, calcium, creatine, chloride, glucose, potassium, sodium, cholesterol, total bilirubin. Blood for analysis of blood gases (i.e., pH, Pco₂, Po₂, HCO₃, base excess, anion gap, O₂ saturation) will be taken at study initiation and at completion of the dosing phase, or at the time of grossly observable signs of toxicity, whichever is sooner.

EXPERIMENTAL DESIGN - STUDY TIME SCHEDULE:

Study Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Time (h)	0	24	48	72	96	120	144	168	192	216	240	264	288	312	336
Time 0 (h):	Initial body weight and clinical chemistry; begin oral dosing														
Time 24 (h):	Removal of test water														
Time 168 (h):	7-day post-dose body weight (>156 h, <180 h).														
Time 336 (h):	Final body weight; sacrifice (if study runs 21 days, final sacrifice will be > 504 h).														

POST-MORTEM EXAMINATIONS:

Time: At study termination (day 15, >336 h, or 22, >504 h).

Sacrifice
Method: Decapitation and exsanguination

Gross
examination: Complete gross post-mortem examinations will be performed on all survivors in the treatment and control groups at termination. All birds dying spontaneously or killed *in extremis* during the course of the study will also be examined.

Tissues: Liver, kidney, adrenal, thymus, bursa, brain, lung, bone marrow, eye, skin, heart, skeletal muscle, gastrointestinal tract, spleen, reproductive organs, and all gross lesions will be taken at the time of necropsy and stored in 10% neutral buffered formalin. Liver,

SNOW GOOSE ORAL TOXICITY TEST PROTOCOL

March 1996

Page 5 of 6

kidney, and brain will be weighed prior to being stored in formalin. Subsections of the liver, kidney, and gastrointestinal tract will be taken for dry weight determination of copper, zinc, iron, arsenic, and manganese concentration.

Histopathology: Histopathologic evaluation of selected tissues will be conducted on all treatment and control animals. Selection of the specific tissues to be evaluated will be made by the study director, study pathologist, sponsor's study monitor, and ARCO's technical representative.

REPORT: A final comprehensive report will be submitted following termination of the study. This report will include, but not necessarily be limited to the following information:

1. Identification of the test material, source, batch number, purity, or other appropriate characteristics.
2. The name of the sponsor, study director, and the names of all other professional personnel involved in the study.
3. A description of the methods used, including:
 - a. A description of housing conditions, type, size, and material of pens and the approximate test room temperature, humidity, and photoperiod.
 - b. Acclimation procedures and methods of assigning birds to test pens and test pens to dose levels.
 - c. Frequency, duration, and methods of observations.
4. A description of the test system used, including the scientific name of the test species, numbers used, age at the beginning of the test, source and identification procedures, and individual body weights.
5. Reported observations will include:
 - a. A description of toxic signs and abnormal behavior, including time of onset, duration, severity, and numbers affected for each dose level and control each test day.
6. A description of the transformations, calculations, or operations performed on the data, a summary analysis of the data, and a statement of the conclusions drawn from the analysis.

SNOW GOOSE ORAL TOXICITY
TEST PROTOCOL

March 1996
Page 6 of 6

7. A description of all circumstances that may have affected the quality or integrity of the data.
8. The locations where all specimens, raw data, and the final report are stored.
9. The statement prepared and signed by the quality assurance unit.

PREPARED BY: 

DATE: 7 March 96

APPROVED BY: Eugene K. Minner

DATE: 3/6/96

APPENDIX B
TEST ROOM TEMPERATURE AND RELATIVE HUMIDITY

TEMPERATURE AND RELATIVE HUMIDITY IN THE
TESTING ROOM DURING THE INITIAL ACCLIMATION PERIOD

DATE	TEMPERATURE °C		RELATIVE HUMIDITY (%)	
	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM
1/19/96	20	18	42	23
1/20/96	19	18	39	33
1/21/96	19	18	65	26
1/22/96	19	18	34	31
1/23/96	20	18	46	22
1/24/96	21	19	41	20
1/25/96	22	19	34	22
1/26/96	21	19	28	20
1/27/96	21	18	27	18
1/28/96	20	17	28	18
1/29/96	20	18	32	22
1/30/96	20	17	32	21
1/31/96	20	18	25	19
2/01/96	19	17	28	17
2/02/96	20	17	32	13
2/03/96	23	18	30	10
2/04/96	22	18	22	11
RANGE	17-23		10-65	

Single Dose Oral Toxicity Test**TEMPERATURE AND RELATIVE HUMIDITY IN THE
TESTING ROOM DURING THE 14-DAY OBSERVATION PERIOD**

DATE	TEMPERATURE °C		RELATIVE HUMIDITY (%)	
	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM
2/05/96	22	18	26	11
2/06/96	19	16	34	11
2/07/96	19	16	42	32
2/08/96	21	18	37	31
2/09/96	21	18	39	28
2/10/96	21	18	39	25
2/11/96	21	19	31	22
2/12/96	21	18	25	22
2/13/96	22	19	27	20
2/14/96	22	18	44	20
2/15/96	21	18	34	26
2/16/96	22	19	32	21
2/17/96	22	20	33	23
2/18/96	22	20	31	24
2/19/96	22	20	28	23
RANGE	16-22		11-44	

Ad Libitum Oral Toxicity Test I

TEMPERATURE AND RELATIVE HUMIDITY IN THE
TESTING ROOM DURING THE 14-DAY OBSERVATION PERIOD

DATE	TEMPERATURE °C		RELATIVE HUMIDITY (%)	
	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM
2/06/96	19	16	34	11
2/07/96	19	16	42	32
2/08/96	21	18	37	31
2/09/96	21	18	39	28
2/10/96	21	18	39	25
2/11/96	21	19	31	22
2/12/96	21	18	25	22
2/13/96	22	19	27	20
2/14/96	22	18	44	20
2/15/96	21	18	34	26
2/16/96	22	19	32	21
2/17/96	22	20	33	23
2/18/96	22	20	31	24
2/19/96	22	20	28	23
2/20/96	22	20	40	23
RANGE	16-22		11-44	

Ad Libitum Oral Toxicity Test II

TEMPERATURE AND RELATIVE HUMIDITY IN THE
TESTING ROOM DURING THE ACCLIMATION AND TEST PERIODS

DATE	TEMPERATURE °C		RELATIVE HUMIDITY (%)	
	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM
2/10/96	21	18	39	25
2/11/96	21	19	31	22
2/12/96	21	18	25	22
2/13/96	22	19	27	20
2/14/96	22	18	44	20
2/15/96	21	18	34	26
2/16/96	22	19	32	21
2/17/96	22	20	33	23
2/18/96	22	20	31	24
2/19/96	22	20	28	23
2/20/96	22	20	40	23
2/21/96	22	21	45	23
RANGE	18-22		20-45	

Ad Libitum Oral Toxicity Test III

TEMPERATURE AND RELATIVE HUMIDITY IN THE
TESTING ROOM DURING THE ACCLIMATION AND TEST PERIOD

DATE	TEMPERATURE °C		RELATIVE HUMIDITY (%)	
	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM
2/22/96	22	21	35	30
2/23/96	23	21	32	17
2/24/96	22	21	32	22
2/25/96	23	19	25	12
2/26/96	23	21	19	17
2/27/96	24	21	21	15
2/28/96	25	17	35	11
2/29/96	22	20	22	16
3/1/96	20	19	28	12
3/2/96	21	19	28	12
3/3/96	21	19	18	13
3/4/96	20	19	23	13
3/5/96	22	19	22	17
3/6/96	24	19	22	12
3/7/96	24	21	19	12
3/8/96	24	22	22	12
3/9/96	23	21	22	17
3/10/96	24	22	22	17
3/11/96	23	19	23	19
3/12/96	22	19	33	19
3/13/96	21	19	31	23
3/14/96	21	19	33	28
3/15/96	21	19	32	24
3/16/96	21	19	34	25
3/17/96	21	19	34	24
3/18/96	21	19	30	22
RANGE	17-25		11-35	

APPENDIX C
BLOOD AND URINE SAMPLING LOG

Single Dose Oral Toxicity Test
Blood Collection

Group	Bird #	Date/Time of Initial	Date/Time of Final
Control ¹	9870	2/5/96 @ 1000	---
	9874	2/5/96 @ 1000	---
	9882	2/5/96 @ 1000	---
	9878	2/5/96 @ 1000	---
Treatment	9871	2/5/96 @ 1030	2/23/96 @ 1300
	9887	2/5/96 @ 1030	2/23/96 @ 1300
	9879	2/5/96 @ 1030	2/23/96 @ 1300
	9869	2/5/96 @ 1030	2/23/96 @ 1300

¹Control group birds were needed for subsequent studies; therefore, final blood samples were not taken as part of this study.

**Ad Libitum Oral Toxicity Test I
Blood Collection**

Group	Bird #	Date/Time of Initial	Date/Time of Post-Exposure	Date/Time of Final
Control ¹	9872	2/06/96 @ 08:30	---	---
	9876	2/06/96 @ 08:30	---	---
	9880	2/06/96 @ 08:30	---	---
	9884	2/06/96 @ 08:30	---	---
Treatment	9873 ²	2/06/96 @ 08:30	---	---
	9877	2/06/96 @ 08:30	2/07/96 @ 16:00	2/08/96 @ 16:30
	9881	2/06/96 @ 08:30	2/07/96 @ 16:00	2/21/96 @ 11:00
	9885	2/06/96 @ 08:30	2/07/96 @ 16:00	2/21/96 @ 11:00

¹Control group birds were needed for subsequent studies; therefore, final blood samples were not taken as part of this test.

²Bird #9873 died prior the end of the exposure period and before blood samples could be taken.

**Ad Libitum Oral Toxicity Test II
Blood Collection**

Group	Bird #	Date/Time of Pre-Fast	Date/Time of Initial	Date/Time of Final
Control	9874	2/15/96 @ 09:00	2/19/96 @ 11:00	2/20/96 @ 11:30
	9876	2/15/96 @ 09:00	2/19/96 @ 11:00	2/20/96 @ 11:30
	9882	2/15/96 @ 09:00	2/19/96 @ 11:00	2/20/96 @ 11:30
Treatment	9878	2/15/96 @ 09:00	2/19/96 @ 11:00	2/20/96 @ 01:15
	9886	2/15/96 @ 09:00	2/19/96 @ 11:00	2/19/96 @ 22:00
	9888 ¹	2/15/96 @ 09:00	2/19/96 @ 11:00	2/20/96 @ 08:10

¹An additional blood sample was taken from bird #9888 prior to the final sample on 2/20/96 at 01:15.

***Ad Libitum* Oral Toxicity Test II**
Urine Collection Dates and Times

Group	Control			Treatment		
Bird #	9876	9874	9882	9878	9886	9888
Pre-Fast	2/15/96 @ 09:00	2/15/96 @ 09:00	2/15/96 @ 09:00	2/15/96 @ 09:00	2/15/96 @ 09:00	2/15/96 @ 09:00
Initial	2/19/96 @ 11:00	2/19/96 @ 11:00	2/19/96 @ 11:00	2/19/96 @ 11:00	2/19/96 @ 11:00	2/19/96 @ 11:00
	2/19/96 @ 18:00	2/19/96 @ 18:00	2/19/96 @ 18:00	2/19/96 @ 18:00	2/19/96 @ 18:00	2/19/96 @ 18:00
	2/19/96 @ 24:00	2/19/96 @ 24:00	2/19/96 @ 24:00	---	---	2/19/96 @ 24:00
	2/20/96 @ 06:00	2/20/96 @ 06:00	2/20/96 @ 06:00	---	---	---
Final	2/20/96 @ 11:30	2/20/96 @ 11:30	2/20/96 @ 11:30	2/19/96 @ 24:00	2/19/96 @ 22:00	2/20/96 @ 06:00

Ad Libitum Oral Toxicity Test III
Blood Collection

Group	Bird #	Date/Time of Initial	Date/Time of Post-Exposure	Date/Time of Final
Treatment	9870	3/4/96 @ 09:15	3/5/96 @ 10:40	3/18/96 @ 09:30
	9872	3/4/96 @ 09:15	3/5/96 @ 10:40	3/18/96 @ 09:30
	9880	3/4/96 @ 09:15	3/5/96 @ 10:40	3/18/96 @ 09:30
	9884	3/4/96 @ 09:15	---	3/5/96 @ 05:00

APPENDIX D
OBSERVATIONS

Phase I, Treatment and Control Groups 2 (*ad libitum* exposure).

48 hour fast.

Proposed Exposure Period = 3 days.

Actual Exposure Period = 31 hours (ran out of test substance).

2/06/96

At 1545 hours, the birds in T-2 were behaving slightly lethargic (compared to birds in C-1, C-2, and T-1). Bird # 9877 would sneeze and shake it's head violently each time it drank water. This occurred several times in the course of a few minutes. After each sneeze and head shake, the bird returned for another drink. During this time it also emitted several high pitched, loud calls which I have not heard from these birds before. At about 1545 hours, another bird in T-2 (#9885) developed sporadic mild shivers. These persisted until 1600 hours, when lights went out.

At 1730 hours, turned lights on and observed birds for about 5 minutes. All appeared normal, except those in T-2. Bird # 9885 remained seated while I observed, and displayed mild, but nearly continuous shivers. Feathers on the head and neck of 3 of the 4 birds in T-2 were slightly erect. None of the other birds displayed this feature. Turned lights out.

At 2140 hours, turned lights on to observe birds at 2130 hours. all birds appear normal except bird # 9877 is displaying hypo-reactivity, and bird # 9885 which has nearly continuous mild shivers, and occasional (approximately 30 seconds in 10 minutes) strong shivers. Little or no lettuce presented at approximately 10:30 this morning has been eaten by group T-2 (Group C-2 has consumed most of it's lettuce ration. The water for group T-2 was nearly all gone. I replenished it with 500 ml of test substance water. T-2's consumption is exceeding that of group C-2.

2/07/96

At 0730 hours, bird # 9873 (T-2) found dead. T-2 water trough nearly dry. Added 1000 ml test substance. Remaining birds in T-2 are drinking the water rapidly. #9885 is still "sneezing" after drinking, then returning for more. All three remaining birds in T-2 appear slightly lethargic compared to the birds in other groups, but do not appear ill. #9885 is not shivering at this time.

At 1010 hours, T-2 water trough almost dry. Added 1000 ml test substance. Remaining birds in T-2 still drinking water constantly. #9877 is drinking the most water. All three remaining birds still seem slightly lethargic, but are standing up and do not seem ill.

At 11:63 hours, Provided another 1000 ml test substance water to group T-2, since level in trough had dropped to less than 1 cm. Started video.

at 16:30 hours, Water trough for group T-2 nearly dry. Spillage collected on pan below trough disposed of. Not measured. Estimated at 1000 ml.

Birds in T-2 had consumed and spilled all but ~300 ml of the test substance water available by 1600 hours on 2-7-96. Most of the spillage today has been due to a single bird (#9877) which has been at the water trough almost continuously. The bird repeatedly takes a drink, stands back from the trough, and lets most or all of the water taken into the mouth dribble back out.

Very little of the feed or lettuce supplied to T-2 is being consumed.

At about 1600 hours, we drew blood samples from the 3 remaining birds in T-2, taking about 2.5 cc from each bird.

The birds were then returned to the pen and supplied with NCWA, water, ad libitum.

Birds in C-2 and T-2 will be observed hourly tonight to allow additional blood samples to be taken if any birds appear to be dying.

At about 1800 hours, Bird #9877 lethargic, standing by water trough with a stuffed up nose and drooling from the mouth (saliva) using its mouth to breath. Still drinking a lot of water. The right eye is halfway shut and tearing. Feathers on the head region all fluffed. Overall, it looks ill.

At about 1900 hours, Bird #9877 still looking ill and drinking plenty of water. Same symptoms as above, except eye has stopped tearing. The eye still looks irritated though. Bird #9881 is eating a fair amount while I'm observing.

At about 2000 hours, Bird #9877 still looking ill and drinking a lot of water. Drooling, sneezing, both eyes half open as if it has a cold. All three birds in T-2 were lying down for approximately 2 minutes after the lights went on whereas the other birds in all other groups were standing. All three birds in T-2 remain lethargic.

At about 2100 hours, all birds in T-2 were lying down and resting. The rest of the birds in the room were standing and quite alert picking at each other.

At about 2200 hours, Bird #9877 & #9885 drank water during the entire observation while Bird #9881 ate.

2-9-96

All birds from Control-1 and two birds from Control-2 were randomized and placed in single cages for Phase II. While acclimating for Phase II, they are still being observed for Phase I.

Phase II**48 hour fast.****Proposed Exposure Period = 3 days****Actual Exposure Period = All treated birds (3) died within 21 hours.****2/19/96**

- 18:00 Bird # 9886 was taking deep breaths. After describing this to Terry Spraker, he said the bird may have increased breathing but definitely has an increased depth of breath.
- 19:00 Bird # 9886 has both increased breathing and increased depth of breath. Eyes are glossy and it has a dazed look on its face. Stares down at the ground a lot. Bird # 9888 is still drinking a lot of water. It also has increased breathing and an increased depth of breath. Bird # 9878 is starting to drink a lot. It sneezed at least 5 times during my 10 minute observation. It also shakes it's head swiftly from side to side and breathes out as if it is trying to clear a nasal passage.
- 20:00 Bird numbers' 9886 and 9888 have the same symptoms as last observation. Bird # 9878 has an increased depth of breath. It is lying down trying to sleep. Bird # 9886 has increased breathing and is now opening it's mouth to breathe. Snot is running out of it's nose and is now lying down with a very limp neck and body. I started recording it's behavior on video tape. The bird did not resist when I tried to handle it. After 5 minutes of lying down, the bird rose to its feet. Then 5 minutes later, it fell down into a lying position again.
- 21:00 Bird # 9886 still hasn't gotten up since it has laid down the last time, approximately 20 minutes ago.
- 21:05 Urine Samples
Bird # 9876: Lots of urine and fecal matter
Bird # 9874: Almost no urine
Bird # 9882: Mostly fecal matter (same amount as # 9876)
Bird # 9886: Lots of fecal matter and urine
Bird # 9888: Lots of milky and light green urine
Bird # 9878: Lots of clear urine
- 21:35 Bird # 9886 died. Blood was drawn from the heart at 22:00 and the bird was immediately taken to Colorado State University Veterinary Teaching Hospital for a complete necropsy performed by Terry Spraker.
- 24:00 Collected urine samples from 5 remaining birds.

2/20/96

- 01:30 John Baroch and Jeff Mach assisted Terry Spraker in drawing blood samples from remaining 2 treatment birds. Bird # 9878 died during the procedure. Blood was collected from the jugular vein while the bird was still alive, and from a heart stick a few minutes after death. Bird # 9888 was also bled again for a sample. The right wing vein was used. Bird # 9888 is weak but still alive and drinking regularly.
- 04:00 Bird # 9888 is lethargic, unkempt, right wing drooping. During the 10 minute observation period, the bird was on it's feet at all times, drinking perhaps every 2-3 minutes, but dribbling much of the water back out of it's mouth. Bird appears to be having trouble finding

the access hole to the water trough, making uncharacteristic side to side head and neck motions and pecking at the side of the cage till it finds the access hole. Pulled bedding pans to compare droppings, then cleaned for taking fresh urine samples. Clean pans will be replaced at 05:00, and samples will be taken at 06:00. Added 500 ml test water to Bird # 9888 water trough and disposed of 475 ml spillage.

Urine Samples

Bird # 9876: Little urine, moderate amounts of "feed and lettuce feces".

Bird # 9874: Same as # 9876.

Bird # 9882: Larger amounts of mostly "feed feces", little urine.

Bird # 9888: Large amounts of clear/whitish urine, no feces.

Bird # 9878: Moderate amounts of whitish urine, no feces.

Bird died at 01:16 hours.

05:00 Condition of Bird # 9888 unchanged from 04:00 observation, except right wing drop is more pronounced. Clean bedding pans are replaced.

06:00 Bird # 9888 sitting down when I entered, for first time. Rose after about 1 minute and took a drink.

Phase III

No fast

Proposed Exposure Period = 24 hours

Actual Exposure Period = 24 hours

3/4/96

Observations taken during the 24-hour exposure period:

13:00 Bird # 9884 and 9872 are drinking the water frequently.

Bird # 9884 is shaking it's head and clearing it's throat.

19:00 Bird # 9884 has increased it's depth of breath.