January 11, 2017
Formation Environmental Project No.: 009-001

Ms. Margie English
Idaho Department of Environmental Quality
Waste and Remediation Division
1410 North Hilton
Boise, ID 83706

Subject: Final Human Health Risk Assessment Report
Conda/Woodall Mountain Mine

Dear Ms. English:

Enclosed, on behalf of the J.R. Simplot Company (Simplot), you will find copies of the above referenced report.

Please do not hesitate to contact Jeff Hamilton or me if you have any questions.

Sincerely,
FORMATION ENVIRONMENTAL, LLC

Robbert-Paul Smit
Project Manager

cc: Norka Paden - IDEQ
Matt Wilkening – USEPA Region 10
Nicholas Vidargas – USEPA Region 10
Colleen O'Hara and Doug Cox – BLM
Jeremy Moore and Sandi Fisher – USFWS
Kelly Wright and Shannon Leigh Ansley – Tribes
Gary Billman - IDL
Allan Erickson and Jeff Schut – CH2M Hill
Burl Ackerman – J.R. Simplot Company
Lori Hamann – J.R. Simplot Company
Jeff Hamilton – J.R. Simplot Company
Mark Lewis – Formation Environmental

FINAL

Conda/Woodall Mountain Mine RI/FS Site-Specific Human Health Risk Assessment Report

J.R. Simplot Company

December 2016

Prepared for:

J.R. Simplot Company
P.O. Box 27, One Capital Center
999 Main Street, Suite 1300
Boise, ID 83707-0027

Prepared by:

FORMATION ENVIRONMENTAL
Formation Environmental, LLC
2500 55th Street, Suite 200
Boulder, Colorado 80301

TABLE OF CONTENTS

Page

TABLE OF CONTENTS i
LIST OF TABLES iii
LIST OF FIGURES v
LIST OF APPENDICES vi
LIST OF ACRONYMS vii
1.0 INTRODUCTION 1
1.1 Purpose and Scope 2
1.2 Document Organization 3
2.0 SITE DESCRIPTION 4
2.1 Mining History and Background 4
2.2 Climate and Setting 5
2.2.1 Climate 5
2.2.2 Geology, Hydrogeology, and Hydrology 6
2.2.3 Ecology/Biology 7
2.3 Land Use 9
2.4 Summary of Environmental Conditions 12
2.4.1 Sources of COIs 12
2.4.2 Transport of COIs 13
3.0 DATA REVIEW AND SCREENING-LEVEL EVALUATION 16
3.1 Risk Assessment Data Set 16
3.1.1 Data Quality Evaluation 16
3.1.2 Data by Media 17
3.2 Selection of Human Health Chemicals of Potential Concern 18
3.2.1 Screening-Level Values 20
3.2.2 COIs Screened Out of the SSHHRA 21
3.2.3 Human Health Chemicals of Potential Concern Quantitatively Evaluated in the SSHHRA 24
4.0 EXPOSURE ASSESSMENT 25
4.1 Human Health Conceptual Site Model 25
4.2 Exposure Media 26
4.3 Potentially Exposed Populations 27
4.4 Exposure Factors 30
4.5 Exposure Point Concentrations 31
4.5.1 EPC Calculation Methodology 31
4.5.2 Receptor-Specific EPC Information 31
4.5.3 Media-Specific EPC Information 34

4.5.4 Radionuclide EPCs 38
4.6 Quantifying Exposure to Non-Radionuclide HH COPCs 38
4.7 Quantifying Exposure to Radionuclides (Uranium and Decay Products) 40
4.8 Qualitative Evaluation of Off-Site Recreational Fisher Receptor 41
5.0 TOXICITY ASSESSMENT 43
5.1 Endpoint-Specific Toxicity Criteria 43
5.2 Exposure Route-Specific Toxicity Criteria 44
5.3 Toxicity Values for Radionuclide HH COPCs 44
5.4 Sources of Toxicity Criteria for Non-Radionuclide HH COPCs 45
6.0 RISK CHARACTERIZATION 47
6.1 Tier 1 RME Risk Estimates 48
6.1.1 Hazard and Cancer Risk Estimates for Non-Radionuclide HH COPCs 48
6.1.2 Cancer Risk Estimates for Radionuclide HH COPCs 49
6.2 Tier 2 Risk Characterization 50
6.2.1 Arsenic 51
6.2.2 Selenium 53
6.2.3 Thallium 54
6.2.4 Cadmium, Cobalt, and Iron 55
6.2.5 Radionuclides (Uranium and Decay Products) 56
6.3 Uncertainty Analysis 58
6.3.1 Data Quality 58
6.3.2 Exposure Analysis 59
6.3.3 Exposure Point Concentrations Modeled from Other Media 60
6.3.4 Toxicity Assessment 63
6.3.5 Risk Characterization Uncertainties 65
6.3.6 Overall Impact of Uncertainties 66
6.4 Risk Characterization Summary 66
7.0 CONCLUSIONS 68
8.0 REFERENCES 70

LIST OF TABLES

Table	Title
2-1	Summary of Culturally-Significant Plant Species
2-2	Grazing Allotment Summary
3-1	Site-Specific Human Health Risk Assessment Chemicals of Interest
3-2	Information About Surface Soil Dataset
3-3	Summary of Inorganic Chemicals in Site-Wide Surface Soil, Surface Water, and Domestic Water Supply
3-4	Summary of Organic Chemicals in Townsite Area Surface Soil and Domestic Water Supply
3-5	Screening-Level Values for Selection of Human Health Chemicals of Potential Concern – Inorganic Chemicals
3-6	Screening-Level Values for Selection of Human Health Chemicals of Potential Concern – Organic Chemicals
3-7	Summary of Human Health Chemicals of Potential Concern – Inorganic Chemicals
3-8	Summary of Human Health Chemicals of Potential Concern – Organic Chemicals
4-1	Tier 1 Receptors and Exposure Factors Descriptions
4-2	Exposure Factors Input for All Receptors
4-3	Tier 1 Exposure Point Concentrations for All Receptors
4-4	Off-Site Fish Tissue Selenium Concentration Summary
5-1	Toxicity and Chemical-Specific Factors for Human Health Chemicals of Potential Concern from Non-Radiological Effects
6-1	Overall Summary of Lifetime Non-Cancer Hazards and Cancer Risks for All Receptors – Non-Radionuclides
6-2	Summary of Lifetime Non-Cancer Hazards and Cancer Risks for All Receptors – by HH COPC (Non-Radionuclides)
6-3	Summary of Lifetime Non-Cancer Hazards and Cancer Risks for All Receptors – with Contributing Pathway Information (Non-Radionuclides)
6-4	Overall Summary of Lifetime Cancer Risks for All Receptors – Radionuclides
6-5	Summary of Radionuclide EPCs and Lifetime Cancer Risks for Select Receptors

6-6 Summary of Lifetime Non-Cancer Hazards for All Receptors - Using Alternative Uranium RfDs

LIST OF FIGURES

Figure	Title
1-1	Conda/Woodall Mountain Phosphate Mine Location
1-2	Conda/Woodall Mountain Mine Features
2-1	Land Ownership and Land Use
2-2	Surface Water Drainages and Sub-Basin Boundaries
2-3	Surface Geology Map
2-4	General Boundaries of the Hydrostratigraphic Systems
2-5	General Vegetation Cover Types and Other Plant Types
2-6	Grazing Allotments
2-7	Private Land and Domestic Wells Surrounding Conda Mine
3-1	Surface Soil Sampling Locations
3-2	Surface Soil Sampling Locations in North Portion of Site
3-3	Surface Soil Sampling Locations in South Portion of Site
3-4	Surface Soil Sampling Locations in East Portion of Site
3-5	Vegetation Sampling Locations
3-6	Vegetation Sampling Locations in North Portion of Site
3-7	Vegetation Sampling Locations in South Portion of Site
3-8	Vegetation Sampling Locations in East Portion of Site
3-9	Surface Water Sampling Locations
3-10	Domestic Water Supply Sampling Locations
4-1	Conceptual Site Model for Human Receptors
4-2	Exposure Areas for Industrial Worker and Recreational Hunter
4-3	Exposure Areas for Seasonal Rancher and Herder
4-4	Exposure Areas for Recreational Trespasser and Native American
4-5	Exposure Areas for Hypothetical Resident and Off-Site Recreational Fisher
6-1	Arsenic Concentrations in Domestic Water Supply and Surface Soil Sampling Locations
6-2	Selenium Concentrations in Domestic Water Supply Sampling Locations
6-3	Uranium Concentrations in Domestic Water Supply and Surface Soil Sampling Locations

LIST OF APPENDICES

Appendix	Title
A	Appendix A – Supplemental Information
B	Appendix B – Human Health Risk Assessment Data Compilation (electronic format)
C	Appendix C – Site-Wide Screening Tables
D	Appendix D – Non-Mined Area Screening Tables
E	Appendix E – Mined Area Screening Tables
F	Appendix F – Townsite Area Screening Tables
G	Appendix G – ProUCL Outputs for Screening Evaluations
H	Appendix H – Supporting Information for Tier 1 Exposure Estimation Methods and Exposure Point Concentrations
I	Appendix I – ProUCL Outputs for Tier 1 Exposure Point Concentrations
J	Appendix J – Industrial Worker Tier 1 Exposure and Hazard/Risk Summary
K	Appendix K – Recreational Hunter Tier 1 Exposure and Hazard/Risk Summary
L	Appendix L – Current Seasonal Rancher Tier 1 Exposure and Hazard/Risk Summary
M	Appendix M – Future Seasonal Rancher Tier 1 Exposure and Hazard/Risk Summary
N	Appendix N – Current Livestock Herder Tier 1 Exposure and Hazard/Risk Summary
O	Appendix O – Future Livestock Herder Tier 1 Exposure and Hazard/Risk Summary
P	Appendix P – Recreational Trespasser Tier 1 Exposure and Hazard/Risk Summary
Q	Appendix Q – Native American Tier 1 Exposure and Hazard/Risk Summary
R	Appendix R – Hypothetical Resident Tier 1 Exposure and Hazard/Risk Summary
S	Appendix S – Evaluation of Radionuclides
T	Appendix T – Evaluation of Soil Background Upper Confidence Limits (UCLs) for Selected Human Health Chemicals of Potential Concern (HH COPCs)
U	Appendix U – Review Comments and Responses

LIST OF ACRONYMS

95UCL	95 Percent Upper Confidence Limit on the Mean
95/95 UPL	95 Percent Upper Confidence Limit on the 95th Percentile
95-95 UTL	95 Percent Upper Tolerance Limit with 95 Percent Coverage
ADD	Average Daily Dose
AMSL	Above Mean Sea Level
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
ARMP	Approved Resource Management Plan
AT	Averaging Time
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	All-Terrain Vehicle
AUM	Animal Unit Month
AWHHRA	Area-Wide Human Health Risk Assessment
BCEH	Bureau of Community and Environmental Health
BPF	Baseline Problem Formulation
BLM	Bureau of Land Management
BTV	Background Threshold Value
BW	Body Weight
C	Concentration
Cal-EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	Chemical of Concern
COI	Chemical of Interest
COPC	Chemical of Potential Concern
CR	Contact Rate
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
CTE	Central Tendency Exposure
CWA	Clean Water Act
d/kg	day per kilogram
DOI	U.S Department of the Interior

LIST OF ACRONYMS (continued)

ED	Exposure Duration
EFD	Exposure Frequency and Duration
ELCR	Excess Lifetime Cancer Risk
EPC	Exposure Point Concentration
FEIS	Final Environmental Impact Statement
FS	Feasibility Study
FSPS	Field Scale Pilot Study
ft	Feet
GIS	Geographic Information System
HEAST	Heath Effects Assessment Summary Tables
HH	Human Health
HH COC	Human Health Chemical of Concern
HH COPC	Human Health Chemical of Potential Concern
HI	Hazard Index
HQ	Hazard Quotient
I	Intake
IDAPA	Idaho Administrative Procedures Act
IDEQ	State of Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IRIS	Integrated Risk Information System
IUR	Inhalation Unit Risk
kg	kilogram
L/day	Liters per day
LADD	Lifetime Average Daily Dose
MCL	Maximum Contaminant Level
MDC	Maximum Detected Concentration
mg/day	milligrams per day
mg/kg	milligrams per kilogram
µg/day	micrograms per day
µg/kg-day	micrograms per kilogram bodyweight per day
mg/kg-day	milligrams per kilogram of body weight per day
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter

LIST OF ACRONYMS (continued)

MOU	Memorandum of Understanding
MRL	Minimal Risk Level
NRWQC	National Recommended Water Quality Criteria
NOAEL	No-Observed-Adverse-Effects-Level
NPS	National Park Service
NTCRA	Non-Time-Critical Removal Action
ODA	Overburden Disposal Area
Pb-210	Lead-210
pCi/g	picoCuries per gram
pCi/L	picoCuries per liter
PEF	Particulate Emission Factor
PFO	Pocatello Field Office
Po-210	Polonium-210
ppm	Parts per Million
PPRTV	Provisional Peer-Reviewed Toxicity Values
PRG	Preliminary Remediation Goal
QA/AC	Quality Assurance/Quality Control
Ra-226	Radium-226
RAGS	Risk Assessment Guidance for Superfund
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RI/FS	Remedial Investigation/ Feasibility Study
RME	Reasonable Maximum Exposure
RMM	Residual Mining Materials
Rn-222	Radon-222
RSL	Regional Screening Level
SA/CO	Settlement Agreement/Consent Order
SLV	Screening-Level Value
SSERA	Site-Specific Ecological Risk Assessment
SSHHRA	Site-Specific Human Health Risk Assessment

LIST OF ACRONYMS (continued)

TMDL	Total Maximum Daily Load
TTEMI	Tetra Tech EM, Inc.
U-238	Uranium-238
U-238+D	Uranium-238 plus decay products
UBR	Upper Blackfoot River
UCL	Upper Confidence Limit
UPL	Upper Prediction Limit
US	United States
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFS	USDA Forest Service
USFWS	US Department of the Interior Fish and Wildlife Service
USGS	US Geological Survey
WRCC	Western Regional Climate Center
YCT	Yellowstone Cutthroat Trout

1.0 INTRODUCTION

This report presents the Baseline Site-Specific Human Health Risk Assessment (SSHHRA), conducted by the J.R. Simplot Company (Simplot), for the former Conda/Woodall Mountain Phosphate Mine (Conda Mine or Site). The Conda Mine is located approximately 8 miles northeast of Soda Springs, in Caribou County, Idaho (Figure 1-1).

Simplot voluntarily entered into an Administrative Order on Consent (AOC) with the Idaho Department of Environmental Quality (IDEQ), US Environmental Protection Agency (USEPA), US Department of the Interior (DOI), and Bureau of Land Management (BLM), to conduct a Remedial Investigation (RI) and assess risk to human health and the environment, as well as perform a Feasibility Study (FS), collectively RI/FS. Pursuant to a July 17, 2000 Memorandum of Understanding (MOU) concerning contamination from the phosphate mining operations in southeastern Idaho, IDEQ is the "Lead Agency," with USEPA implementing Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The BLM, DOI's US Fish and Wildlife Service (USFWS), and the Shoshone-Bannock Tribes have elected to participate as "Support Agencies." Hereafter, the IDEQ, USEPA, BLM, USFWS, and the Tribes are collectively referred to as the Agencies.

The SSHHRA described herein was completed in two stages: (1) development of a Baseline Problem Formulation (BPF) (Formation 2012a) in conjunction with the Agencies to establish guiding assumptions and procedures, and (2) quantification of the risks for the complete and significant pathways following a tiered evaluation. Departures from the BPF (Formation 2012a), made to reflect updated guidance and Site conditions, are detailed in Appendix A. The tiered[1] approach was conducted in accordance with current USEPA guidance (USEPA 1989, 1991a, 1991b, 1992b, 1992c, 2004a, 2005a, and 2007). Tier 1 provides a comprehensive exposure assessment and risk characterization for all receptors and an evaluation of all Chemicals of Interest (COIs), using standard risk assessment methodology. Tier 2 provides further assessment of the Human Health Chemicals of Potential Concern (HH COPCs) identified through screening of the COIs in Tier 1. Tier 2 also includes evaluation of the pathways that are driving the estimated potential risk, review of the spatial distribution of HH COPC concentrations within the Site, additional detailed receptor-specific assessments if warranted, qualitative consideration of background concentrations, and discussion of the assumptions and uncertainties associated with the Tier 1 risk characterization.

[1] A tiered approach involves beginning the evaluation with a high degree of conservatism in the values and information used to estimate risk, and progressing with decreasing the degree of conservatism. The tiered approach allows for reviewing results throughout the process and making decisions on subsequent tiers.

1.1 Purpose and Scope

The purpose of the SSHHRA is to evaluate current and future potential risks to human health from exposure to the COIs identified by the Agencies for the Conda Mine RI/FS.[2] The analysis is based on exposures that could occur under conservative, but reasonably anticipated land-use scenarios in the absence of institutional or engineering controls. In addition, the SSHHRA supports the development of Preliminary Remediation Goals (PRGs) and the evaluation of remedial action alternatives in the FS to manage environmental health risks at the Site. The areas evaluated in this SSHHRA include the Mined Area portion of the Site (areas disturbed by mining operations), and a Non-Mined Area portion of the Site (an area surrounding the Mined Area that is potentially affected by COIs released from mining-related features) (Figure 1-2). The Mined Area is where the materials such as waste rock, overburden piles, tailings, etc. (also termed residual mining materials [RMM]), generated during mining, reside. Locations outside of the Non-Mined Area boundary, such as locations on the Upper Blackfoot River (UBR) and Trail Canyon Creek (Figure 1-2), are considered off-Site.

The COIs for which Site-wide maximum concentrations exceed screening levels are first identified as HH COPCs. The HH COPCs are carried into the more detailed exposure analysis and risk characterization. The HH COPCs identified from the tiered risk analysis as having potentially adverse human health effects are then considered Preliminary Human Health Chemicals of Concern (HH COCs). Final HH COCs for evaluating risk management actions in the FS will be identified by the Agencies on the basis of the final SSHHRA and other information (e.g., Site-specific background studies).

The fundamental decisions that the SSHHRA risk characterization is designed to support are:

- Determine whether HH COPCs released from the Conda Mine have resulted, or are likely to result, in potential adverse human health effects.
- If unacceptable risk to human health is identified, determine which HH COPCs, exposure pathways, and fate and transport mechanisms are most important and result in potential risks.
- Determine whether unacceptable risks warrant remedial action.

Because of the uncertainty associated with elements of a risk assessment (USEPA 1989), the process relies on a number of protective assumptions that are intended to likely overestimate the risks. A tiered approach using generic assumptions and models, supported by more realistic and Site-specific assumptions and models, is generally accepted as a valid means to ensure that risk assessment results provide appropriate support for effective risk management.

[2] The COIs correspond to the Chemicals of Potential Concern identified for the RI.

1.2 Document Organization

This SSHHRA is organized as follows:

- Section 2 (Site Description) – Presents relevant background information about the Site to support the risk assessment;
- Section 3 (Data Review and Screening-Level Evaluation) – Presents an overview of the available RI data, defines the dataset for use in the SSHHRA, and describes the process for identifying the HH COPCs.
- Section 4 (Exposure Assessment) – Presents the conceptual Site model (CSM) identifying the potentially exposed receptor populations and associated exposure pathways. This section also presents receptor-specific exposure factors for estimating intake of HH COPCs from environmental media, and methods for calculating the exposure point concentrations (EPCs) and intake.
- Section 5 (Toxicity Assessment) – Presents the review of available information to identify the nature and degree of toxicity of each HH COPC, and evaluate the relationship between magnitude of exposure and magnitude of adverse health effects for each HH COPC.
- Section 6 (Risk Characterization) – Presents the Tiers 1 and 2 analyses and a synthesis of exposure and toxicity information to estimate the nature and magnitude of potential cancer risks and non-cancer hazards. This section also discusses uncertainties and bias in the calculated results.
- Section 7 (Conclusions) – Presents a summary of findings to help guide future risk management decisions at the Site.
- Section 8 (References) – Lists references cited in the SSHHRA Report.

2.0 SITE DESCRIPTION

The following subsections present a summary of mining at the Site and descriptions of the environmental setting and conditions as they pertain to the SSHHRA.

2.1 Mining History and Background

As previously described, the Site includes the Mined and Non-Mined Areas (Figure 1-2). The Mined Area consists of approximately 3,033 acres owned by Simplot, and 1,620 acres of Federal lands managed by the BLM ("BLM lands"). Property ownership in the Non-Mined Area consists of approximately 3,998 acres of Simplot lands, 4,834 acres of lands owned by other private parties, 1,470 acres of BLM lands, 95 acres of Federal lands managed by the United States (US) Department of Agriculture (USDA) Forest Service (USFS), and 0.5 acres of State land (Figure 2-1).[3]

Historical mining activities at the Conda Mine occurred from 1906 through 1984, with mining initially consisting of underground operations (1906 through 1956) and transitioning into open-pit mining (beginning in the early 1950s). Simplot constructed a pump station in 1984 at the Site to boost the pressure in a slurry pipeline that transports phosphate ore from the Smoky Canyon Mine to the Don Plant near Pocatello, Idaho. The town of Conda was vacated by 1987, and the town structures were largely demolished. Simplot continues to operate the pump station.

Mining operations left RMM[4] (Figure 1-2) containing naturally elevated selenium and other COIs. Handling and disposal of the RMM accelerated both physical and chemical weathering processes, resulting in releases of selenium and other chemicals to the environment. Numerous area-wide studies have identified Middle Waste Shale as the predominant source of selenium and other COI releases to the environment (Montgomery Watson 1999, Bond 2000, Herring et al. 2000, Munkers 2000). The RMM cover approximately 1,500 acres and haul and maintenance roads extend over about 200 acres. Most of the RMM are contained within Simplot property (approximately 1,330 acres) with a small portion located on BLM land (approximately 270 acres).

During the later years of mining and since mining ceased, Simplot reclaimed approximately 580 acres of the disturbed lands. Reclamation consisted of: (1) reshaping angle-of-repose overburden piles; (2) placing topsoil whenever feasible or roughening the surface to improve conditions for plant growth); (3) seeding the area with a mix of grasses, alfalfa and clover; and

[3] Ownership records are current as of 2015 and are based on Caribou County Geographic Information Systems (GIS) data from 2009, supplemented with Simplot records. Land currently owned by Simplot within the Blackfoot Bridge Project Boundary is being negotiated for purchase by Monsanto (see Figure 2-1).

[4] Waste rock is the rock that was removed during underground mining to access ore. Mill tailings are the solid byproduct (i.e., finely milled host rock material) of the beneficiation process (e.g., milling). The tailings material is what remains after the economically valuable ore has already been extracted. All these materials contain the seleniferous Waste Shale and Mudstones.

(4) fertilizing the area with inorganic fertilizers. Reclamation activities were halted in the late 1990s and some unreclaimed piles remain on the Site. In addition, Simplot regraded and constructed Dinwoody Formation soil covers over an area of 147 acres in the Pedro Creek Sub-Basin (Figure 2-2). A pile was regraded to facilitate the construction of a Plant Selenium Uptake Field-Scale Pilot Study (FSPS) under the RI, and another pile was re-graded as part of a Non-Time-Critical Removal Action (NTCRA). The NTCRA was performed under a Settlement Agreement/Consent Order (SA/CO) (IDEQ/EPA/BLM 2012). Both the NTCRA and FSPS piles were seeded with low-selenium-accumulating grass species.

2.2 Climate and Setting

The Site is located along the north-south trending Aspen Range just north of Trail Canyon (Figure 1-2). Elevations range from approximately 6,200 feet (ft) above mean sea level (AMSL) at the Former Townsite to approximately 7,700 ft AMSL on Woodall Mountain. The Aspen Range divides the Site, with the eastern and northern portions forming part of the Blackfoot River basin and the west side of the range forming part of the Bear River basin (Figure 2-2). Most of the Mined Area around the Former Townsite and south to Trail Canyon is located on generally west-facing slopes that are drained by small basins towards the Former Townsite or to Trail Canyon. The northern portion of the Mined Area is located along the ridge of Woodall Mountain with runoff flowing west towards the Agrium facility, east towards Trail Creek and north to the Blackfoot River. The western Woodall Mountain and Trail Canyon drainages are part of the Bear River Basin. State Land Creek, Pedro Creek, and Camp G Creek drainages, on the eastern side of Woodall Mountain, are in the Blackfoot River Basin.

2.2.1 Climate

The climate in the area is dominated by cool and relatively dry weather, with precipitation of approximately 21 inches annually (Western Regional Climate Center [WRCC] 2012). Total snowfall averages about 110 inches each year (WRCC 2012). The snow cover typically remains on the ground from November to March. Summer temperatures are mild, normally ranging from 42 to 80 degrees Fahrenheit, with the highest temperatures occurring in July. Winter temperatures normally range from 9 to 40 degrees Fahrenheit, while spring and fall months range from 16 to 72 and 9 to 70 degrees Fahrenheit, respectively. Soda Springs, which is at an elevation (5,800 ft AMSL) significantly lower than the Site, has an average of only 70 frost-free days (Love et al. 2009). The growing season at the Site, at best, extends from late May to September with the first frost generally occurring in early September.

2.2.2 Geology, Hydrogeology, and Hydrology[5]

The topography at the Conda Mine is dominated by Woodall Mountain ridge and its foothills, with a small area comprised of valley floors.

Geology – Woodall Mountain ridge is comprised of Phosphoria Formation (i.e., Meade Peak Member [host of the phosphate ore rock] and Rex Chert Member) and Wells Formation rock (Figure 2-3). The foothills are comprised of Salt Lake Formation, Dinwoody Formation, Phosphoria Formation and Wells Formation rock. The valley floors include a mix of alluvial/colluvial material deposited on top of the bedrock units (e.g., Olivine Basalt, Salt Lake Formation, Thaynes Limestone, Dinwoody Formation, Phosphoria Formation [including Rex Chert and Meade Peak Member], and Wells Formation) (Figure 2-3). There are several faults in the area (Figure 2-3).

Hydrogeology – Groundwater occurrence at the Site can be separated into three hydrostratigraphic systems (Figure 2-4):

- Shallow Hydrostratigraphic System - A shallow/uppermost interconnected system within the unconsolidated deposits along the transition zone from the mountain front into the valley floors as well as within the valley floors;
- Intermediate Hydrostratigraphic System - A system in the upper consolidated deposits stratigraphically above and including the Meade Peak Member; and
- Deep Hydrostratigraphic System - A system forming part of the regional Wells Formation aquifer.

The shallow hydrostratigraphic systems are not vertically extensive in proximity to the mining-disturbed areas and therefore cannot yield adequate volumes of groundwater to serve as potential sources for domestic water supply. The deeper consolidated formations (e.g., Olivine Basalt, Salt Lake, Dinwoody, and Wells formations) are generally the most capable of yielding the amount of groundwater necessary for potential domestic water supply use.

Hydrology – As previously described, a number of local drainages exist along the western and eastern portions of the Site. Drainages along the eastern and northern portions of the Site flow into the Blackfoot River Basin, and drainages along the western and southern portions flow into the Bear River Basin (Figure 2-2). The Blackfoot River flows into the Blackfoot River Reservoir located approximately 10 miles northwest of the Site.

The southwestern and southern portions of the Site consist of much smaller drainages than those comprising the northern and eastern portions of the Site. The southwestern and southern

[5] For an in-depth description of the geology, hydrogeology and hydrology at the Site, refer to Section 5 of the Final RI Report (Formation 2016).

drainages are generally dry, but when they do carry flow, it is lost to infiltration before leaving the Mined Area. The drainages within the eastern portion of the Site include the intermittently flowing State Land, Pedro, and Camp G Creeks (Figure 2-2). Flow in the upper reaches of these water bodies is often lost to the subsurface and then resurfaces downstream. The headwaters of all these waterbodies are located at elevations ranging from 6,800 feet to 7,200 feet. Camp G Creek, Pedro Creek and State Land Creek do not have any special State or Federal designations that significantly restrict their use. The USFS did not note these drainages to be eligible for designation as Wild and Scenic Rivers (USFS and National Park Service [NPS] 1998). State Land Creek is listed as impaired under the Clean Water Act (CWA) 303(d), based on selenium and sediment from the headwaters on Woodall Mountain to the confluence with the Blackfoot River to the northeast, a distance of approximately 9 miles (IDEQ 2014). However, for sediment, State Land Creek is in Category 4 (a) - waters not supporting one or more beneficial uses but a Total Maximum Daily Load (TMDL) is completed and approved by USEPA, as described in the 2013 TMDL addendum report (IDEQ 2013). The drainages and ponds at the Site are subject to IDEQ water quality criteria (standards) for designated cold-water biota use.

Other waterbodies include:

- Features containing water year round such as the New Tailings Pond (utilized as a water reservoir for the ore-slurry pipeline), the Hoorah Hollow Pond, the Pit Lake, the FSPS sedimentation basin, livestock watering pond PCP-2, and the NTCRA NES-5 Seep Collection Pond.

- Features containing seasonal runoff such as the NTCRA sedimentation ponds, pooling areas for use in livestock watering, and other pooling areas throughout the Site.

The Blackfoot River from its headwaters area (approximately 15 miles upstream [east] of the Site) to the Blackfoot Reservoir is identified as impaired under CWA Section 303(d), based on concentrations of selenium, sediment, dissolved oxygen, and high temperatures (IDEQ 2014). For selenium, the Blackfoot River is in Category 5 which is the list of impaired water bodies under the Clean Water Act Section 303(d). For sediment and temperature/dissolved oxygen, the Blackfoot River is in Category 4(a) (IDEQ 2015), but a TMDL is completed and approved by USEPA.

2.2.3 Ecology/Biology

The general ecological/biological setting of the Conda Mine presented in this subsection is based on field observations and focuses primarily on factors that favor human activities (e.g., game hunting, fishing, and plant gathering)[6] for consumption. Figure 2-5 depicts the general types of vegetation cover present at the Site. Information on ecological/biological setting is

[6] Other biotic organisms present at the Site are described in the Site-Specific Ecological Risk Assessment (SSERA) (Formation 2012b).

presented in greater detail in the Draft Final Site-Specific Ecological Risk Assessment (SSERA) BPF (Formation 2012b).

Wild Game – The Site includes terrestrial habitats supporting healthy conifer-aspen, mountain brush, and sagebrush-grass communities. The vegetation community provides habitat for a variety of wildlife species. Ungulates frequenting the area, primarily during spring through fall, include mule deer (*Odocoileus hemionus*), elk (*Cervus elaphus*), and moose (*Alces alces*). Game birds potentially found in the area are Hungarian partridges (*Perdix perdix*), chukar partridges (*Alectoris chukar*), blue grouse (*Dendragapus obscurus*), ruffed grouse (*Bonasa umbellus*), and greater sage grouse (*Centrocercus urophasianus*) (Formation 2012b).

Fish – As previously described, State Land Creek, Pedro Creek, and Camp G Creek are non-perennial in the upper reaches, flowing only occasionally due to runoff from snowmelt or rain. All three are perennial in the lower reaches (i.e., where influenced by the Blackfoot River and Trail Creek). As a result of the small size of Site drainages and low water availability, the aquatic environments at Conda do not support substantial fisheries or benthic invertebrate communities. Fish species recorded in the lower reaches of the drainages consist of speckled dace (*Rhinichthys osculus*) and redside shiners (*Richardsonius balteatus*), with some sculpin (*Cottus* spp.) and suckers (*Catostomus* spp.). No salmonids (trout) were found. Habitat and temperature factors, among others, limit the presence of salmonid species in these drainages (Formation 2012b). The Blackfoot River and its tributaries upstream from the Blackfoot Reservoir are designated as "catch and release" for cutthroat trout (Idaho Department of Fish and Game [IDFG] 2012).

Culturally-Significant Plant Species – The Area-Wide Human Health Risk Assessment (AWHHRA) identified aquatic and terrestrial plant species that members of the Shoshone-Bannock Tribe in the region either ingest or use to brew teas (cited as Tetra Tech EM, Inc. [TTEMI] 2001 in TTEMI 2002). The culturally-significant species identified include two aquatic species – watercress (*Nasturtium officinale*) and water buttercup (*Cara photomycetin*),[7] and four terrestrial species – wild onion (*Allium canadense*), bitterroot (*Camus* spp.),[8] golden sage (*Artemisia* spp.),[9] and red willow (*Salix* spp.) (TTEMI 2002).

[7] The scientific name for water buttercup (*Cara photomycetin)* provided in the AWHHRA was not found in botanical literature and so it is unclear what species was actually collected. To evaluate aquatic plant ingestion pathways, the AWHHRA used watercress concentrations to evaluate aquatic plant ingestion pathways because it was judged that human receptors were more likely to ingest watercress than water buttercup, and contaminant concentrations in water buttercup were similar to levels detected in watercress samples. Therefore, receptor-specific exposures to contaminants in water buttercup were not considered in the AWHHRA.
[8] The scientific name for bitterroot (*Camus* spp.*)* provided in the AWHHRA does not exist in botanical literature and so it is unclear what species was actually collected for use in the AWHHRA. Alternatives could be bitterroot (*Lewisia redivia*) or wild camas (*Camassia quamash*), both of which can be used by Native Americans. The AWHHRA indicated that samples of bitterroot were collected only from unimpacted zones; therefore, receptor-specific exposure to contaminants in bitterroot was not considered in the AWHHRA. No bitterroot or wild camas was seen at or collected from sampling locations at the Site.
[9] The scientific names for golden sage (*Artemisia* spp.) and red willow (*Salix* spp.) are provided as genus only (i.e., general) and so the actual species collected for the AWHHRA are unknown. To evaluate tea ingestion pathways, the AWHHRA apparently used sage and willow concentrations, but the tables do not provide enough detail to determine if both sage and willow were used. Species in the sage and willow genera are abundant at the Site.

Observational vegetation surveys were conducted to evaluate the presence of these culturally-significant plants. The survey identified watercress and wild onion, each at only one location. Watercress was identified in the Non-Mined Area, at one small spring along the banks of Camp G Creek where there tends to be perennial flow. A small population of wild onion (specifically Geyer's onion – *Allium geyeri*[10]) was found in the Non-Mined Area along Pedro Creek (at location PC-2). Since no other populations of watercress or wild onions were found at the Conda Mine Site, these culturally-significant plants are not considered to be abundantly available at the Site. Sage and willow are more common at the Site.

The Shoshone-Bannock Tribes (2014, 2016) have recently provided a listing of culturally-significant plant species that are found in their indigenous areas, which can serve as an additional source of cultural information. Table 2-1 provides a summary of the culturally-significant plants listed in Attachment 1 of Shoshone-Bannock Tribes (2016) and identifies which of those plants have been observed or sampled at the Site.

2.3 Land Use

The predominant land uses in and around the Site are associated with natural resource development, agricultural production, livestock grazing, and recreational use. Residential use in the vicinity of the Site is limited in occurrence relative to natural resource development, agricultural production, livestock grazing, and recreational/cultural uses.

Mining and Minerals – Phosphate mining, while not a dominant land use in terms of acreage, is economically important. A significant amount of un-mined Phosphoria Formation remains at the Conda Mine (Figure 2-3), and the area surrounding the Site continues to be used and developed for mining (Figure 2-1).

Recreational – Recreational use of public lands is also considered economically important in the region and includes hunting, fishing, camping, hiking, skiing, and snowmobiling, among others. As most of the Site property is private (Figure 2-1), hunting and other recreation uses on those lands is primarily by landowners or by invitation only. Although hunters must be accompanied by a Simplot escort while within the Mined Area, BLM-managed land within the Non-Mined Area is accessible for hunting by the general public.

Agricultural and Livestock Use – Crop production (wheat and hay) and livestock (sheep and cattle) ranching are the dominant agricultural and ranching activities outside the perimeter of the Mined Area (i.e., in the Non-Mined Area). Livestock grazing on private and BLM-managed property is a current and anticipated future land use at the Site. Livestock grazing on BLM grazing allotments within the Mined Area (see below) is currently not permitted.

[10] Although this is not the same species noted in the AWHHRA, *Allium geyeri* is a species in the same genus, is also commonly called "wild onion", and is known to be edible.

Seven BLM grazing allotments fall within the Site: Conda Mine, North Sulfur and Trail[11], Trail Canyon-1, Trail Canyon-2, Woodall Mountain, Woodall Ranch, and Woodall Spring (Figure 2-6) (BLM 2010, 2012a, 2012b).[12] Livestock grazing within these allotments is permitted for sheep and cattle. Horses are also pastured and used for ranching activities in the grazing allotments. The allotment number, class of livestock, season of use, and animal unit month (AUM),[13] are reported for each allotment on Table 2-2. Table 2-2 also presents acreage of each grazing allotment within the Mined Area and Non-Mined Area and approximate percentages of land ownership.

The BLM does not prescribe grazing methods for the ranchers using the allotments. The ranchers are required to follow the Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management (BLM 1997). Grazing in some of the BLM allotments has been partially restricted by the BLM Pocatello Field Office (PFO) due to elevated selenium concentrations in water and plants (BLM 2012a).[14] The BLM PFO Approved Resource Management Plan (ARMP) (BLM 2012a) specifies that closures will remain in place until selenium can be reduced to acceptable levels through containment or capping. All of the allotments, except the Conda Mine allotment, are identified in the BLM ARMP (refer to Figure 12) as being "potentially impacted by selenium." BLM's ultimate goal is to return the BLM-managed public land to its multi-use status.

There are no year-round or seasonal residents or ranchers living within the Mined Area of the Site. One operating seasonal ranch is located within the Non-Mined Area of the Site. Ranching occurs five months on the Site from late May through late October, and ranchers reside elsewhere for the remainder of the year. The rancher who used to seasonally run operations was interviewed to obtain basic information about livestock grazing at the Site. The rancher conveyed that they only grazed sheep and cattle, and that they would also use horses on the ranch. The livestock grazed on private land as well as BLM and USFS allotments. Permission to graze on these allotments was obtained through application. Horses were also used during the movement of sheep and cattle and therefore grazed on the Site. Seasonal grazing operations by the rancher included approximately 1,000 ewes and lambs grazing on about 50 acres per day. The rancher noted that grass tended to be the preferred vegetation for the grazing livestock; however, published literature indicates that cattle and sheep do not have the same grazing patterns, with sheep preferentially grazing forbs over grasses. Springs, ponds, and creeks served as a water source for the livestock. Salt was administered to the livestock as a dietary supplement and the rancher explained that selenium was no longer added to the salt.

[11] Only a very small portion of the North Sulphur and Trail (BLM) grazing allotment is in the Site (47 acres) and so this allotment is not discussed further in this document.
[12] There is one USFS grazing allotment (North Sulphur) in the vicinity (Figure 2-1) but only a very small portion of this allotment is in the Site (99 acres) and so this allotment is not discussed further in this document.
[13] Grazing use by livestock is measured in terms of AUMs. One AUM is equal to the amount of forage used to support one cow and one calf for one month (approximately 800 pounds of forage).
[14] Sheep grazing is restricted on approximately 1,328 total acres: 71 percent of the Woodall Mountain, 40 percent of Trail Canyon-1, and 13 percent of Trail Canyon-2 grazing allotments, based on calculations of acres of public land affected by selenium in each allotment (BLM 2010).

The livestock were raised for meat (cattle and sheep) and wool (sheep). The sheared wool was sent directly to a brokerage in Salt Lake City and was distributed to Russia or Eastern Bloc countries. The animals were sent to Colorado for slaughtering and the meat was then distributed throughout the western and eastern US. The status of future ranching, beginning in May 2016, is uncertain, since the Jouglard Sheep Company may no longer be ranching in the area.

Residential – The closest population center to the Conda Mine is the town of Soda Springs, Idaho, approximately 8 miles southwest. The town of Soda Springs has a population of approximately 3,056 (US Census Bureau 2010). Residents do not occupy the Mined Area. One year-round resident lives within the Non-Mined Area. Based on property ownership, Site conditions, and regional knowledge, future residential land use is expected to be similar to current use. Future development of residences on the Mined Area is unlikely because of the current land ownership, the presence of mineable ore, steep sloping bedrock outcrop areas, the lack of conveniently-available potable water, and population growth trends (i.e., lack of increased development of rural areas outside of Soda Springs). The overburden piles are not suitable for residential development because of slope angles and the geotechnical properties of the overburden rock. Given the current land use and conditions, it is unlikely that the ownership will change. Simplot controls private lands where most of the mining occurred, and based on historic and current management practices for State and Federal lands, as well as the same physical constraints identified for private land, surrounding public lands will remain unavailable for residential use. Regardless, a hypothetical future residential scenario will be evaluated as part of the SSHHRA, per Agency request.

Cultural – Shoshone-Bannock Tribal members have treaty-reserved rights to hunt, fish, gather, and conduct ceremonies on Federal unoccupied lands in the region, as summarized in the BLM PFO Final Environmental Impact Statement (FEIS) (BLM 2010, 2012a). The USEPA, BLM and other Federal agencies acknowledge the treaties, statutes, executive orders, and the historical relations between the US and American Indian tribes, and have a legal trust responsibility for the protection of tribal lands, assets, resources, and treaty rights. The relationship between the US government and American Indian tribes is based on legal agreements between these sovereign nations. The 1867 Executive Order provided for the establishment of the Fort Hall Indian Reservation, and the 1868 Fort Bridger Treaty affirmed the reservation as a homeland for the Shoshone-Bannock Tribes. Subsequently, a series of land cessions occurred, and the present-day reservation boundaries were established in 1900. Even though the Shoshone-Bannock Tribes relinquished ownership of these lands involuntarily, the 1868 Fort Bridger Treaty reserved off-reservation treaty rights to tribal members, which include gathering, hunting, fishing, and practicing tribal cultural activities on unoccupied public lands (BLM 2010, 2012a), including those in and around the Site.

Current and Potential Future Water Uses – A survey of domestic wells and springs potentially utilized for drinking water within a 5-mile radius of Conda was completed through a search of

well permit records. Figure 2-7 depicts private parcels in the vicinity of the Site, with domestic wells identified where present. Two current uses of groundwater for domestic water supply currently exist within the Site: the Simplot culinary well (GW-11) and the springs used for water at the Jouglard ranch (represented by sampling locations JS-1 and JRLD). The potential domestic water supply dataset described further in Section 3.1 includes samples collected from all groundwater wells (except the two Meade Peak Formation wells because the Meade Peak Formation is an aquitard with low permeability and does not readily transmit water), all springs, and surface water of the French Drain and Hoorah Hollow Pond (sustained by discharging groundwater).

2.4 Summary of Environmental Conditions

This subsection summarizes findings of the ongoing RI with respect to COI sources, transport pathways, and potential exposure routes at the Conda Mine. Additional detail is provided in the Final RI Report (Formation 2016).

2.4.1 Sources of COIs

Mudstone and Waste Shale present in the Meade Peak Member of the Phosphoria Formation (ore body) are naturally enriched in selenium and other COI. The excavated Mudstone and Waste Shale units, were placed in overburden piles within Overburden Disposal Areas (ODAs) and waste rock piles; together with Dinwoody Formation, Rex Chert Member, and Wells Formation rock. Tailings, being the finely milled non-economically valuable host rock material generated during the beneficiation process, also contain the aforementioned materials. When the Mudstone and Waste Shale are exposed to air and water, chemical weathering (primarily oxidation) of the metal-sulfide minerals occurs, and selenium and other COIs associated with the minerals can be released and transported into the environment. Uranium, as part of naturally occurring radioactive materials, can be elevated in phosphate ore from southeastern Idaho as well as other parts of the US and world. Radionuclides can become concentrated in wastes during mining and beneficiation as well as mineral processing.

The overburden piles have the greatest amounts of Mudstone and Waste Shale materials, largest aerial extent, and greatest concentrations of selenium and other COIs. The material properties of the overburden piles allow for percolation of precipitation through the weathered Mudstone and Waste Shale, therefore releasing the greatest mass of COIs directly into groundwater and surface water. Tailings are limited in extent and are lower in selenium concentrations compared to the overburden piles. However, the fine-grained particle size of the tailings reduces exposure to the weathering effects of air and water and thus lower amounts of COIs are released into groundwater and surface water. Waste rock piles generated during the underground mining operations are smaller in extent and are lowest in selenium and COI content.

Additional detail is provided in Section 6 of the Final RI Report (Formation 2016).

2.4.2 Transport of COIs

Transport of COIs released at the abovementioned sources is predominantly via shallow groundwater and surface water interaction. Sediment transport can occur as a result of erosion during runoff events. Selenium uptake by plants growing on RMM (e.g., overburden piles, waste rock, and tailings), although not considered physical transport, represents a potential exposure pathway to receptors. Air transport of overburden dust particles from the overburden piles is negligible, and transport to riparian soils is limited.

Surface Water and Sediment Transport – Transport of COIs from the Mined Area into the surrounding surface water and sediment at the Site is most significant along the east side of Woodall Mountain. Of the COIs, selenium exceeded comparison values at locations from State Land and Pedro Creek's headwaters to their confluences with the UBR and Trail Creek, with locations in close proximity and downgradient of the overburden piles exhibiting higher concentrations. Camp G Creek has the lowest extent of adverse effects due to mining-related releases. Transport of COIs into the drainages along the west side of the Site is limited given the topography and configuration of the overburden piles and tailings source materials.

Conda mining-related impacts on the UBR are greatest during periods of high runoff when contaminated surface water and sediment in State Land Creek and Pedro Creek can reach the UBR. In general, average selenium surface water and sediment concentrations in the UBR do not indicate a measureable change between locations upgradient and downgradient of the Site (Formation 2016, US Geological Survey [USGS] 2015). There are no surface water releases on the West Side of the Aspen Range and sediment concentrations at the mouths of the dry drainages are below comparison values.

Groundwater Transport – Impacts to shallow groundwater in the eastern part of the Site have occurred in groundwater in proximity to the overburden piles. Horizontal transport in groundwater is mostly in shallow hydrostratigraphic systems and limited with the individual extent of the drainages along both the east and west sides of the Aspen Range. The groundwater plumes, containing elevated COI concentrations, in the shallow hydrostratigraphic system along the east side of the Aspen Range do not appear to have extended beyond the second set of foothills. The groundwater plumes in the shallow hydrostratigraphic system along the west side of the Aspen Range do not appear to have extended much beyond the New Tailings Pond northward or westward, or much westward beyond the meadows area (Formation 2016).

Some impacts have been observed in the intermediate hydrostratigraphic unit in the eastern part of the Site but to a lesser lateral extent when compared to the shallow unit. The groundwater plumes, containing elevated COI concentrations, in the intermediate

hydrostratigraphic system along the east side of the Aspen Range do not appear to have extended beyond the first set of foothills. The groundwater plumes in the intermediate hydrostratigraphic system along the west side of the Aspen Range do not appear to have extended beyond the Site boundary, based on concentrations measured in off-Site wells.

Impacts to groundwater from the deeper hydrostratigraphic unit (i.e., the Wells Formation), does not appear too widespread. COI concentrations in the Wells Formation are generally below Maximum Contaminant Levels (MCLs). As indicated by the data from monitoring wells which have elevated selenium concentrations, but still at or below the MCL, groundwater plumes within the Wells Formation are likely limited to areas within or immediately adjacent to the footprint of ODAs lying atop outcrop areas. Releases into the regional Wells Formation groundwater are likely to undergo dilution and dispersion when coming in contact with clean recharge from surrounding undisturbed Wells Formation outcrop areas, as well as due to the long flow paths from the sources to the regional water table.[15]

Plant Uptake – The overburden piles and tailings areas contain vegetation with the highest selenium concentrations. The greatest direct uptake of selenium and other COIs occurs where vegetation is growing in Mudstones and Waste Shale. However, a contributing factor is the type of vegetation. For example, selenium hyperaccumulators can have relatively high concentrations of selenium, even when not growing directly on Mudstones and Waste Shale. Plants growing on parts of the overburden piles containing higher amounts of Dinwoody Formation or Wells Formation materials, relative to Mudstones and Waste Shale, accumulate less selenium.

Terrestrial and Aquatic Biota – In general, concentrations of selenium and other COIs were highest in biota collected closest to the source material, and decreased with increasing distance from the source material.

Physical habitat quantity and quality of streams in and around the Site are limited, primarily due to the low flow regimes and grazing effects. Headwater areas tend to be ephemeral or intermittent, and viable habitat to support a fish population is limited. Habitat quality during late summer and early fall diminishes even further due to reductions in flow. Fish can be present in State Land, Pedro and Camp G Creeks, near their confluences with the UBR. Typical fish species in the creeks consist of speckled dace (*Rhinichthys osculus*) and redside shiners (*Richardsonius balteatus*), with some presence of sculpin (*Cottus* spp.) and suckers (*Catostomus* spp.). No salmonid species (e.g., trout) have been observed during Site surveys. Habitat quality and quantity may be the limiting factor for salmonid species in State Land, Pedro and Camp G Creeks. No historical data were found reporting the presence of Yellowstone cutthroat trout (YCT) (*Oncorhynchus clarkii bouvieri*) in State Land, Pedro, or Camp G Creeks,

[15] Data from a Wells Formation well installed at the edge of an overburden pile atop Woodall Mountain, indicate that selenium concentrations in the locally recharged groundwater is approximately 5 mg/L.

although YCT are present in the Blackfoot River. Flow, other habitat limitations, and/or water quality may limit YCT in State Land, Pedro, and Camp G Creeks.

Additional detail is provided in Section 7 of the Final RI Report (Formation 2016).

3.0 DATA REVIEW AND SCREENING-LEVEL EVALUATION

This section summarizes the evaluation process used to select the data suitable and appropriate for use in the SSHHRA, as well as the steps used to identify HH COPCs from the COIs (Table 3-1). USEPA guidance (USEPA 1989) identifies several steps for HH COPC selection including: data review, frequency of detection, and COI screening. Exceedance of the screening levels does not necessarily mean that the HH COPCs are contaminants that have been released from the Site, or that they represent unacceptable risk to humans. Rather, HH COPCs are the chemicals for which more extensive risk assessment is necessary in order to make informed risk management decisions.

3.1 Risk Assessment Data Set

The data evaluated for use in the SSHHRA include the most up-to-date RI dataset, as presented in the Final RI Report (Formation 2016),[16] and the addition of 2015 soil and vegetation samples collected from the NTCRA area.

3.1.1 Data Quality Evaluation

The data quality evaluation process included evaluating the sample collection, handling, analysis, as well as quality assurance/quality control (QA/QC) procedures. In addition, previous data quality evaluations performed by other investigators or data users were evaluated when available. The data evaluation process was performed consistent with the methods prescribed in the *Risk Assessment Guidance for Superfund (RAGS) (Part A)* (USEPA 1989) and *Guidance for Data Useability in Risk Assessment (Part A)* (USEPA 1992a). Only data that were determined to be of appropriate quality were used in the risk evaluation. Data usability was also evaluated based on the quality of the data, the source of the data, whether the data was authored, generated, distributed, or reviewed by the Agencies, and the intended use of the data. In general, laboratory data and field measurements not collected under documented standard protocols by a government agency, consulting firm or university research group were used qualitatively, where appropriate.

Only data that have been validated with verifiable validation protocol, originated under documented standard protocols by a government agency, consulting firm, or university research group were identified as of appropriate quality for risk assessment exposure calculations.[17]

[16] A detailed description of the investigations conducted under the RI, along with available data and data quality, is provided in the Final RI Report (Formation 2016).

[17] QA/QC samples such as duplicates were not included, but rather were evaluated as part of the QA/QC evaluation to confirm accuracy and precision in the analytical methods. Validated data qualified as “J” flag (estimated below the method detection limit but positively identified) are included while rejected data noted with an “R” flag were not included per USEPA guidance (USEPA 1989 and 1992a).

These data provide appropriate chemical, exposure, spatial and temporal representativeness for this risk assessment, and are included in Appendix B.

3.1.2 Data by Media

Data that were identified in the data quality evaluation process as of appropriate quality for the SSHHRA were segregated by media. Figures 3-1 through 3-10 show the locations from which associated data was used in this SSHHRA. Not all media sampled for the RI are applicable to the SSHHRA (e.g., terrestrial insect, small mammal tissue, benthic macroinvertebrate/periphyton, and fish). No livestock or wild game COI-tissue data were collected for the purposes of the SSHHRA.

Soil – Surface soil data are from spatially distributed locations representing Site conditions (Figures 3-1 through 3-4), and were separated into two subgroups for comparison: soils from source areas or source materials and soils from Non-Mined areas. Soils from the Mined Area include samples collected from RMM which include waste rock, overburden piles, tailings, etc. Soils from the Non-Mined areas include samples collected within the grazing areas from upland soils near Site drainages, soils from the haul roads, and soils within the Former Townsite. For the purposes of the SSHHRA, surface soil samples from both areas were included in the evaluation. Soil samples at the Site have been collected from a variety of depth intervals to accomplish different sampling objectives (e.g., assessment of nature and extent of COIs, and soil properties for cover materials). As such, the surface soil samples representing the uppermost conditions vary in depth intervals. Table 3-2 describes the intervals for the samples used in this evaluation. Out of 332 samples used, the majority of surface soil samples are from the uppermost 8 inches in areas with RMM, as follows:

- 171 samples from 0 to 2 inches;
- 109 samples from 0 to 4 inches; and
- 2 samples from 0 to 8 inches.

Samples collected from pristine Dinwoody Formation outcrop areas to evaluate the extent of low-seleniferous materials available for approved soil-cover construction, as well as samples collected from the NTCRA and FSPS soil covers, were also used in the SSHHRA. Only the uppermost depth intervals of the samples collected to evaluate these cover materials were used (Table 3-2), for a total of 5 samples from 0 to 2 inches, 1 sample from 0 to 12 inches, 4 samples from 0 to 6 inches, and 11 samples from 0 up to 18 inches. The uppermost samples collected from the Rex Chert borrow areas were from 0 to 6 inches (4 samples). Finally, there were 25 roadway samples collected from 2 to 12 inches to evaluate whether the roads were constructed with seleniferous materials. These are included for exposure estimates related to dust generated from vehicle travel. If a location had been sampled more than once, the most recent data was used. Source material (i.e., samples collected from the RMM), soil, and “dry”

sediment, were assessed together (and henceforth referred to collectively as soil) since it is assumed that exposure to these materials would be similar.

Vegetation – Terrestrial and aquatic vegetation data are included in the risk assessment because human health receptors may potentially be exposed to HH COPCs in these media directly (e.g., tea ingestion) or indirectly (e.g., via consumption of livestock and wild game). The vegetation dataset used for modeling exposure to livestock and wild game, includes both washed samples (terrestrial vegetation) and unwashed samples (aquatic vegetation). Because wild game and livestock may ingest soil adhered to (unwashed) vegetation, their soil ingestion rates were adjusted (as described in Section 4.5.3) to account for this type of soil exposure when modeling game and livestock concentrations as discussed later in this report. The sage and willow dataset used for modeling exposure via tea preparation of culturally-significant plants includes only washed samples. The data available for evaluation of direct consumption of culturally-significant vegetation includes primarily unwashed samples. Although some human receptors may rinse soil from vegetation prior to consumption, Native American receptors may not rinse vegetation prior to use. So, using results from washed or unwashed samples could potentially underestimate or overestimate exposure to HH COPCs via these pathways, depending on how individuals prepare teas or food. Figures 3-5 through 3-8 present the locations with data included in the modeling of dietary exposures for this SSHHRA.

Surface Water – The surface water dataset includes samples collected from the largely ephemeral drainages, ponds, seeps and springs (Figure 3-9).

Groundwater for Domestic Water Supply – As described in Section 2.3, only two current uses of groundwater for domestic water supply currently exist within the Site: the Simplot culinary well (GW-11) and the springs used for water at the Jouglard ranch (represented by sampling locations JS-1 and JRLD). The potential domestic water supply evaluated in this SSHHRA was based on samples collected from all groundwater wells (except the two Meade Peak Formation[18] wells because the Meade Peak Formation is an aquitard with low permeability and does not readily transmit water), all springs, and surface water of the French Drain, and Hoorah Hollow Pond (both sustained by discharging groundwater). Data from the seasonal seeps, Pit Lake,[19] and seasonal surface water ponds are not included. Figure 3-10 presents the locations included in the domestic water supply evaluation.

3.2 Selection of Human Health Chemicals of Potential Concern

The HH COPCs were selected in this evaluation through the screening process, consistent with USEPA guidance (USEPA 1989). None of the COIs (Table 3-1) were detected infrequently in

[18] Wells GW-22-MM and GW-23-MM

[19] The Pit Lake receives water from incident precipitation, runoff from the surrounding area, and moisture in the Meade Peak. Monitoring well GW-33 represents potential conditions in a hydrostratigraphic unit that could potentially sustain domestic water use.

all media, and none were consistently measured in blank samples, and therefore did not influence the elimination of compounds. Comparisons to background concentrations and evaluation of non-Site related data are discussed further in the uncertainty analysis and are provided for context where appropriate. Some of the COIs are considered essential nutrients for human health, and most of them are required, at low levels, for essential body functions.

Screening of inorganic COIs was conducted for Site-wide environmental media, which includes all data identified to be usable and appropriate for the risk assessment as previously described. The screen was conducted separately for soil, surface water, and domestic water supply. Table 3-3 presents summary statistics for the inorganic COIs in these Site-wide media. The Site-wide dataset was also divided into Non-Mined Area data and Mined Area data for supplemental screening; comparing the screening evaluations between the Mined and Non-Mined Areas data can provide helpful information. For organic COIs, a separate screening evaluation of the Townsite was performed because this is the only area where organic compounds were analyzed. Table 3-4 presents summary statistics for the organic COIs in soils and domestic water supply in the Townsite area.

The Screening-Level Values (SLVs), described in greater detail in Section 3.2.1 and summarized in Table 3-5 (inorganic COIs) and Table 3-6 (organic COIs), are based on residential land use. Residential screening levels were used to minimize the chance of erroneously eliminating a COI and potentially underestimating risk in the quantitative evaluation.

The selection of HH COPCs was conducted by comparing maximum detected concentrations (MDCs) of COIs in environmental media (soil, surface water, domestic water supply) to risk-based SLVs, as described above and in the SSHHRA BPF (Formation 2012a). For non-detected COIs, the maximum detection limit was compared to the SLVs. COIs for which the MDC exceeded SLVs for one or more media were identified as HH COPCs and retained for detailed exposure and risk calculations. COIs for which SLVs are not available and COIs that were not detected in a given media yet had a maximum detection limit above the SLV were evaluated qualitatively, and are discussed in the uncertainty section (see Section 6.3).

Details of the media-specific screens are presented in Appendix C (Site-wide); Appendix D (Mined Area); Appendix E (Non-Mined Area); and Appendix F (Townsite Area organics). Summary statistics are provided in the screening tables for each COI and media to provide context with the maximum measured concentration and the SLV. Included in these tables are 95 percent upper confidence limits on the arithmetic mean (95UCLs). The calculation of the 95UCL considers the distribution and range of the dataset and provides a more reasonable maximum exposure (RME) estimate of the concentration, as compared to the MDC.[20] Appendix G presents output information from the USEPA ProUCL statistics program. For datasets with

[20] The USEPA ProUCL computer program (USEPA 2013) was used to conduct distribution testing and calculate the 95UCLs for COIs. The latest ProUCL package (version 5.0) includes computation methods (e.g., Kaplan-Meier) that can be used for datasets with non-detect values. The appropriate 95UCL was chosen based on the recommendations provided by ProUCL.

fewer than four detected values, or if the calculated value exceeded the MDC, the MDC was presented in the associated table as recommended by ProUCL. For non-detected COIs, the maximum detection limit was presented in the screening tables.

COIs that were eliminated during screening are considered to represent negligible risk for human health, and were not evaluated further (USEPA 1989). COIs for which the maximum concentrations exceeded SLVs were identified as HH COPCs and retained for further evaluation. The fact that an HH COPC was retained by the screening process does not indicate that it represents unacceptable risk or that remedial action will be required. Rather, it indicates that additional evaluation is needed to better characterize the level of risk and, if necessary, support risk management decisions.

3.2.1 Screening-Level Values

SLV sources varied based on exposure medium (soil, surface water, and groundwater) but were consistent with USEPA and IDEQ risk guidance. All SLVs are shown on Tables 3-5 and 3-6, and the final columns present the selected SLVs for each medium for use in the screen. Selected SLVs were generally the lowest value for a given medium when multiple values were available. These SLVs do not constitute identification of Applicable or Relevant and Appropriate Requirements (ARARs) for the Site. A list of ARARs were presented in the RI/FS Work Plan (NewFields 2008), and ARARs will be evaluated further in the FS.

Soil – The primary source of soil SLVs was the USEPA Regional Screening Levels (RSLs) table (USEPA 2016), using a target risk level of 1E-06 and a target hazard index of 0.1. The residential RSLs were used to screen soils. For some COIs, RSLs are available for both carcinogenic and non-carcinogenic effects. In these cases, the RSL with the lower concentration was selected. Where applicable, Tables 3-5 and 3-6 show both carcinogenic and non-carcinogenic RSLs and the RSL used in the screening. All inorganic COIs in soil had an SLV available.

Surface Water – The surface water SLVs (Table 3-5) were selected from a range of State and Federal sources based on the following hierarchy:

1. Idaho Administrative Procedures Act (IDAPA) Water Quality Standards for Human Health for Consumption of Water & Organisms (IDAPA 2015);

2. USEPA National Recommended Water Quality Criteria (NRWQC), Human Health for consumption of Water & Organisms (USEPA 2015a);

3. USEPA National Primary Drinking Water Regulations, including MCLs (USEPA 2015b); and

4. If one of the previous three sources did not provide an SLV, USEPA Tapwater RSLs (USEPA 2016), using a target risk level of 1E-06 and a target hazard index of 0.1, were used as source of alternate SLVs.

Screening for surface water was based on the total (non-filtered) fraction. All inorganic COIs in surface water had an SLV available.

Domestic Water Supply (Groundwater) – The groundwater SLVs used for domestic water supply screening (Tables 3-5 and 3-6) were obtained from the 2004 IDEQ Risk Evaluation Manual (IDEQ 2004). The benchmarks are either risk-based values or MCLs. If the IDEQ value was not available, alternate SLVs were obtained from USEPA Tapwater RSLs (USEPA 2016), using a target risk level of 1E-06 and a target hazard index of 0.1. Screening for groundwater was based on the total (non-filtered) fraction. All inorganic COIs in groundwater had an SLV available.

3.2.2 COIs Screened Out of the SSHHRA

This section summarizes which COIs screened out of the SSHHRA. As previously described, COIs were only screened out of the SSHHRA and eliminated from further evaluation if the MDC in all Site-wide media were below the SLVs (or Townsite Area, for organics). Detailed screening-summary tables for the Site-wide and Townsite Area are presented in Appendices Tables C.7 and F.5, respectively. Table 3-7 provides a summary of the Site-wide screening results.[21] Supplemental tables for the Non-Mined Area and Mined Area are in Tables D.7 and E.7, respectively.

Inorganic-Compounds Screening Results – Of the 24 inorganic COIs, five compounds were screened out of the SSHHRA: copper, fluoride, lead, mercury, and nitrate (Table 3-7 and Appendix C.7). Copper, fluoride, and mercury were not carried through to the risk evaluation step because they were measured below their SLVs in all media. Lead and nitrate are discussed qualitatively in this section. The other 19 COIs are evaluated quantitatively in the risk assessment.

Lead was not carried through the quantitative risk evaluation for the following reasons:

- In soil, lead concentrations exceeded the residential SLV of 400 milligrams per kilogram (mg/kg) at a frequency of less than 1 percent. The industrial screening level of 800 mg/kg was also exceeded at a frequency of less than 1 percent.

[21] Results of the Non-Mined Area and Mined Area supplemental screening evaluations are in Tables D.7 and E.7, respectively. Of note, boron, silver, and zinc concentrations did not exceed SLVs within the Non-Mined Area (Appendix D).

- In surface water, total lead concentrations in 1 out of 204 surface water samples (frequency of less than 1 percent) exceeded the residential ingestion SLV of 0.015 milligrams per liter (mg/L). It should be noted that comparing to a residential ingestion SLV assumes that surface water is used as the domestic water source, which is a conservative assumption. None of the dissolved lead concentrations in the surface water samples exceeded the residential SLV. In addition, none of the other total lead results for surface water samples were detected above the method detection limit.

- In domestic water supply (groundwater), total lead concentrations in 6 percent of samples exceeded the residential drinking-water-supply ingestion SLV of 0.015 mg/L. None of the dissolved lead concentrations in the domestic water supply samples exceeded the residential SLV.

- The detection frequency of lead in water samples was about 20 percent in total water samples and less than 10 percent in dissolved water samples.

- The 95UCLs for all three media were well below their respective residential SLVs.

Given the infrequent rate of detection and the relatively low dissolved lead concentrations in surface water and groundwater, it appears that the majority of the lead has low solubility and, low bioavailability (Agency for Toxic Substances and Disease Registry [ATSDR] 2007a). This suggests that lead at the Site would not be readily absorbed nor accumulate in the food chain. It appears from these multiple lines of evidence that lead is not a widespread contaminant at the Site and not likely to present an adverse risk. Therefore, it has been eliminated from further evaluation in the SSHHRA. It is likely that lead in groundwater will be included in the ARARs evaluation contained in the FS.

Nitrate was not carried through the quantitative risk evaluation for the following reasons:

- In surface water, 1 sample (NESeep7 Pond) out of 565 samples (frequency of less than 1 percent) had nitrate concentrations that exceeded the residential ingestion SLV of 10 mg/L. The other sample collected from that pond (NESeep7 Pond) had nitrate concentrations below the SLV. It should be noted that comparing to a residential ingestion SLV assumes that surface water is used as the domestic water source, which is a conservative assumption;

- In groundwater, one well (GW-19) had a nitrate concentration exceeding the SLV of 10 mg/L. Five nitrate results from GW-19 exceeded the SVL. None of the nitrate concentrations in the other 621 groundwater samples exceeded the SLV.

- The 95UCLs for nitrate in all media were well below their residential SLVs.

- Nitrate was not analyzed for the surface soil samples evaluated in this SSHHRA. However, nitrate concentrations measured in 64 other Site subsurface soil samples to 24 inches in depth (maximum concentration of 33 mg/kg) were all well below the SLV (13,000 mg/kg).

Given the infrequent rate of detection above SLVs, the limited spatial occurrence of these exceedances in surface water and domestic water supply samples, and because there are low nitrate concentrations in soil, it is unlikely that nitrate is a widespread contaminant at the Site or presents an adverse risk. Therefore, it has been eliminated from further evaluation in the SSHHRA.

Organic-Compounds Screening Results – As previously mentioned, the Townsite Area is the only area with the potential for the presence of organic compounds. Of the 133 organic COIs evaluated, low concentrations of 23 organic compounds were detected in soil samples and 3 organic compounds were detected in domestic water supply samples from the Townsite Area (Table 3-4). MDCs (or maximum non-detected concentrations) for all organic COIs were compared to SLVs; the results are presented in Appendix F and summarized on Table 3-8.

Of the 133 organic COIs, 105 compounds were screened out of the SSHHRA because the MDCs (or maximum non-detected concentrations) were lower than the SLVs for both soil and domestic water supply (Appendix F.5). The other 28 COIs are listed on Table 3-8, and these HH COPCs are discussed qualitatively in this section.

Twenty-five of the organic COIs were identified as uncertain HH COPCs and are discussed in the uncertainty section. These compounds included COIs for which SLVs were not available, and COIs that were not detected in a given media yet had a maximum detection limit above the SLV. Although there is uncertainty about the risk from these uncertain HH COPCs, it is believed that the impact of these uncertainties on overall risk estimates is minimal, since many of the organic COIs were not detected in the Townsite Area and most of the COIs had SLVs for at least one media. These uncertain HH COPCs were not carried through to the risk evaluation step but are discussed in the uncertainty section (Section 6.3).

Three COIs had soil MDCs that exceeded their respective SLVs and were identified as HH COPCs: benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene (Table 3-8, Appendix F.5). Although the soil concentrations exceeded residential SLVs (Appendix F.1), exceedances were based on non-detected and detected concentrations, none of these HH COPCs had soil concentrations above 1 part per million (ppm) (Table 3-4), and none were measured above industrial screening levels (which range from 0.29 to 2.9 mg/kg). Furthermore, the measured concentrations of benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h,)anthracene are similar to concentrations of these compounds measured in background soil from rural and agricultural areas (ATSDR 1995) and below concentrations of

these compounds measured in background soil from urban areas (Bradley et al. 1994; Kay et al. 2003; and Wang et al. 2004).

These organic compounds were not quantitatively evaluated in the SSHHRA because:

- The low concentrations measured in soil samples at the Site are less than background concentrations for urban areas and similar to those found in rural and agricultural areas;
- All measured concentrations of benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene are below industrial screening levels;
- Detected concentrations of benzo(a)pyrene exceeded the residential SLV in four of the twelve soil samples (frequency of 33 percent), and detected concentrations of benzo(b)fluoranthene and dibenzo(a,h)anthracene exceeded the residential SLV in 1 of the 12 soil samples (frequency of 8 percent);
- The relatively low frequency of detection despite the bias of the sampling program in this area; and
- None of these compounds were detected above SLVs in the domestic water supply samples.

3.2.3 Human Health Chemicals of Potential Concern Quantitatively Evaluated in the SSHHRA

As listed in Table 3-7, nineteen inorganic COIs in Site-wide media were identified as HH COPCs for quantitative evaluation in this SSHHRA: aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, iron, manganese, molybdenum, nickel, selenium, silver, thallium, uranium, vanadium, and zinc.

As listed in Table 3-8, several organic COIs were identified as HH COPCs or uncertain HH COPCs and evaluated qualitatively in the previous section. These compounds included COIs for which SLVs are not available, COIs that were not detected in a given media yet had a maximum detection limit above the SLV, and COIs that were detected infrequently, which could impart uncertainty in the evaluation. These COIs were evaluated qualitatively, and are noted in the uncertainty section (see Section 6.3).

A separate screening evaluation for radionuclides in Site-wide media was not conducted. Rather, because the uranium concentrations exceeded the SLV for at least one environmental medium and because radionuclides are of concern at many mining sites, uranium-238 plus decay products (U-238+D) were evaluated further in the quantitative risk assessment presented in Section 6.

4.0 EXPOSURE ASSESSMENT

Exposure assessment involves the determination or estimation of the magnitude, frequency, duration, and routes of exposure for estimating intake of HH COPCs by humans that contact affected environmental media at the Site (USEPA 1989). The objective of the exposure assessment is to estimate the type and magnitude of HH COPC exposures in a way that can be used, in combination with the toxicity assessment, to characterize the risk of adverse effects from exposure to Site-related releases.

The following sections present the CSM and identify potentially exposed receptor populations and associated exposure pathways, receptor-specific exposure factors for estimating intake of HH COPCs from environmental media, and methods for calculating EPCs and intake. Exposures were estimated using standard equations and methods consistent with risk assessment guidance from USEPA (USEPA 1989, 2011) and as described in the SSHHRA BPF (Formation 2012a). Details about EPCs and exposure estimate equations are provided in Appendix H.

4.1 Human Health Conceptual Site Model

The CSM (Figure 4-1 and Table 4-1) identifies the pathways by which humans can be exposed to HH COPCs and includes:

- Primary and secondary sources of HH COPCs;
- Mechanisms of HH COPC releases from these source areas and transport of the HH COPCs;
- Exposure media;
- Routes of exposure; and
- Exposure receptors.

Consistent with USEPA guidance (1989), the CSM identifies which pathways are (1) potentially complete, (2) potentially complete but probably result in insignificant exposure, or (3) incomplete. Those exposure pathways characterized as potentially complete and significant were the focus of evaluation in the SSHHRA. To be potentially complete, the primary elements of an exposure pathway must be present at the Site. Incomplete exposure pathways were not evaluated further in the SSHHRA. Complete but insignificant exposure pathways are assumed not to add appreciable risk relative to other complete exposure pathways.

The exposure pathways in the CSM were identified using data on HH COPC concentrations in environmental media; past, present and potential future use assumptions about the Site, and

USEPA guidance (USEPA 1989). This information was supplemented by interviews with local residents to help determine reasonable land use scenarios and whether pathways should be added or eliminated from the HH CSM (Appendix A).

4.2 Exposure Media

The primary source for HH COPCs at the Site is the RMM. Through weathering and leaching, HH COPCs are released in various degrees from the RMM and potentially transported via surface water runoff or infiltration to secondary source media of soil (including sediment), surface water, and groundwater. Through both the primary and secondary transport pathways, the HH COPCs can be found in the exposure media. Based on the results of sampling conducted for the RI as well as the expected transport pathways for the HH COPCs, the potential current and future exposure media at the Site include:

- Soil and the associated derived air particulates;
- Surface water including streams, ponds, seeps and springs;
- Sediment in Site surface waters;
- Domestic water supply which includes groundwater and surface water from springs that produce an adequate volume of water during most of the year;
- Wild game;
- Livestock that graze at the Site;
- Terrestrial and aquatic plants;
- Fish in off-Site surface waters; and
- Dietary items derived from Site media (e.g., homegrown garden produce grown in Site soils, teas brewed from Site vegetation).

It should be noted that for soil, surface water, groundwater, and terrestrial and aquatic plants, the concentrations of HH COPCs measured in these media were used to estimate current and future exposure. Aquatic sediment exposure is not evaluated further in this risk assessment since it was determined in the SSHHRA BPF (Formation 2012a) to be an insignificant pathway. As mentioned earlier in the report, “dry” sediment was included in the soil dataset and evaluated as soil in the risk assessment. Concentrations of HH COPCs in wild game, livestock, and dietary items were estimated using uptake models described further in this section, and these modeled concentrations were used to estimate exposure. Details about EPCs calculated for each receptor and each media are presented in Section 4.5 and Appendix H. A qualitative discussion of fish data is presented in Section 4.8.

4.3 Potentially Exposed Populations

The identification of potentially exposed populations (also called receptors) that may contact COPCs is dependent on current and future land and water use. As discussed in Section 2.3, current human use of the Site is limited given substantially reduced operations at the Site that require a work force, the distance to nearby residences and a population center, and the lack of features that draw receptors to the area. The limited affinity for the Site was documented in Site surveys and interviews conducted from 2009 through 2012 which are presented in Appendix B of the SSHHRA BPF (Formation 2012a). However, based on rural land-use scenarios, the following eight potential receptor populations were identified for evaluation in this SSHHRA. The potentially-exposed receptors and exposure pathways are detailed on Table 4-1, and Figures 4-2 through 4-5 present the exposure areas for each receptor.

Industrial Worker – The industrial worker receptors are Simplot employees that operate the Conda Pump Station and conduct routine outdoor maintenance activities around the mine property. Therefore, the current exposure area for the industrial worker is within the boundaries of the Mined Area (Table 4-1, Figure 4-2). It is assumed that potential exposure for the future industrial worker would be the same as current exposure (Figure 4-2). The industrial worker is an adult assumed to be exposed to Site media only on occasions when performing maintenance activities around the mine property. The industrial workers do not engage in major construction activities. It was assumed that the current/future industrial worker receptor is exposed to three media via several different pathways while on-Site: soil, domestic water, and wild game (from hunting on-Site, which is currently allowed by Simplot) (Table 4-1). These receptors drink bottled water delivered to the Pump Station and wash hands using a domestic water supply source (i.e., Simplot culinary well GW-11).

Recreational Hunter – Simplot controls hunting access on the private lands it owns. Currently, hunting on the Mined Area is allowed, however only with a Simplot escort due to safety requirements. The current and future exposure area for the recreational hunter is Site-wide (with a Simplot escort for the Simplot-owned property or independently on BLM or other private property) (Table 4-1, Figure 4-2). It is recognized that large game such as elk and deer can forage over large areas that include both unfenced private land and BLM- or State-managed lands. This SSHHRA assumes that large game could graze or browse on Simplot-controlled areas, and be harvested elsewhere. Although large game may be harvested elsewhere, the exposure evaluation assumes that the animal lived on-Site a portion of the year and exposure parameters reflect Site conditions. The risk analysis assumes typical activities by current and future hunters to include contact with soil and surface waters, as well as ingestion of wild game (Table 4-1). The hunter population is assumed to include adults and youth greater than 6 years of age. This may be conservative since Idaho hunting licenses are available only for ages 10 years and older. However, children younger than 10 years may accompany hunters, and may ingest wild game.

Seasonal Rancher – Ranchers currently live and graze their livestock (cattle or sheep, and associated horses) in the Non-Mined Area of the Site from the end of May through the end of October. The ranchers remove livestock and live elsewhere during other months. As previously described, grazing allotments that extend onto the Mined Area are currently closed. Therefore, the current exposure area for the seasonal rancher is within the Non-Mined Area (Table 4-1, Figure 4-3). During seasonal occupation, the current rancher lives in the same location of the Non-Mined Area each year, occupying a residence (permanent structure), with livestock herders occupying temporary structures such as mobile trailers. The current seasonal rancher population is comprised of adults (no children). These receptors currently drink and bathe using water from clean springs, emanating from the foothills east of the Mined Area. Current seasonal rancher receptors may supplement their diet with Site-derived livestock (beef and mutton) and also wild game. Interviews with the current seasonal rancher indicate that they consume Site-derived livestock but they do not currently supply beef or mutton to other local residents. This receptor currently does not supplement their diet with homegrown produce during the summer months. While it is not expected that this population will change in the future, several modifications to the future scenario have been made to account for other possible exposure pathways that cannot be ruled out with the information currently known. The future seasonal rancher is assumed to have an exposure area that includes the current Non-Mined Area and the BLM land (i.e., grazing allotments) within the Mined Area (Figure 4-3). The future rancher scenario includes the youth portion of the population. It is assumed that future populations would use the springs, as noted above, as domestic water supply sources, and would supplement their diet with Site-derived livestock (beef and mutton), wild game, and homegrown produce during the summer months (Table 4-1).

Livestock Herder – At the request of the Agencies, current and hypothetical future livestock herder exposure scenarios were also assessed in this SSHHRA. This receptor is an adult livestock herder that is hired to watch over a sheep or cattle herd, while residing in self-contained camping trailers in the grazing vicinity. The livestock herder could spend extended time (i.e., several days at a time) within the grazing period from late May through late October. The exposure scenario includes ingestion and dermal contact with surface water (e.g., drinking water and washing hands) (Table 4-1). It is assumed that all other dietary intake is obtained from off-Site for both the current and future scenarios. The current exposure area is the Non-Mined Area (Table 4-1 and Figure 4-3). The future exposure area includes both the Non-Mined Area and the BLM land (i.e., grazing allotments) in the Mined Area (Table 4-1 and Figure 4-3).

Recreational Trespasser – Signs of trespass (primarily off-road motorcycles or all-terrain vehicle [ATV] use) have been observed on Simplot property in the Mined Area (e.g., Shield and Jouglard Canyons and Margarette Creek/Trail Canyon areas). It is assumed that the current exposure area includes the entire Site (Table 4-1, Figure 4-4) and that this population uses the Site on an irregular and relatively infrequent basis. The future exposure area and use is expected to remain the same (Table 4-1, Figure 4-4). The current and future potentially exposed receptor group includes both adults and children. Since access to the Site is via off-

road travel, the age group assumed for this receptor is adults, youth and children greater than 4 years of age. These receptors are assumed to bring their own water while recreating, but could wash hands in and drink Site surface water occasionally (Table 4-1).

Native American – Shoshone-Bannock Tribal members hold treaty rights to hunt, fish, gather, and conduct ceremonies on off-reservation public lands. It is not known to what extent Native Americans use or plan to use Federal lands within the Site; so, the exposure scenario for the Native American receptor population is based predominantly on the receptor of the same name in the AWHHRA.[22] It is assumed that Native Americans may visit public lands within the Site for either plant collection or hunting. Although the current and future exposure area for the Native American would most accurately just include BLM land within the Site, the current and future exposure area for this receptor included the entire Non-Mined Area of the Site and BLM land in the Mined Area to account for the treaty rights of the Native Americans (Table 4-1, Figure 4-4). This receptor population includes adults, youth and children that are assumed to visit the Site to gather native plants for direct consumption, for use in brewing teas, for ceremonial practices (e.g., inhalation of smoke from burning plants, dermal application of salve derived from plants[23]), or to hunt (Table 4-1). Out of the four culturally significant plants that were used in exposure calculations in the AWHHRA (watercress, wild onion, sage, and willow), watercress and wild onion were each seen at one location at the Site; sage and willow were more abundant at the Site. Table 2-1 provides a summary of the culturally-significant plants listed in Shoshone-Bannock Tribes (2016) and identifies which of those plants have been observed or sampled at the Site. These receptors are assumed to bring their own water while visiting the Site, but could wash hands in and drink Site surface water occasionally.

Hypothetical Resident – This population is modeled on the standard residential receptor (USEPA 1989) with the addition of Site-derived dietary exposure pathways for wild game, homegrown produce, livestock, and aquatic plants (i.e., watercress). In addition, these receptors are assumed to drink and bathe using groundwater as the domestic water supply, and have incidental exposure to surface soils. The hypothetical future resident receptor group includes both adults, youth and children, and is assumed to have an exposure to media across the entire Site (Table 4-1, Figure 4-5). Because the plausibility or reality of a future residential scenario is unclear, Site-wide samples were used to assess possible exposure, regardless of current land ownership (e.g., BLM land). Land use and population statistics indicate that the Site is unlikely to become residential but this future scenario was assessed, as requested by the Agencies.

Off-Site Recreational Fisher – As previously described, Site drainages within the Mined Area are largely ephemeral. Based on information gathered while conducting numerous Site visits

[22] The draft Shoshone-Bannock Exposure Scenario for use in Risk Assessment (Shoshone-Bannock 2016) is another source of information regarding the use of natural resources in traditional practices and celebrations.
[23] It is noted that these are not the only uses for culturally-significant plants by Native Americans; refer to Shoshone-Bannock 2016 for more information.

and sampling at the Site, the upper stream reaches are typically dry, except during the spring. Flows along the east side of the Site can reach the UBR and Trail Creek (off-Site). Water is present year round near their confluences with the Blackfoot River and Trail Creek, and several perennial pools. These drainages do not provide the habitat to support populations of fish that are normally ingested by fishers (i.e., salmonids) and the intermittent nature of the drainages do not support a substantial or sustainable fishery. Additionally, all local year-round residents interviewed, including the nearby vacation lodge owner and fishing guide, indicated that the Site drainages were not used for fishing. Exposure to Site contaminants in fish in Site drainages is an incomplete pathway and, as such, are not evaluated in the SSHHRA. Therefore, the evaluation of the off-Site recreational fisher receptor is qualitative and presented in greater detail later in this report. It is assumed that current and future exposure areas for this pathway are the same (Figure 4-5).

4.4 Exposure Factors

For each receptor group, exposure factors were selected to quantify the intake of HH COPCs from complete exposure pathways. The exposure factors were selected for both an RME and a central tendency exposure (CTE) (USEPA 1989, 1993). The RME is the maximum exposure that is reasonably expected to occur at the Site. Intake parameter values were selected so that the combination of all parameters resulted in an estimate of the RME for a particular exposure pathway. By design, the estimated RME is higher than that expected to be experienced by most of the exposed population. This is consistent with USEPA guidance (USEPA 1992d), where the goal of the exposure assessment is to provide a reasonable, high-end (i.e., conservative) estimate of exposure that focuses on potential exposures in the actual population. As recommended in *Guidance for Risk Characterization* (USEPA 1995), CTE estimates represent the central estimates of exposure or dose and are intended to be more representative of likely human exposures, if exposure occurs as assumed.

Exposure factors were developed based on USEPA guidance (USEPA 1989, 1991a, 1996a, 2002a, 2004a, 2005b, 2009a, 2009b, 2011, and 2014a). The latest exposure factor handbook (USEPA 2011) was used as the primary source of exposure parameters. Exposure factors, other assumptions, and references are shown for each of the receptors in Table 4-2.

For the hypothetical future resident, the receptor populations were divided into four age groups (USEPA 2011), young child (0-2 years), older child (2-6 years), youth (6-16 years), and adult (16 years or older). Adult and youth-age ranges were also used for other receptors where applicable. The current and future industrial worker, current and future livestock herder, and current seasonal rancher scenarios assume only adult-age persons would be involved in the activities on Site. It was assumed that the future seasonal rancher may include youth.

4.5 Exposure Point Concentrations

As previously indicated, this SSHHRA incorporates a tiered approach to evaluate risk from HH COPCs. Tier 1 provides a comprehensive exposure assessment and risk characterization for all receptors using the RME and CTE approaches outlined in Section 4.4. The same EPCs were used for both the CTE and RME exposure estimates. Exposure pathways for each receptor are listed on Table 4-1, Figures 4-2 through 4-5 present exposure areas for each receptor, and exposure factors are presented in Table 4-2. Tier 1 EPCs were derived for all relevant media and are provided in Table 4-3. Detailed information about the calculation of each EPC is presented in Appendix H. More information about the calculation of EPCs is provided below.

4.5.1 EPC Calculation Methodology

Consistent with USEPA guidance (USEPA 1992c and 2013), EPCs were calculated as the 95UCL and the recommended statistic from ProUCL version 5.0 was used for the HHRA. For some EPCs (e.g., Site-wide selenium in soil), the recommended EPC was a 97.5 percent UCL or other statistic given the data distribution. USEPA's version 5.0 ProUCL statistical program and guidance were used to calculate the 95UCLs.[24] Each dataset was first tested using the ProUCL software to determine the data distribution, and the appropriate 95UCL estimation method was chosen based on the recommendations provided by ProUCL (USEPA 2013). Non-detected values were handled by ProUCL based on the data set for that media. For datasets with fewer than four detected values, or if the calculated value exceeded the MDC, then the MDC was presented. For non-detected HH COPCs, the maximum detection limit was presented.

4.5.2 Receptor-Specific EPC Information

The exposure pathways for each receptor are detailed on Table 4-1, and Figures 4-2 through 4-5 present the exposure areas for each receptor. The EPCs for most receptors were the same when evaluating current and future land use, except for the seasonal rancher and the livestock herder scenarios. The differences, which are generally based on the potential differences in Site access in the future, are explained in greater detail below.

While several of the scenarios consider a child component, it was assumed that the EPC in a given media would not vary from child to adult since the exposure areas would essentially be the same. Data used to develop the EPCs were based on the data that were assumed to best represent potential exposure for that receptor given current Site knowledge and expectations for future use. While some of the data used to estimate EPCs for a given receptor was taken from

[24] Several datasets were ran in ProUCL version 5.1 and no differences in the suggested UCLs were observed. In order to maintain consistency among all of the calculations in the report, the use of ProUCL 5.0 is appropriate.

areas that are larger than what is often considered a reasonable exposure unit (i.e., less than ½ acre for a residential scenario), most of the soil samples were judgmental and collected in or near RMM. As such, the EPC is likely to be biased high for the receptor since exposure is likely to be more random, and to materials with varying and lower concentrations of HH COPCs. For the domestic water supply EPC, it was assumed that all surface water and groundwater had an equal likelihood of contact since these are dynamic systems and concentrations can change spatially and with time. Likewise, for the surface water EPC, concentration data from all seeps and springs were used since it is unknown at this time which, if any, location would have preferential use or contact over other locations.

Industrial Worker – As previously stated, it was assumed that the current/future industrial worker receptor is exposed to three media via several different pathways while on-Site: soil, domestic water, and wild game (Table 4-1, Table 4-3, Appendix H). To evaluate exposure to soil, the EPCs were the 95UCL of Mined Area surface soils. The EPC for the domestic water supply was the 95UCL concentration for HH COPCs measured in the Simplot Culinary Well (GW-11) groundwater. To calculate the wild game EPC for the industrial worker that may occasionally hunt on Simplot property, Site-wide soil, surface water, and terrestrial vegetation 95UCLs (since the wild game may forage over the entire Site) were used and incorporated into an uptake equation described in the next sub-section.

Recreational Hunter – As previously stated, it was assumed that the current/future recreational hunter receptor is exposed to three media via several different pathways while on-Site: soil, surface water, and wild game (Table 4-1, Table 4-3, Appendix H). To evaluate exposure to soil, the EPC was the 95UCL of Site-wide area surface soils. The EPC for surface water exposure was the 95UCL concentration for HH COPCs measured in Site-wide surface water. To calculate the wild game EPC for the recreational hunter that may occasionally hunt anywhere on-Site, Site-wide soil, surface water, and terrestrial vegetation 95UCLs (since the wild game may forage over the entire Site) were used and incorporated into an uptake equation described in the next sub-section.

Seasonal Rancher – The current seasonal rancher could be exposed to four media: soil, domestic water supply, livestock, and wild game (Table 4-1, Table 4-3, Appendix H). To evaluate exposure to soil, the EPC was the 95UCL on the Non-Mined Area surface soils. Soils from the Mined Area were not included because grazing is not currently allowed there. The EPC for the domestic water supply for the current seasonal rancher receptor was assumed to be the 95UCL concentration of HH COPCs measured in domestic water supply locations on private land only in the Non-Mined Area. To calculate the livestock (beef and mutton) EPCs for this receptor, the soil, surface water, and terrestrial vegetation 95UCLs for Non-Mined Areas were used and incorporated into an uptake equation described in the next sub-section. To calculate the wild game EPC for the seasonal rancher, Site-wide soil, surface water, and terrestrial vegetation 95UCLs (since the wild game may forage over the entire Site) were used and incorporated into an uptake equation described in the next sub-section.

The future seasonal rancher could be exposed to five media: soil, domestic water supply, livestock, wild game, and garden produce (Table 4-1, Table 4-3, Appendix H). The soil EPC for the future seasonal rancher was based on 95UCL HH COPC concentrations in surface soil samples collected in the Non-Mined Area plus BLM land in the Mined Area to account for the future potential for BLM land to be grazed and accessed. The EPC for garden produce was estimated based on that same surface soil EPC (assuming that land could be used for residential purposes); equations for modeling HH COPC concentrations in garden produce are described in the next sub-section. The EPC for domestic water supply for this receptor was assumed to be the 95UCL concentration of HH COPCs measured in domestic water supply locations Site-wide (since it was assumed that future surface water and groundwater had an equal likelihood of contact since these are dynamic systems and concentrations can change spatially and with time). The livestock (beef and mutton) EPC was based on soil, surface water, and terrestrial vegetation 95UCLs for Non-Mined Areas plus BLM land in the Mined Area. The wild game EPC for the future seasonal rancher was assumed to be the same as the current seasonal rancher since it was based on Site-wide HH COPC 95UCL concentrations.

Livestock Herder – It was assumed that the current livestock herder is exposed to soil and surface water while on-Site (Table 4-1, Table 4-3, and Appendix H). To evaluate current exposure to soil, the EPC was the 95UCL of Non-Mined Area surface soils. The EPC for surface water exposure for the current livestock herder receptor was the 95UCL concentration for HH COPCs measured in Non-Mined Area surface water. It was assumed that the future livestock herder may access the Non-Mined Area property as well as the BLM land in the Mined Area. As such, the EPCs for soil and surface water for the future livestock herder were based on 95UCL concentrations for HH COPCs in these areas.

Recreational Trespasser – As previously stated, it was assumed that the current/future recreational trespasser receptor is exposed to soil and surface water while on-Site (Table 4-1, Table 4-3, Appendix H). To evaluate exposure to soil, the EPC was the 95UCL of Site-wide area surface soils. The EPC for surface water exposure was the 95UCL concentration for HH COPCs measured in Site-wide surface water.

Native American – As previously stated, it was assumed that the current/future Native American receptor accesses the Non-Mined Area and BLM land in the Mined Area (to account for the treaty rights of the Native Americans) and is potentially exposed to five media: soil, surface water, wild game, and culturally-significant plants (for direct ingestion and for tea). It should be noted that there were very few to no established populations of watercress or onion observed during the numerous Site visits, inspections, and surveys. The EPC for culturally-significant plant species was based on the 95UCL of 160 vegetation samples comprised of plants listed on Table 2-1 that were collected from the Non-Mined Area and BLM land in the Mined Area. For tea made from culturally-significant plants, the EPC is based on 95UCL HH COPC concentrations in 23 sage and willow samples from the Non-Mined Area and BLM land in the Mined Area. Equations for modeling HH COPC concentrations in tea are described in the

next sub-section. The soil EPC for the Native American receptor was based on 95UCL HH COPC concentrations in surface soil samples collected in the Non-Mined Area plus the BLM land in the Mined Area, and the EPC for surface water for this receptor was assumed to be the 95UCL concentration of HH COPCs measured in surface water in that same area. To calculate the wild game EPC for the Native American, Site-wide soil, surface water, and terrestrial vegetation 95UCLs (since the wild game may forage over the entire Site) were used and incorporated into an uptake equation described in the next sub-section.

Hypothetical Resident – It was assumed that the hypothetical future resident is exposed to six different media: soil, domestic water supply, livestock, wild game, culturally-significant plants (direct ingestion), and garden produce (Table 4-1, Table 4-3, Appendix H). Site-wide samples were used to assess possible exposure, regardless of current land ownership (e.g., BLM land). As such, to evaluate exposure to soil for the future residential receptor, the EPC was the 95UCL HH COPC concentrations for Site-wide area surface soils. This soil EPC was used to estimate the garden produce EPC, using equations described in the next sub-section. The EPC for the domestic water supply for the future resident receptor was assumed to be the 95UCL concentration of HH COPCs measured in domestic water supply locations Site-wide. To calculate the livestock (beef and mutton) EPC for this receptor, the soil, surface water, and terrestrial vegetation 95UCLs for Site-wide areas were used and incorporated into an uptake equation as described in the sub-section below. To calculate the wild game EPC for the future resident, the soil, surface water, and terrestrial vegetation 95UCLs (Site-wide, since the wild game may forage over the entire Site) were used and incorporated into an uptake equation as described in the sub-section below.

Off-Site Recreational Fisher – No EPCs were estimated for this receptor because it was evaluated qualitatively, as described in Section 4.8.

4.5.3 Media-Specific EPC Information

The EPCs for each medium and figures showing the various sampling locations used in the Tier 1 media EPC calculations are presented in Appendix H. The ProUCL outputs are provided in Appendix I. EPCs for each receptor for their relevant exposure media (e.g., soil, domestic water supply, beef, wild game, garden produce, culturally significant plants, and tea) are explained in greater detail below and summarized in Table 4-3.

Soil – Soil EPCs were calculated as 95UCL HH COPC concentrations from the surface soil sampling locations (defined in Section 3.1) within the applicable exposure area for each receptor with complete soil exposure pathways (outlined on Table 4-1). Appendix H presents surface soil EPCs and figures showing sampling locations for Site-wide exposures (Appendix H.1; recreational hunter, recreational trespasser, hypothetical future resident), Mined Area exposure (Appendix H.2; industrial worker), Non-Mined Area exposure (Appendix H.3; current seasonal rancher and current livestock herder), and Non-Mined and Mined Area BLM Land

exposure (Appendix H.4; future seasonal rancher, future livestock herder, Native American). For all receptors, inhalation of soil-derived particulates was calculated using the applicable soil 95UCL EPC with a particulate emission factor (PEF) (listed in Table 4-2 for each receptor) to arrive at an air concentration.

Surface Water – Surface water EPCs were calculated as 95UCL HH COPC concentrations from surface water sampling locations (defined in Section 3.1) within the applicable exposure area for each receptor with complete surface water exposure pathways (outlined on Table 4-1). Appendix H presents surface water EPCs and figures showing sampling locations for Site-wide exposures (Appendix H.5; recreational hunter, recreational trespasser), Non-Mined Area exposure (Appendix H.6; current livestock herder), and Non-Mined and Mined Area BLM land exposure (Appendix H.7; future livestock herder, Native American).

Domestic Water Supply – Domestic water supply EPCs were calculated as 95UCL HH COPC concentrations from the domestic water supply dataset (defined in Section 3.1) within the applicable exposure area for each receptor with domestic water supply exposure pathways (outlined on Table 4-1). Appendix H presents domestic water supply EPCs and figures showing sampling locations for Site-wide exposures (Appendix H.8; hypothetical future resident, future seasonal rancher[25]), Simplot culinary well exposure (Appendix H.9; industrial worker), and Non-Mined private land exposure (Appendix H.10; current seasonal rancher).

Wild Game and Livestock – EPCs for wild game and livestock (cattle and sheep) were modeled from Site-specific surface water, vegetation, and soil concentrations. Wild game and livestock EPCs are presented in Appendices H.15 through H.18 (with the supporting surface soil, surface water, and vegetation EPCs in Appendices H.1 through H.7, and H.11 through H.13). It was assumed that the wild game graze, drink surface water, and incidentally ingest soil over the entire Site (Appendix H.15; industrial worker, recreational hunter, current and future seasonal rancher, Native American, and hypothetical resident receptors). Livestock EPCs were based on the soil, surface water, and vegetation in the exposure areas of the related receptors: Site-wide (Appendix H.16; hypothetical future resident); Non-Mined Area (Appendix H.17; current seasonal rancher), and Non-Mined Area and Mined Area BLM land (Appendix H.18; future seasonal rancher). The vegetation EPCs for livestock and wild game were based on all available vegetation samples within the exposure areas, including browse, forbs, grasses, aquatic species, and also samples specifically collected to measure HH COPCs in selenium-accumulating species.

Wild game estimates were based on elk (as representative of other ungulates such as deer and moose). It is recognized that other game species could be harvested from the Site, but it was assumed for the purposes of this evaluation that wild game is represented by elk since the

[25] The exposure area for the Future Seasonal Rancher is Non-Mined Area and Mined Area BLM Land, but the Site-wide domestic water supply dataset was used to represent that potential future exposure.

volume of meat harvested from this species is likely much greater and provides more potential meals than smaller game species (such as grouse or rabbit). For livestock (cattle and sheep), it was assumed that roughly half of their food intake was from non-Site derived food, since they are only on-Site from May through October. This adjustment reflects the portion of the year (6 months) that livestock can graze at the Site, excluding the remainder of the year when snow covers the ground at the Site and livestock are fed from external sources (feed, hay) and/or moved to another location for the winter. For wild game, it was assumed that an elk is on-Site for roughly 28 percent of the year based on acreage at the Site and the home range of elk in Southeastern Idaho (Kuck 2003). Other larger home range estimates are provided in the open literature for non-migratory elk in Idaho but this value was chosen because it is based on a study of elk in the general area with similar habitat options. These factors are important because elk home ranges can be quite large depending on the habitat and food sources available.

To calculate the livestock EPCs, the applicable soil, surface water, and terrestrial vegetation 95UCLs were used and incorporated into an uptake equation utilizing chemical-specific transfer coefficients (to estimate the transfer from cattle dietary items to meat) from *Air Toxics Hot Spots Program Risk Assessment Guidelines: Technical Support Document for Exposure Assessment and Stochastic Analysis* (California Environmental Protection Agency [Cal-EPA] 2012) and cattle-specific exposure assumptions. HH COPC intake in soil, food, and water was estimated by multiplying the concentration of the chemical in the dietary media by the corresponding ingestion rate. The estimated daily mass of HH COPC intake was calculated as a summation of these soil, food, and water intakes. The mass ingested per day was multiplied by the transfer coefficient to tissue to yield the livestock EPCs. Refer to Appendices H.16 through H.18 for a thorough description of the equations. For cattle, a 5% (of total diet) soil ingestion rate was used in the uptake modeling per Cal-EPA (2012) (Appendices H.16 through H.18). The primary source of transfer coefficients for HH COPCs was Cal-EPA (2012) with additional factors from Baes et al. (1984) for HH COPCs lacking values in Cal-EPA (2012). Three transfer coefficients (in day per kilogram [d/kg]) were available in the literature for selenium: 3.4E-3 (Hintze et al. 2002), 1.5E-2 (Baes et al. 1984), and 4E-2 (Cal-EPA 2012). Further evaluation of these values showed that the uptake factor for selenium in beef was related to whether cattle were acclimatized to seleniferous areas; cattle from seleniferous areas accumulated less selenium than those that were not acclimated. Since Conda is in an area with seleniferous formations and soils, the uptake factor from Hintze et al. (2002) better estimates uptake at the Site and was used preferentially in the risk characterization. Appendices H.16 through H.18 present selenium EPCs using all three uptake factors, and additional risk calculations with these alternative values are presented and discussed in the uncertainty section (Section 6.3.3). EPCs in beef muscle and offal were assumed to be the same for all HH COPCs except selenium and cadmium. For selenium, the offal EPC was calculated as 5.5 times the muscle EPC. This multiplier is based on review of the liver and muscle selenium concentrations in beef, as presented in Hintze et al. (2002) and Lawler et al. (2004). For cadmium, the offal EPC was calculated using a transfer coefficient of 0.03, as suggested in Cal-EPA (2012). In all cases,

mutton EPCs were assumed to be the same as beef EPCs. Appendices H.16 through H.18 contain the uptake model as well as further information related to transfer coefficients and the chemical-specific beef and mutton EPC calculations.

Wild game EPCs were calculated using the same uptake model and equations as the beef, but using elk-specific body weight and ingestion rates for soil, forage, and water. For wild game, a 2% (of total diet) soil ingestion rate was used in the uptake modeling per Beyer (1994) (Appendix H.15). Like beef, the selenium uptake coefficient from Hintze et al. (2002) was used as the primary value but selenium uptake and risks using the other two uptake coefficients were calculated and presented in Section 6.3.3. Similar to beef EPCs, the wild game muscle EPC and wild game offal EPC were assumed to be the same for all analytes except selenium and cadmium. Public health assessments by the ATSDR (2001 and 2006) reported that given the level of selenium in elk liver, it is possible that an adult consuming a large amount of contaminated elk liver could experience adverse health effects, although it is unlikely that the contaminants in elk muscle and liver will result in an adverse health effect to those who eat 8 ounces of elk meat daily, or eat up to 10 ounces of elk liver per month. The public can refer to Table 1 (page 18) in the ATSDR (2006) document to find out how much elk liver they can safely eat per month for body weights ranging from 33 to 254 pounds. For selenium, the offal EPC for elk was calculated as 6.75 times the muscle EPC. This multiplier is based on review of the average liver and muscle selenium concentrations in elk presented in Table C-8 of ATSDR (2006). For cadmium, the offal EPC is calculated using a transfer coefficient of 0.03, as provided in Cal-EPA (2012). Appendix F.7 contains the uptake model as well as further information related to transfer coefficients and the chemical-specific elk EPC calculations.

Garden Produce – Garden produce EPCs were modeled from Site-specific soil concentrations. Garden produce EPCs were calculated for the hypothetical future resident using Site-wide soil EPCs (detailed in Appendix H.20), and for the future seasonal rancher using Non-Mined Area and Mined Area BLM Land soil EPCs (detailed in Appendix H.21). Garden produce EPCs were modeled from applicable soil EPCs consistent with USEPA's 2005 *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (USEPA 2005b). For both the exposed and protected aboveground garden produce, a plant-soil bioconcentration factor was used with the soil 95UCL EPC to calculate garden produce EPCs. Similar methods were used to calculate the below-ground garden produce EPC, except using a different plant-soil concentration factor specifically for below-ground garden produce.

Culturally-Significant Plants – Concentrations of HH COPCs in culturally-significant plants that may be directly ingested or used by Native American receptors were based on the 95UCL of 160 vegetation samples (mostly washed; 1 unwashed sample) comprised of plants listed on Table 2-1 that were collected from the Non-Mined Area and BLM land in the Mined Area, and presented in Appendix H.14-1. The EPC for tea brewed from culturally-significant plants was calculated for the Native American receptor following the methodology outlined in the AWHHRA (TTEMI 2002). The 95UCLs for HH COPC concentrations in 26 sage and willow samples

(washed) from Non-Mined Area and Mined Area BLM Land (Appendix H.14-2) were utilized along with estimated factors during infusion. Tea EPCs for the Native American receptor are presented in Appendix H.19. Watercress concentrations for consumption by the hypothetical resident were based on data collected in the one wild onion sample (unwashed) from the Site, since there were no data available for watercress. These EPCs are presented in Appendix H.14.

4.5.4 Radionuclide EPCs

As described further in Section 4.7, the potential radiological activity of uranium and its decay (daughter) products were evaluated in the risk assessment. The potential radiological activity values for radionuclides in Site media to be used in the radionuclide risk calculations were estimated using the total uranium concentrations. These estimations were made based on the assumption that at least 95 percent of naturally occurring uranium is in the form of uranium-238 (U-238) and the activity concentration is assumed to be in direct proportion to the total uranium concentration. The uranium EPC in mg/kg or mg/L in a given media was converted to the U-238 activity concentration in picoCuries per gram (pCi/g) or picoCuries per liter (pCi/L) using conversion factors. The conversion factors of 0.34, 0.326, and 345.45 were derived from USEPA U-238+D PRGs for fish, soil, and water, respectively (USEPA 2014b, 2014c). The conversion value for fish was used for tissue concentrations in livestock and wild game since these species are not represented in the PRG tables. Per Agency recommendation, radium-226 (Ra-226), radon-222 (Rn-222), lead-210 (Pb-210), and polonium-210 (Po-210) were assumed to be in secular equilibrium (equivalent activity concentrations) with U-238. The radionuclide EPCs for each media are presented in Table S-1 of Appendix S.

4.6 Quantifying Exposure to Non-Radionuclide HH COPCs

HH COPC exposure is quantified by the calculation of an intake, or dose, which is normalized to body weight and exposure time of the receptor. A dose is calculated by combining assumptions regarding contact rate (intake amount and time, frequency and duration of exposure) to a contaminated medium with representative HH COPC EPCs for the medium of concern at the point of contact.

The intake or dose of a particular HH COPC by a receptor is quantified with the generic equation below (USEPA 1989):

$$I = \frac{C \times CR \times EFD}{BW} \times \frac{1}{AT}$$

where:

I	=	the chemical intake or dose (mg/kg body weight [BW]-day);
C	=	the chemical concentration (mg/kg or mg/L);
CR	=	contact rate or the amount of contaminated medium contacted per event (liters/day [L/day] or milligrams/day [mg/day]);
EFD	=	the frequency (days/year) and duration (number of years) of exposure days;
BW	=	the average body weight of the receptor (kg); and
AT	=	averaging time of the exposure (days); for non-carcinogens, AT equals exposure duration (ED) x (365 days/year); for carcinogens, AT equals (70 years over a lifetime) x (365 days/year).

This equation calculates an intake that is normalized over the body weight of the individual and the time of the exposure. The intake is compared to the quantitative dose-response information for the HH COPC to provide a measure of risk. Chemical-specific dose-response information includes reference doses (RfDs) or reference concentrations (RfCs) for non-carcinogenic HH COPCs and cancer slope factors (CSFs) or Inhalation Unit Risks (IURs) for carcinogenic HH COPCs (see Section 5). Appendix H.22 provides the media-specific exposure estimate equations for the ingestion, dermal contact, and inhalation pathways. Appendices J through S provide the estimated media-specific HH COPC intake for all pathways and receptors.

In the Tier 1 intake estimates, bioavailability was assumed to be 1 for all HH COPCs via all exposure pathways, except arsenic. USEPA guidance (USEPA 2012a) indicates that the default relative bioavailability of arsenic in soil is 60 percent and therefore this value was used to quantify exposure for arsenic. A factor less than 100 percent indicates that less arsenic is absorbed from soil ingestion pathways than from water, which is the exposure medium in the critical toxicity studies used to derive the oral RfD and CSF. Bioavailability of arsenic is controlled by several factors such as arsenic speciation and form, as well as the mineralogy and other physical and chemical characteristics of the soil. This factor only applies to arsenic via soil pathways and was not applied to other pathways such as domestic water supply or surface water exposure. Additional information related to bioavailability of inorganic compounds and the impact this assumption has on risk estimates is provided in the uncertainty analysis in Section 6.3.

Two different types of health effects are considered in this analysis: (1) carcinogenic effects and (2) non-carcinogenic effects. For carcinogenic effects, the total cumulative intake averaged over a lifetime is used because the quantitative dose-response function for carcinogens is based on the assumption that cancer results from chronic, lifetime exposures to carcinogenic agents. This intake or dose is then averaged over a lifetime to provide an estimate of intake or dose to carcinogens as milligram per kilogram of body weight per day (mg/kg-day), which is expressed as a lifetime average daily dose (LADD). Thus, for potentially carcinogenic HH COPCs, the averaging time is equal to 70 years (USEPA 1989).

Non-carcinogenic effects are evaluated for chronic, subchronic, or acute exposures by receptors to systemic or reproductive toxicants. For non-carcinogenic effects, the relevant intake or dose is based on the daily intake averaged over the exposure period of concern. As defined in USEPA guidance (USEPA 1989), an exposure period for toxicity can be either acute (exposure occurring from one event or over one day), subchronic (cumulative exposures occurring from 2 weeks up to 7 years), or chronic (cumulative exposure over 7 years to a lifetime in duration). The quantitative dose-response function for non-carcinogenic effects (chronic and subchronic) is based on the assumption that effects occur once a threshold dose is attained from repeated exposure. Therefore, the intake or dose for non-carcinogenic risk assessment is based on an average daily dose (ADD) that is averaged over the duration of exposure. The averaging time for assessing non-carcinogenic effects is equal to the exposure duration for the receptor. For this SSHHRA, it is assumed that all exposure is of chronic nature even though some of the receptors may have intermittent (yet recurring) exposure.

4.7 Quantifying Exposure to Radionuclides (Uranium and Decay Products)

To quantify exposure for radionuclides potentially at the Site, assuming their presence based on uranium concentrations in Site media, the 95UCL for uranium-238 and associated decay products was estimated based on the uranium concentration and conversion described in Section 4.5.4. The radionuclide risk calculator tool developed by USEPA (USEPA 2015c) was used to estimate exposure and risk to all Site receptors from Site media. EPCs for the various media are presented in Table S-1 of Appendix S.

USEPA's risk calculator tool contains "prescribed" scenarios, which include: residential, outdoor worker, indoor worker, composite worker, recreator, farmer, and construction worker. The model assumes that the receptors are exposed to a combination of soil, tap water, air, farm products and game, depending on the scenario. Default exposure assumptions are used in the model unless the user elects to input user-defined values. The assumptions used in the Site-specific calculation of exposure were the same as those used in the non-radiological HH COPC risk assessment, when possible. If a variable was not used/needed in the non-radiological HH COPC risk assessment, the USEPA default contained in the model was used. For the air dispersion modeling, Boise, Idaho was chosen as the representative city for climate and other meteorological data.

The recreator scenario in the calculator tool was used as a starting point to model exposure and risk for most of the Site receptors because it allows the most flexibility in choosing Site-specific exposure assumptions and using Site-specific media concentrations. The USEPA's resident scenario was used to evaluate the hypothetical future resident exposure to soil, garden produce (as calculated by USEPA's tool from soil concentrations), domestic water supply (as tap water), and livestock and game (using Site-specific estimated tissue concentrations). To allow for the evaluation of garden produce, risks were run separately using that option under the residential receptor and adding the estimated risks to the other pathway risks. The risk calculator also

included evaluation of indoor and outdoor radon inhalation for the hypothetical future resident. A similar approach was used for the future seasonal rancher and Native American receptors. In addition, a "comparison" residential evaluation scenario was conducted using a Site-specific background 95UCL for soil uranium (dataset and calculations are provided in Appendix T),[26] and the Federal uranium MCL for water concentrations (USEPA 2014a). The exposure assumption input values for the model are provided for each of the receptors in Appendix S-3.

4.8 Qualitative Evaluation of Off-Site Recreational Fisher Receptor

A qualitative evaluation of the off-Site recreational fisher receptor was conducted as part of this risk assessment to evaluate potential risks for this scenario, using multiple lines of evidence as described in this section. The UBR and some of its tributaries are regional sport fisheries, primarily for cutthroat trout but other cold water species are sought as well. It should be noted that state regulations for the adjacent section of the UBR and Trail Creek prohibit keeping captured Cutthroat Trout. Thus, while this evaluation discusses some Cutthroat Trout data, it is assumed that potential exposure could occur from consuming other trout species caught in the UBR or Trail Creek. Likewise, non-consumable fish species are included as well for additional information. This discussion is focused on selenium because it is the primary compound of concern in the aquatic environment and because it can accumulate in the food chain.

For the off-Site recreational fisher receptor, the primary route of selenium exposure is through consuming fish. This receptor could also casually contact surface water and sediment while fishing although, it is assumed that this exposure would be infrequent, intermittent, and insignificant when compared to the potential dose received via fish ingestion. As described in the Final RI Report (Formation 2016), none of the measured concentrations of selenium in the surface water or sediment samples exceed the human health water quality criterion or a residential soil exposure screening level, respectively, recognizing that comparing sediment concentrations to residential soil values is very conservative given the differences in exposure frequency and duration.

Average selenium concentrations (4.4 mg/kg) in salmonid fish samples caught off-Site (in Trail Creek or the UBR) (Table 4-4) exceed the Idaho Bureau of Community and Environmental Health (BCEH) SLV of 2.6 mg/kg for fish consumption (ATSDR 2013a). This suggests that consuming salmonid fish could cause harmful health effects to recreational fishers if they consume fish caught from this Site in amounts above the Idaho serving size and meal frequency of consumption of 8 ounces /week for adults and 4.5 ounces/week for children (BCEH 2011).

[26] While Site-specific background data are available for all COIs in the Final RI Report (Formation 2016), only data for certain HH COPCs are provided in Appendix T in this SSHHRA. Uranium is included in Appendix T since it was necessary to calculate a uranium background 95UCL to use in the "comparison scenario" of the radionuclide risk model. This UCL evaluation is supplemental to the comprehensive Site-specific background evaluation that is presented in the Final RI Report (Formation 2016). The background evaluation in the Final RI Report includes thorough descriptions of the background sampling locations and datasets.

Data for non-salmonid fish species (Table 4-4) also exceed the screening levels in some samples at some sampling locations but these fish are typically not consumed. It should be noted that potential impacts to fish and other aquatic organisms are quantitatively evaluated in the SSERA. However, as previously discussed, selenium concentrations in UBR surface water and sediment, immediately upgradient and downgradient of the Site drainages are similar, which suggests that COI contributions from Site drainages are not resulting in a measurable change in COI concentrations in the UBR. These findings in surface water are similar to the findings reported by the USGS (2015) that concentrations in the UBR do not vary significantly after the confluence of Spring Creek (which is upgradient of the Site), to the Blackfoot Reservoir.

5.0 TOXICITY ASSESSMENT

The toxicity assessment provides a description of the relationship between a dose of an HH COPC and the anticipated incidence of an adverse health effect (Preuss and Ehrlich 1987 and USEPA 1989). The purpose of the toxicity assessment is to provide a quantitative estimate of the inherent toxicity of HH COPCs to incorporate into the risk characterization. Toxicity values are derived from the quantitative dose-response association and are correlated with the quantitative exposure assessment in the risk characterization.

5.1 Endpoint-Specific Toxicity Criteria

For risk assessment, toxic chemical effects are separated into two categories of toxicity: carcinogenic effects and non-carcinogenic effects because the mechanisms of action for these endpoints differ. Generally, USEPA has required that potentially carcinogenic HH COPCs be treated as if minimum threshold doses do not exist (USEPA 1986), whereas non-carcinogenic effects are recognized to have a threshold below which toxicity is unlikely.

Potential carcinogenic effects resulting from human exposure to HH COPCs are estimated quantitatively using CSFs, which represent the theoretical increased risk per milligram of HH COPC intake per kilogram of body weight per day (mg/kg-day) or unit risks, which are the theoretical increased risks per exposure concentration. CSFs, or unit risks, are typically derived for “known or probable” human carcinogens. CSFs or unit risks are used to estimate a theoretical upper-bound lifetime probability of an individual developing cancer as a result of exposure to a particular lifetime daily dose of a potential carcinogen. HH COPCs that are believed to be carcinogenic may also have non-carcinogenic effects. Potential health risks for these HH COPCs are evaluated for both carcinogenic and other types of effects as described below.

Unlike carcinogenic effects, most non-carcinogenic biological effects of chemicals occur only after a threshold dose is achieved (Klaassen et al. 2007). Lead appears to be a notable exception. This threshold concept of non-carcinogenic effects assumes that a range of exposures up to some defined threshold can be tolerated without appreciable risk of harm. Adverse effects may be minimized at concentrations below the threshold by pharmacokinetic processes, such as decreased absorption, distribution to non-target organs, metabolism to less toxic chemical forms, and excretion (Klaassen et al. 2007).

RfDs and RfCs are developed by the USEPA RfD Work Group on the basis of a wide array of non-carcinogenic health effects. The RfD and RfC are estimates of the daily maximum level of exposure to human populations (including sensitive subpopulations) that are likely to be without an appreciable risk of deleterious effects during a lifetime (USEPA 1989). RfDs are expressed in units of daily dose (mg/kg-day) while RfCs are expressed as an air concentration (milligrams

per cubic meter [mg/m^3]). Both incorporate uncertainty factors to account for limitation in the quality or quantity of available data.

5.2 Exposure Route-Specific Toxicity Criteria

In deriving toxicity criteria, USEPA methodologies consider the route of administration (or exposure) of the test chemical in toxicity or epidemiological studies. Typically, oral RfDs and oral CSFs are derived from toxicity studies with oral administration or exposure route, and RfCs or IUR are derived from inhalation toxicity studies. While extrapolation of an inhalation toxicity criterion to the oral pathway or vice versa can be attempted, this practice is not recommended because there can be a great deal of uncertainty introduced (USEPA 1989). Therefore, oral RfDs were not extrapolated to provide toxicity values for inhalation pathways. Quantitative risk evaluation of the inhalation exposure pathways was conducted only for those chemicals that have reference toxicity values specifically from inhalation administration.

Conversely, USEPA has not derived specific toxicity criteria for the dermal exposure pathway. This presents a complication because oral and inhalation toxicity criteria are based on administered dose and not absorbed dose while dermal exposure pathways consider the absorbed dose (i.e., how much of the chemical in soil or water crosses the skin barrier and is absorbed by the body). Per USEPA (1989), the oral RfD or oral CSF can be applied in evaluation of the dermal exposure pathway following adjustment of the oral toxicity criteria for gastrointestinal absorbance. In later guidance (USEPA 2004a), USEPA recommends adjusting oral toxicity criteria by gastrointestinal absorbance factors if gastrointestinal absorbance of the chemical in the vehicle of administration in the critical study is less than 50 percent. USEPA recommends adjusting oral toxicity criteria for a number of inorganic chemicals based on the possibility of low gastrointestinal absorbance in the critical study as shown in Exhibit 4-1 of the associated guidance (USEPA 2004a).

5.3 Toxicity Values for Radionuclide HH COPCs

As for non-radionuclide COPCs, the exposure intake (or dose) is coupled with a toxicity value to develop a risk estimate. Non-carcinogenic effects were not considered for radionuclide analytes, except for uranium. Uranium is the only radionuclide that has demonstrated toxicity to both carcinogenic and non-carcinogenic endpoints. Slope factors, for a given radionuclide represent the risk equivalent per unit intake (i.e., ingestion or inhalation) or external exposure of that radionuclide. The Center for Radiation Protection Knowledge developed the cancer slope factors that are used in USEPA's radionuclide PRG calculator and risk tool (USEPA 2015c).

5.4 Sources of Toxicity Criteria for Non-Radionuclide HH COPCs

Toxicity factors used in the SSHHRA are shown in Table 5-1 and were selected using the following USEPA hierarchy of sources:

- USEPA Integrated Risk Information System (IRIS) database (http://www.epa.gov/iris);
- USEPA Provisional Peer-Reviewed Toxicity Values (PPRTVs) database;
- USEPA Health Effects Assessment Summary Tables (HEAST);
- USEPA National Center for Environmental Assessment, Superfund Health Risk Technical Support Center;
- Other USEPA documents or databases;
- ATSDR toxicological profiles; and
- Other referenced technical publications.

Additionally, a summary of standard toxicity values can be obtained from USEPA's RSLs table (USEPA 2016a).

Table 5-1 presents three different RfDs for uranium. The uranium RfD of 0.003 mg/kg-day, obtained from IRIS (USEPA 2016b), is used in primary risk calculations in this SSHHRA. It is currently the RfD listed in the most recent RSL tables (USEPA 2016a) used for screening purposes in earlier steps of the SSHHRA. The SSHHRA is consistent with USEPA's recommended approach to use IRIS as the first tier of the recommended hierarchy of sources of human health toxicity values (USEPA 2003); this same approach is also outlined in the IDEQ Risk Evaluation Manual (IDEQ 2004).

In a letter dated September 12, 2016, USEPA directed that Simplot use the intermediate-duration oral Minimal Risk Level (MRL) of 0.0002 mg/kg-day in ATSDR's uranium toxicity profile (ATSDR 2013b) as an RfD in lieu of USEPA's IRIS RfD for uranium (USEPA 2016c, USEPA 2016d). This 0.0002 mg/kg-day RfD is based primarily on a 1998 study that is more current than the 1949 study used to develop the IRIS RfD. The letter from USEPA is provided in Appendix U and presents additional detail supporting the requested use of ATSDR's value.

As a result of this directive, this SSHHRA presents supplemental risk calculations for all receptors that are based on the 0.0002 mg/kg-day uranium RfD. Further, these appendices also provide risk calculations based on the 0.0006 mg/kg-day chronic RfD that was developed for the uranium MCL by the Office of Ground Water and Drinking Water (USEPA/USGS 2000), as cited in a USEPA (2008) memorandum. The RfD of 0.0006 mg/kg-day was developed using the same principal study used by ATSDR (USEPA 2016d). The differences between ATSDR and USEPA methodologies resulted in the development of a quantitatively different RfD even

when using the same study/endpoint. Risk calculations using this range of three RfDs are presented in each of the appendices, in Table 6-6, and are discussed further in Section 6.3.4 (Uncertainty Analysis).

6.0 RISK CHARACTERIZATION

The risk characterization combines results of the exposure estimates (Section 4) with the toxicity factors (Section 5) to assess the relative risk and potential for adverse effects from HH COPCs. HH COPCs for which risk or hazards exceed risk/hazard target levels may become identified as HH COCs, and the focus of risk management considerations, further evaluation, and remediation if warranted. The HH COC list resulting from the SSHHRA should be considered preliminary and is finalized with input from regulatory agencies prior to the FS.

Carcinogenic (cancer) and non-carcinogenic (non-cancer) risks are assessed separately in accordance with USEPA guidance (USEPA 1989) to provide estimates of incremental cancer risks and indices for potential non-cancer hazards. Excess cancer risks are summed across all HH COPCs that have a carcinogenic effect and all exposure pathways that contribute to exposure of an individual in a given population. Complete risk characterization also includes a discussion of uncertainties associated with the various steps of the risk assessment.

The USEPA generally considers excess lifetime cancer risks (ELCRs) less than or equal to 1E-04 (1 in 10,000 chance of developing cancer as a result of Site-related exposure) as not requiring action under CERCLA (USEPA 1991c). USEPA considers ELCRs between 1E-06 to 1E-04 as the risk management range, and 1E-06 as the risk target goal. As stated in the 2004 Risk Evaluation Manual (IDEQ 2004), the IDEQ recommended target level for cumulative site risk for carcinogenic health effects is a sum of ELCR for all exposure pathways across all COCs of less than or equal to 1E-05. The IDEQ 1E-05 recommended target level is protective based on the overall conservative nature of exposure scenarios used in this process and the underlying health criteria (IDEQ 2004). For the SSHHRA, lifetime cancer risks greater than 1E-05 and 1E-06, where 1E-06 is generally considered the *de minimus* risk level below which there is no concern, are noted.

Potential hazards were also estimated for non-carcinogenic effects of HH COPCs based on oral, dermal, and particulate inhalation exposure. For non-carcinogenic effects, exposure estimates are compared to reference doses using the hazard quotient (HQ) approach. If the HQ for an HH COPC is equal to or less than 1, there is no appreciable risk that non-cancer health effects will occur (USEPA 1989, IDEQ 2004). Cumulative risk from multiple HH COPCs was calculated using the Hazard Index (HI) approach, where HQs of individual HH COPCs are summed. The USEPA risk target goal and the IDEQ recommended target level for non-carcinogenic health effects is for the HI to be less than or equal to 1 (USEPA 1989, IDEQ 2004). If this cumulative HI is greater than 1 and more than one HH COPC affects the same target tissue or organ system (e.g., the liver), then the total risk of adverse effects in that tissue (HI) will be estimated by summing the HQ values for all HH COPCs that act on that tissue.

The potential risks and hazards were developed in accordance with the procedures presented in RAGS Part A, Part B, and Part E (USEPA 1989, 1991c, and 2004a). The equations used in

calculating the risk estimates were discussed in Section 4.6. In accordance with USEPA guidance (USEPA 1989 and 2005b), risk and hazard estimates were rounded to one significant digit.

The baseline Tier 1 RME risk characterization and uncertainty is described for each of the receptors in Section 6.1 for all HH COPCs. The associated tables for the Tier 1 RME analysis, including risk to adult, youth, and child life stages, are presented in Appendices J through S. For Tier 2 analysis, the primary pathways, media and sampling locations responsible for risk estimates are identified, and the primary uncertainties associated with the HH COPCs are discussed. The Tier 2 analysis is presented in Section 6.2.

6.1 Tier 1 RME Risk Estimates

Current and future risk estimates based on the Tier 1 RME evaluation are presented in the following sections. A summary of results is presented for non-radionuclide HH COPCs in Section 6.1.1 and for radionuclide HH COPCs (i.e., uranium and uranium decay products) in Section 6.1.2.

6.1.1 Hazard and Cancer Risk Estimates for Non-Radionuclide HH COPCs

Table 6-1 lists the overall non-cancer hazards (HIs) and cancer risks (ELCRs) by receptor. Table 6-2 provides a more detailed summary of the HQs/HIs and ELCRs for each HH COPC, and Table 6-3 identifies contributing pathways. The tables present lifetime risks only, but it should be noted that there is not an appreciable difference between risks for the child, adult, or lifetime life stages (for those receptors with a childhood component). Shaded (i.e., gray highlighted) values indicate than an HI or ELCR estimate exceeds the regulatory risk target goals of either 1 (for the HI; IDEQ/USEPA target level) or 1E-05 (for the ELCR; IDEQ recommended target level). ELCR values in bold indicate that the cancer risk estimate is within USEPA's risk management range of 1E-06 to 1E-04 for managing risks in cleanups. Hazards and risks that are less than the regulatory goal of 1 for non-carcinogenic endpoints or 1E-06 for carcinogenic endpoints are not discussed further in this SSHHRA since they do not pose an unacceptable health risk to any of the receptors evaluated. Appendices J through R provide more detailed information for each COPC, pathway, and receptor by life stage (adult and child).

Three receptors (current and future seasonal rancher, and hypothetical future resident) had ELCRs for non-radionuclide HH COPCs that exceed IDEQ's recommended target level of 1E-05 (Table 6-1). Three receptors (industrial worker, and current and future livestock herder) had ELCRs less than IDEQ's recommended target level of 1E-05 (and within USEPA's risk management range of 1E-04 to 1E-06) (Table 6-1). Three receptors (recreational hunter, recreational trespasser, and Native American) had ELCRs at or less than 1E-06, which is generally considered the *de minimus* risk level below which there is no concern. For the current

and future seasonal rancher, and the hypothetical future resident, arsenic is the HH COPC that drives the carcinogenic risk estimate for these three receptors, and the ingestion of domestic water supply pathway contributes the most significantly to risk (with additional contributions from other pathways) (Table 6-2, Table 6-3).

The same three receptors (current and future seasonal rancher, and hypothetical future resident) had HIs for non-radionuclide HH COPCs that exceed IDEQ's (and USEPA's) target level of 1 (Table 6-1). The other six receptors (industrial worker, recreational hunter, current and future livestock herder, recreational trespasser, and Native American) had HIs less than 1. For the current and future seasonal rancher, and hypothetical future resident, the HH COPCs and pathways that contributed the most to the HIs greater than 1 are selenium via the domestic water supply pathway, and cobalt and thallium via the livestock consumption pathway (Tables 6-2 and 6-3). Cadmium also had an HQ greater than 1 for the ingestion of homegrown produce pathway for the future seasonal rancher and the hypothetical future resident. Iron also had an HQ greater than 1 for the hypothetical future resident (with small contributions mostly from domestic water supply and livestock consumption). These HH COPCs, receptors and media will be further evaluated in the Tier 2 Risk Characterization discussed in Section 6.2.

6.1.2 Cancer Risk Estimates for Radionuclide HH COPCs

Methodology described in Section 4.7, including risk calculations with the USEPA PRG risk calculator (USEPA 2015c), was used to evaluate cancer risks associated with radionuclides (i.e., uranium and uranium decay products) possibly present at the Site. The USEPA PRG risk calculator only evaluates carcinogenic endpoints so only ELCRs are discussed in this section. The estimated non-cancer hazards resulting from potential uranium exposure were evaluated in the analysis for non-radionuclide HH COPCs in the previous subsection. Exposure and risk calculations are presented in Appendix S, and Table 6-4 summarizes the overall cancer risks estimated for each of the receptors. Shaded (i.e., gray highlighted) values indicate that the ELCR is greater than the IDEQ recommended target level of 1E-05; ELCR values in bold indicate that the cancer risk estimate is within USEPA's risk management range of 1E-06 to 1E-04 for managing risks in cleanups. It is worthwhile to note that for radiological risks, USEPA considers a cancer risk of 3E-04 to be protective (USEPA 2014d) even though it is greater than the risk management range of 1E-04 to 1E-06. Risks less than 1E-06, which is generally considered the *de minimus* risk level below which there is no concern, are not discussed further in the SSHHRA since they do not pose an unacceptable health risk to that receptor.

All of the scenarios evaluated herein had an ELCR from radionuclides greater than 1E-06 (Table 6-4). The radionuclide ELCR estimates for four of the receptors (industrial worker, recreational hunter, recreational trespasser, and Native American) were less than IDEQ's recommended target level of 1E-05 for site risk (Table 6-4). The radionuclide ELCR estimates for the other five receptors (current and future seasonal rancher, the current and future livestock herder, and the hypothetical future resident) exceeded IDEQ's recommended target level of 1E-

05. However, the ELCRs for the future seasonal rancher and hypothetical future resident exceeded USEPA's risk target goal of 3E-04 for radiological risks. For comparison purposes, an additional evaluation was performed for a "comparison scenario" to evaluate risks to a hypothetical future resident using a Site-specific background 95UCL value for soil uranium and a domestic water supply EPC equivalent to the MCL for uranium, in addition to the produce and wild game consumption pathways. This "comparison scenario" evaluation resulted in an ELCR of 1E-02, which is greater than the primary-calculated ELCR for this receptor of 2E-03 (Table 6-4). Potential radiological risks for the current and future seasonal rancher, the current and future livestock herder, and the hypothetical future resident are discussed further in the Tier 2 Risk Characterization. Ingestion of game and livestock did not result in pathway-specific ELCRs greater than 1E-05 for any of the receptors for which these were complete pathways.

6.2 Tier 2 Risk Characterization

The Tier 2 risk characterization provides additional analysis of the HH COPCs identified as exceeding IDEQ recommended target levels from the Tier 1 RME risk analysis and further analyzes the models, data, and assumptions of the Tier 1 assessment that contribute the most risk/hazard in the Tier 1 assessment. The Tier 2 risk characterization is intended to inform the FS process, and provide information that will be useful in developing risk management decisions. Consistent with the methodologies presented in USEPA and IDEQ guidance (USEPA 1989 and IDEQ 2004), compounds with ELCRs greater than 1E-05 or HIs greater than 1 are the focus of this Tier 2 risk characterization. Arsenic, cadmium, cobalt, iron, selenium, and thallium are identified as preliminary HH COCs for non-cancer effects. No non-radionuclide HH COPCs were identified for the Recreational Fisher (qualitatively evaluated in Section 4.8), industrial worker, recreational hunter, recreational trespasser, livestock herder, or Native American receptors (Table 6-1). For the current and future seasonal rancher, and the hypothetical future resident, selenium and thallium were the HH COPCs that most frequently exceeded the recommended target level (Table 6-2, Table 6-3).

Arsenic was the only non-radionuclide HH COPC for which ELCR estimates exceeded the IDEQ recommended target level of 1E-05, and the only non-radionuclide HH COPC identified as a preliminary HH COC based on carcinogenic endpoints. Arsenic was identified as a preliminary HH COC for the current/future seasonal rancher and hypothetical future resident. It should be noted that the cancer risk estimates potentially resulting from arsenic exposure were within USEPA's risk management range of 1E-04 to 1E-06 for these receptors.

Adverse non-cancer or cancer risks were not predicted for any exposure pathways related to inhalation exposure to any media or dermal exposure to any media (Table 6-3).

The estimated non-cancer hazards resulting from potential uranium exposure were below 1 for all receptors (Table 6-2), and are not discussed further. Potential radiological risks associated with the receptors with ELCRs greater than 1E-05 (current and future seasonal rancher, the

current and future livestock herder, and the hypothetical future resident) are discussed further below.

Preliminary HH COCs assessed in this Tier 2 evaluation are arsenic, selenium and thallium (based on calculated hazards/risks to the current and future seasonal rancher and hypothetical future resident), and radionuclides. Cadmium, cobalt, and iron are discussed below as well because they contributed to the elevated HQ for the hypothetical future resident and current/future seasonal rancher (though to a much lesser degree than arsenic, selenium and thallium). Preliminary HH COCs are discussed separately below by media of potential concern.

6.2.1 Arsenic

ELCRs associated with arsenic exceeded the IDEQ recommended target level of 1E-05 for the current and future seasonal rancher and hypothetical future resident receptors (Tables 6-1 through Table 6-3) and were within USEPA's risk management range of 1E-04 to 1E-06. The primary pathway responsible for cancer risk estimates for these receptors was ingestion of domestic water supply; although ingestion of livestock, and garden produce (for the future seasonal rancher and hypothetical future resident) also contributed to the risk estimates (Table 6-3).

Domestic Water Supply – The Idaho State standard for drinking water is an ARAR, and represents the default acceptable risk for human receptors (USEPA 2002b). The domestic water supply EPC used to estimate risk was 0.0032 mg/L for the current seasonal rancher, and 0.0056 mg/L for the future seasonal rancher and the hypothetical future resident. Both of these are well below the Federal MCL and Idaho state drinking water standard of 0.01 mg/L. The corresponding cancer risk estimates exceed the 1E-05 IDEQ recommended target level, but are within the USEPA risk management range (1E-04 to 1E-06).

Figure 6-1 shows the 14 locations where maximum arsenic concentrations exceed the Idaho state drinking water standard of 0.01 mg/L (which is also the Federal MCL drinking water standard).[27] The other 53 sampling locations have arsenic concentrations at or below the drinking water standard. Locations with arsenic concentrations higher than the standard are primarily associated with RMM or other mine disturbance.

Soil – The soil arsenic EPCs used to estimate risk were 8.3 mg/kg for the current seasonal rancher, 8.5 mg/kg for the future seasonal rancher and 14 mg/kg the hypothetical future resident. The highest concentrations of arsenic in soils were typically from the Old Tailings Pond Sub-Basin and the French Drain Sub-Basin, and collected at Simplot-owned private land (Figure 6-1). Site concentrations of arsenic in background locations ranged from 3.5 to 9.6

[27] Not all samples from these locations exceeded the drinking water standard.

mg/kg, with a 95UCL of 6.8 mg/kg (Appendix T), and a calculated Site-specific 95 percent upper confidence limit on the 95th percentile of the data set (95/95 upper prediction limit [UPL]) background concentration of 9.4 mg/kg (Formation 2016). The data from regional studies suggest background concentrations in the western US range from about 7 to 40 mg/kg (Shacklette and Boerngen 1984, Oregon DEQ 2013, Montana DEQ 2005). For Montana, a background threshold value (BTV) was estimated as 22.5 mg/kg (Hydrometrics 2013). The calculated 95UCL and 95% upper tolerance limit with 95% coverage (95-95 UTL) for arsenic in background areas evaluated for other sites within the southeast Idaho phosphate mining area were 8.2 and 15.6 mg/kg, respectively (MWH 2015). If so, then soils at the Site contain arsenic concentrations that are largely within the range expected from natural background within the region. As described in greater detail below, chronic arsenic exposure is known to cause a myriad of adverse health effects. However, scientific studies have not conclusively shown that exposure to low-levels of arsenic in soil, such as those measured at this Site, results in adverse health effects even in studies with much higher levels of soil arsenic (ATSDR 2007b).

Livestock and Plant Ingestion – Ingestion of livestock and garden produce were associated with ELCRs for the current/future seasonal rancher and hypothetical future resident that exceeded the IDEQ recommended target level of 1E-05 but were within USEPA's risk management range of 1E-06 to 1E-04. Ingestion of culturally-significant plants also added to risk from arsenic for the hypothetical future resident, although less so than the other dietary intakes. For livestock meat consumption, the contribution of risk was higher for beef than for mutton, since the ingestion rates were slightly higher for beef for all receptors. EPCs for livestock and garden produce were not measured directly, but were modeled based on arsenic concentrations measured in soil and water (for garden produce) and soil, water, and forage vegetation (for livestock). As noted above, the arsenic concentration in soil throughout most of the Site is fairly representative of background concentrations. If so, estimated livestock and garden produce arsenic concentrations may be representative of EPCs for these media from natural background conditions. As discussed in Section 4.6, based on USEPA guidance (USEPA 2012a), the default relative bioavailability of arsenic in soil is 60 percent, which indicates that less arsenic is absorbed from soil ingestion pathways than from water, which is the exposure medium in the critical toxicity studies used to derive the oral RfD and CSF. Although direct soil ingestion estimates incorporated 60 percent adjustment, other soil-derived ingestion pathways likely overestimated intake exposure. Further, for the hypothetical future resident, exposure to watercress consumption was evaluated using a single wild onion sample from the Site that was unwashed prior to analysis. If human receptors rinse soil from vegetation consumed directly, then this EPC could potentially overestimate intake exposure.

Arsenic (in domestic water supply) is considered a preliminary HH COC for the Site. Estimated cancer risks for arsenic via the ingestion of total arsenic in domestic water for the seasonal rancher and the hypothetical future resident were above the IDEQ recommended target level of 1E-05 although they were within USEPA's risk management range of 1E-04 to 1E-06. It is important to note that, while several individual samples of surface water and groundwater

collected to represent a potential drinking water source for several receptors exceeded the Federal MCL, the EPCs used for the drinking water exposure point concentrations for all receptors was below the Federal MCL, and non-cancer hazard indices were 1 or less. The appearance of small "corns" on the palms, soles and torso and darkening of the skin has been associated with ingesting low levels of arsenic for many years (ATSDR 2007b), although the level expected to cause these skin alterations are higher than the EPCs for the Site. Ingestion of inorganic arsenic has been shown to cause an increased risk of skin cancer and cancer of the liver, bladder and lungs in several studies (ATSDR 2007b), although the MCL has been established to be protective of cancer. Because EPCs for the Site are below the MCL, it is unlikely that ingesting water from domestic water supply sources would result in liver, bladder or lung cancer, however.

6.2.2 Selenium

Non-cancer hazards associated with selenium exceeded the IDEQ/USEPA target level of 1 for the current and future seasonal rancher and hypothetical future resident (Table 6-2). The primary pathway of concern was use of groundwater and select surface water locations as a domestic water supply source (Table 6-3).

Domestic Water Supply – The selenium domestic water supply EPCs used to estimate risk was 0.5 mg/L for the current seasonal rancher, and 0.34 mg/L for the future seasonal rancher and the hypothetical future resident. These selenium concentrations exceed the Idaho drinking water standard of 0.05 mg/L. Figure 6-2 presents the locations where selenium concentrations exceed the Idaho state drinking water standard. These locations are generally downgradient from the RMM within the shallow and intermediate stratigraphic groundwater units, and within the riparian footprint of the drainages. Groundwater within the Non-Mined Area, outside of the riparian footprint, remains acceptable as a drinking water source.

Selenium (in domestic water supply) is considered a preliminary HH COC for the Site. Chronic exposure to selenium in the diet (via food or water intake) can cause selenosis, which is a disease characterized by hair loss, nail brittleness, and numbness of the extremities (ATSDR 2003). The basis of the RfD that served to estimate the hazard quotient for selenium evaluated these symptoms in a population of people exposed to much greater levels and included a safety factor. The exposure levels predicted in this risk assessment for all receptors are well below levels that have caused selenosis; however, the EPCs used in the risk assessment to represent potential exposure to domestic water supply for several receptors exceeded the drinking water standard.

6.2.3 Thallium

Non-cancer hazards associated with thallium exceeded the IDEQ/USEPA target level of 1 for the current and future seasonal rancher and hypothetical future resident. For all receptors, the primary pathway contributing to exposure was ingestion of livestock (Table 6-3). For livestock meat consumption, the contribution of risk was higher for beef than for mutton, since the ingestion rates were slightly higher for beef for all receptors.

Livestock and Wild Game – Site-specific data on thallium concentrations in livestock were not available; rather, EPCs for meat ingestion were modeled from Site-wide soil, water, and vegetation concentrations. Data from regional studies suggest that thallium concentrations in soils at the Site are within the range of natural background concentrations. For example, the Oregon DEQ (2013) published background concentrations for the state of Oregon ranging from 0.2 to 5.7 mg/kg. Background concentrations in Montana ranged from 0.07 to 0.84 mg/kg, with a BTV (based on the 95UCL of the mean) of 0.41 mg/kg (Hydrometrics 2013). Regional background concentrations of thallium ranged from 0.1 to 1.3 mg/kg, with a 95UCL of 0.5 mg/kg (MWH 2015). Site concentrations of thallium in background locations ranged from non-detected to 6.8 mg/kg, with a 95UCL of 2.7 mg/kg (Appendix T), and a calculated Site-specific 95/95 UPL background concentration of 6 mg/kg (Formation 2016). The thallium EPC used to estimate Site-wide risk was 0.83 mg/kg (ranging from non-detected to 5.7 mg/kg), which is generally within these background ranges. If thallium is predominantly present at background concentrations in soil, then uptake into livestock, and subsequent exposure to human receptors is likely also within the natural background range.

National exposure estimates published by ATSDR (1992) indicate that the typical daily human exposure to thallium from food is 5 micrograms per day (µg/day) for a 70 kg adult, or 0.071 micrograms per kilogram bodyweight per day (µg/kg-day). This estimate is very similar to the dietary intake for thallium calculated for the hypothetical future resident of 0.09 µg/kg-day (Appendix R-4), with the other exposure scenarios having lower overall exposure (0.03 µg/kg-day, Appendix L-4; and 0.04 µg/kg-day, Appendix M-4).

The toxicity value used to estimate the HQs for thallium were based on the data for soluble salts of thallium administered in an aqueous solution (RfD of 1E-05 mg/kg-day for hair follicle atrophy). It is recognized in the PPRTV Support Document for Thallium (USEPA 2012b) that the toxicity database for this compound is generally of poor quality, and these same studies were used to previously estimate RfDs that were as high as 9E-05 mg/kg-day. The RfD for thallium sulfate is 2E-05 mg/kg-day (USEPA 2012b) and included a safety factor of 10,000 which reflects the lack of confidence and uncertainty in the value. It is unknown what form of thallium would be found in biota at the Site but risks would be much less if other thallium RfDs were considered. In addition, exposure estimates for the Conda SSHHRA assume that bioavailability is 100 percent, although most inorganic compounds in solids are poorly absorbed from the gastrointestinal tract. The critical study for the RfD was based on an aqueous solution

with dissolved thallium, which is a highly bioavailable form and may not be representative of bioavailability of thallium from foods and abiotic materials at the Site.

6.2.4 Cadmium, Cobalt, and Iron

Non-cancer hazards for cadmium, cobalt, and iron slightly exceeded the IDEQ/USEPA target level of 1 for the following receptors and pathways (Table 6-2, Table 6-3):

- Cadmium - Future seasonal rancher (HQ=2) and hypothetical future resident (HQ=4), garden produce ingestion pathway;
- Cobalt – Current seasonal rancher (HQ=2), future seasonal rancher (HQ=2), and hypothetical future resident (HQ=2), livestock ingestion pathway;
- Iron - Hypothetical future resident (HQ=2), domestic water supply and livestock ingestion pathways.[28]

These HH COPCs are likely inconsequential for the Site. All of the HQs for cadmium, cobalt, and iron were 2, and up to only 4 for cadmium for the hypothetical future resident (Table 6-2). Most inorganic compounds are poorly absorbed from the gastrointestinal tract and because bioavailability was assumed to be 100 percent, estimated risks via ingestion pathways were likely overestimated. Further, inspection of the data show that cadmium, cobalt and iron concentrations are very similar to naturally occurring levels. The data from regional studies indicate that background concentrations of cadmium in the western US range from about 0.4 to 41 mg/kg (Hydrometrics 2013, Oregon DEQ 2013, MWH 2015), with a 95UCL of 13.6 mg/kg (MWH 2015). Site concentrations of cadmium in background locations ranged from 0.8 to 9 mg/kg, with a 95UCL of 3.8 mg/kg, and a calculated Site-specific 95/95 UPL of 6.5 mg/kg (Formation 2016). The Site-wide soil EPC for cadmium was 26.4 mg/kg, which is within the regional background range up to 41 mg/kg, but is higher than the background 95UCL and 95/95 UPL. The background concentrations of cobalt in the western US range from 7.1 to 13 mg/kg (Shacklette and Boerngen 1984, Hydrometrics 2013, MWH 2015), with a 95UCL of 7.92 mg/kg (MWH 2015). Site concentrations of cobalt in background locations ranged from 5.9 to 18.4 mg/kg, with a 95UCL of 11.6 mg/kg (Appendix T), and a calculated Site-specific 95/95 UPL background concentration of 16 mg/kg (Formation 2016). The Site-wide cobalt soil EPC of 6.1 mg/kg is generally lower than these regional background concentrations. For iron, the range of soil background concentrations are from 24,400 to 26,000 mg/kg (Shacklette and Boerngen 1984, Hydrometrics 2013). Site concentrations of iron in background locations ranged from 11600 to 27300 mg/kg, with a 95UCL of 20,782 mg/kg (Appendix T), and a calculated Site-specific 95/95 UPL background concentration of 26,943 mg/kg (Formation 2016). The Site-wide

[28] The HQs for individual exposure pathways for iron were at/below 1, but when summed, the HQ for total ingestion pathway was just slightly greater than 1 (1.5). Domestic Water Supply and Livestock are two individual pathways contributing to that hazard (Appendices R-1 and R-4).

iron soil EPC of 15,549 mg/kg is generally lower than these regional background concentrations. In addition, none of these compounds affect the same target organ although several of them potentially impact one of the same endpoints as selenium and thallium, which is hair loss.

Overall, it is believed that the risk posed by these preliminary HH COCs is insignificant when compared to other HH COCs at the Site, because: (1) they are present at concentrations similar to background conditions (Shacklette and Boerngen 1984, Hydrometrics 2013, Oregon DEQ 2013, MWH 2015); and (2) their relatively small HQs (2 to 4) when compared to the HIs (20 to 30).

6.2.5 Radionuclides (Uranium and Decay Products)

The estimated non-cancer hazards resulting from potential uranium exposure were below 1 for all receptors (Section 6.1.1). Potential radiological risks associated with uranium and its decay products yielded ELCRs greater than 1E-05 for the current and future seasonal rancher, the current and future livestock herder, and the hypothetical future resident. However, as noted in Section 6.1.2, only the ELCRs for future seasonal rancher and hypothetical future resident exceeded USEPA's risk target goal of 3E-04 for radiological risks (USEPA 2014d).

Uranium is a naturally occurring radioactive element that is present in nearly all rocks and soils, with higher levels found in lands supporting current and historical mining (ATSDR 2013b). Appendix S.1 summarizes all of the EPCs used to estimate potential risks associated with uranium and decay products for all receptors, and Table 6-5 summarizes the soil and water EPCs specifically used for the scenarios with ELCRs greater than 1E-05. Figure 6-3 shows the concentrations of uranium at surface soil[29] and domestic water supply sampling locations. The Site-wide soil uranium EPC (23 mg/kg) is greater than what would be considered background, as calculated in Appendix T (1.5 mg/kg is 95UCL for background dataset), the Final RI Report (Formation 2016, 2 mg/kg Site-specific background 95/95 UPL concentration), by ATSDR (2013b; 3 mg/kg), and by Shacklette and Boerngen (1984; 2.5 mg/kg). However, pathway-specific ELCRs for direct ingestion, inhalation, and external exposure risks from Site soil were at or below 1E-05 (and below 3E-04) for all receptors (Appendix S.4). Similarly, ingestion of wild game/livestock or surface water also did not result in pathway-specific ELCRs greater than 1E-05 for any of the receptors for which these were complete pathways (Appendix S). The range of surface water uranium EPCs (0.002 to 0.006 mg/L; Table S-1) is just slightly above the range of Site-specific background surface water concentrations (0.001 to 0.002 mg/L 95/95 UPLs; Formation 2016). Overall, the radionuclide risk evaluation provided little evidence that uranium and decay products pose a cancer risk above the radiological cancer risk target goals of 1E-05

[29] An evaluation was performed to assess the effect of soil sample depth on estimated EPCs for uranium and its associated decay products. Site-wide soil data indicate that there is not a significant difference between surface and subsurface concentrations of this constituent.

or 3E-04 at the Site due to direct exposure to soil, surface water, game or livestock for any of the receptors evaluated herein.

As indicated in Section 4.8, garden produce exposure and risk was modeled in the PRG calculator using soil concentrations to estimate plant uptake. The scenarios that included homegrown produce consumption had risk estimates that exceeded the IDEQ recommended target level of 1E-05, and almost all of the soil-related risk was associated with the consumption of produce. It is believed that this is mostly an artifact of conservative modeling of the PRG risk calculator because even using the Site-specific soil background UCL of 1.5 mg/kg, yielded risks above 1E-05 for the produce consumption pathway (Table 6-5). Furthermore, when comparing Site-specific background uranium concentrations in vegetation (approximately 0.01 pCi/g) to modeled plant concentrations from soil uptake (a uranium concentration of 0.652 pCi/g with soil to plant transfer factor of 5.39E-03 from the USEPA PRG Risk Calculator yields a U-238+D plant concentration of 0.01 pCi/g), the plant concentrations are similar, which suggests that the risk component of the PRG Risk Calculator for produce consumption overestimates risks.

The domestic water supply EPC for all of the scenarios it was included in exceeded a 1E-05 recommended target level, except for the industrial worker. For the future seasonal rancher and hypothetical future resident, risks from the domestic water supply pathway alone exceeded 1E-05. The hypothetical future resident had the greatest estimated risk at 2E-03, with roughly 66 percent contributed by the ingestion of domestic water supply pathway and the remainder due to the consumption of homegrown produce. However, the domestic water supply EPC of 0.005 mg/L is lower than the uranium MCL of 0.03 mg/L. It should be noted that several states, including Idaho, have public health concerns related to radon in indoor air with the primary concern being lung cancer from inhalation exposure, while exposure and stomach cancer rates from ingesting uranium in drinking water is a much less significant concern. This empirical information and public health policy issue contrasts with the risk results presented herein, which are hypothetical in nature and are based on USEPA's PRG risk calculator model.

For comparison, an evaluation was conducted for a hypothetical future resident with the domestic water supply EPC at the MCL (30 mg/L or 10 pCi/L) and the Site-specific surface soil background UCL (1.5 mg/kg) used as the soil EPC. Risk for this hypothetical future resident receptor was roughly 1E-02, which is almost an order of magnitude greater than worst-case hypothetical risks that *might* be attributable to impacts from the Site (Table 6-5). The Site-wide domestic water supply EPC for the hypothetical future resident and future seasonal rancher (1.24 pCi/L), which is based on the 95UCL on the average for groundwater and some surface water sources. In comparison, the average concentration measured in the Idaho Falls Public Water Supply is 0.94 pCi/L (City of Idaho Falls 2015), which suggests that the domestic water supply at the Site is not that different than what is typically measured in a nearby public water supply source.

Because of the weight of evidence associated with potential radiogenic risks at the Site as described above, we believe that uranium and radionuclides do not pose significant health risks at the Site. Moreover, uranium did not pose an unacceptable non-cancer risk for any of the receptors evaluated as part of the non-radiologic risk assessment summarized in Section 6.1.1. Additional information related to the uncertainty and conservative bias of the radiological evaluation is included in the following section.

6.3 Uncertainty Analysis

Uncertainty analysis is a standard component of the USEPA risk assessment (USEPA 1989). USEPA recognizes that quantitative evaluation of risks to humans from environmental impacts is frequently limited by uncertainty (lack of knowledge) regarding analytical data, exposure, toxicity, and risk factors. Although risk assessment follows a formal scientific approach, the methods used and assumptions made in assessing potential human health risks are subject to a degree of uncertainty. Making assumptions, or estimates, based on available data or incorporating professional judgment is an inherent part of the quantitative risk assessment process. The use of Site-specific factors acts to decrease uncertainty, although significant uncertainty persists in even the most Site-specific risk assessments.

Depending on the source, uncertainties may increase or decrease the estimated risks. However, in conformance with USEPA guidance (USEPA 1989), exposure factors and EPC calculation methods were selected to reduce or minimize the chances of underestimating exposure and risk. It is important to the risk management decision-making process that the sources of uncertainty are identified. This section describes the potential impacts of the assumptions used in this risk assessment on the overall risk characterization.

6.3.1 Data Quality

As reported in the Final RI Report (Formation 2016), the data collected satisfied the goals described in the RI/FS Work Plan (Formation 2008) for characterization of the nature and extent and fate and transport of contamination at the Conda Mine Site. In addition, risk assessment data needs were incorporated in scoping the RI sampling of all media. Hundreds of samples of soil, sediment, groundwater, surface water, and vegetation were collected across the Site. Much of the data were collected in the vicinity of known or suspected contaminant sources (i.e., RMM), or along suspected transport pathways. This factor may tend to overestimate exposure and risk for most pathways.

Laboratory data were of high quality for all media. Data were evaluated for usability in risk assessments using USEPA methods (USEPA 2004b). Only data validated at Level 5 were used in exposure assessments. Validation levels for various datasets are shown in Appendix D of the Final RI Report (Formation 2016).

6.3.2 Exposure Analysis

The USEPA risk assessment guidance for exposure assessments generally includes evaluation of hypothetical exposure scenarios rather than Site-specific evaluation based on detailed surveys of Site use (USEPA 1989). This conservative default approach was used for the hypothetical future resident scenario. Under this approach, if a chemical is found to be present at a Site, it is assumed that exposure to that chemical will occur regardless of whether that exposure is realistic or likely. Because the plausibility or reality of a future residential scenario is unclear, Site-wide samples were used to assess possible exposure for a RME scenario, regardless of current land ownership (e.g., BLM land). These exposures could potentially be an overestimate of risk for residences established in the eastern portion of the Non-Mined Area or an underestimate if a residence was built directly on RMM. The current and future seasonal rancher scenarios provide a reasonable representation of seasonal residents exposed to media within the Non-Mined Area and Mined Area BLM land.

Uncertainties associated with the exposure assessment included development of EPCs and selection of exposure parameters. For EPCs averaged over large areas (Site-wide 95UCLs), all data points were given the same weight. Because areas of potential contamination were more densely sampled (as sampling was largely conducted with judgmental samples in RMM or other areas of suspected impact), areas with the highest HH COPC concentrations are over-represented in the EPCs and exposure estimates. This approach is expected to result in an overestimate of EPCs for given receptor scenarios since exposure is likely to occur more randomly and in areas that are less likely to have RMM.

Estimates of HH COPC intake include uncertainties associated with the exposure assumptions. Most exposure parameters are based on the upper bound RME level (most conservative scenario), which is specifically designed to evaluate the exposure to an individual at the high end of the possible range of exposures. Exposure parameters such as ingestion and inhalation rates and EPCs are based on high end estimates, generally the 95th percentile for the possible ranges. Standard default exposure parameters recommended in USEPA's Exposure Factors Handbook (USEPA 2011 and 2014a) were used for several parameters including ingestion rates for soil, water, homegrown produce and beef, and wild game. These values are typically based on the 95th percentile of the range of potential exposure rate values, or similar upper-end estimates. Using the upper-bound values ensures protection of sensitive subpopulations, but may overestimate average exposures.

Other parameters such as contact with Site surface water by trespasser, hunters, livestock herder, and Native American are typically not identified by USEPA. In these cases, ingestion rates were based on professional judgment and discussions with the Agencies. Exposure parameters, their sources, and the underlying rationale are presented in Table 4-2.

The Native American receptor group is one not often considered in risk assessments and information regarding their land use patterns and lifestyle are less readily available. Therefore, considerable professional judgment regarding exposure frequency, duration, and diet was utilized. It is recognized that other traditional exposure pathways, such as inhalation exposure from sweatlodge use or smoking, or dermal exposure from salve application or basketmaking[30] could be complete exposure pathways. However, without direct knowledge of these activities occurring at the Site or with materials taken from the Site, the likelihood of these pathways being complete and significant is uncertain and difficult to reasonably quantify. Correspondence from the Shoshone-Bannock Tribes indicated that current information regarding Site use (e.g., traditional exposure pathways, and consumption rates for culturally-significant plant species) may not be complete. The Shoshone-Bannock Tribes have recently provided reference materials regarding possible exposure scenarios for a subsistence lifestyle (Shoshone-Bannock Tribes 2016). Exposure parameters for the Native American in this SSHHRA were largely based on the AWHHRA (TTEMI 2002) until the Agencies provide guidance about the specific use of the subsistence exposure scenarios provided in the Shoshone-Bannock Tribes (2016) exposure document.

Any uncertainty associated with the radionuclide risk assessment is believed to be generally related to the assumptions and methodologies inherent in the USEPA-developed PRG Risk Calculator model since some of the assumptions and algorithms in the model cannot be changed or verified. To provide context for the results of the USEPA-developed model, a "comparison scenario" residential evaluation was conducted using the Site-specific background soil concentration for uranium and the Federal uranium MCL for water concentrations. Based on the "comparison scenario" evaluation, elevated ELCRs were yielded when using background uranium concentrations in soil (and subsequent uptake into plants) and drinking water

6.3.3 Exposure Point Concentrations Modeled from Other Media

Analytical data from the media of interest are preferred. However, modeling factors can be applied to predict HH COPC concentrations in media where data were not collected. The use of modeling factors may overestimate or underestimate potential media concentrations and subsequent risk depending on how closely the default input parameters or literature assumptions represent Site-specific properties and the degree to which the algorithm is adequately predictive. For example, USEPA's default PEF was used to estimate potential HH COPC concentrations in ambient air, and transfer coefficients were used to estimate concentrations in garden produce, tea, livestock, and wild game.

The use of the default PEF assumes generic meteorological conditions for the entire northwestern US and a timeframe different from several of the exposure scenarios. Dust

[30] It is noted that these are not the only uses for culturally-significant plants by Native Americans; refer to Shoshone-Bannock 2016 for more information.

generation and potential inhalation during certain recreational activities such as ATV and motorcycle riding would likely be higher than assumed in the SSHHRA, which was evaluated as windblown dust for the various receptors. Although the degree of uncertainty depends on the receptor, this pathway is considered to contribute only a minor amount of risk and thus the degree of uncertainty is considered to be relatively small.

EPCs in livestock and wild game (elk) meat were estimated using uptake equations and transfer coefficients as recommended by USEPA (2005a). Livestock were assumed to graze at the Site for six months per year, and elk were assumed to have access to the Site all year. Elk forage over areas much larger than the Site, and so it was assumed that an elk is on-Site for roughly 28 percent of the year based on acreage at the Site and the home range of elk in Southeastern Idaho (Kuck 2003). The use of an adjustment factor when modeling the wild game (elk) concentration to account for the time an elk grazes at the Site may underestimate the tissue concentrations in other small ranging game species that may only forage/graze at the Site. However, because of the differences in exposure to these other game species related to uptake, metabolism, distribution, and excretion and the uncertainty associated with the quantity of meat from the smaller game species receptor to ingest, it is difficult to quantify the impact using the adjustment factor has on overall receptor risk. EPCs were based on the assumption that the animals obtained all of their food while at the Site from areas represented by the forage vegetation EPCs. For cattle and sheep, this may overestimate the potential exposure to HH COPCs in forage because the amount of time on-Site would be limited by the number of animals being grazed, which is based on the AUM restrictions of the grazing allotments (Table 2-2). A large herd of cattle or sheep would remove the available resources from the Site more quickly than a small herd, thus requiring moving animals to other areas for grazing. The same livestock EPCs were used for both beef and mutton consumption, even though sheep have different body weights and consumption rates for vegetation and water, and so this is a source of uncertainty for receptor intakes. Further, the vegetation EPCs for livestock and wild game were based on all available vegetation samples within the exposure areas, including browse, forbs, grasses, aquatic species, and also samples specifically collected to measure HH COPCs in selenium-accumulating species. Similar to soil samples, most of the vegetation samples were judgmental and collected in or near RMM. In addition, some of the vegetation samples were from unwashed samples, which adds to the incidental soil ingestion that was already incorporated to the EPC calculations. Based on livestock exposure factors and Site concentrations, the estimated uptake of selenium into livestock meat was mostly contributed by selenium in Site vegetation, although ingested soil and water also contributed to the overall estimate. As such, the EPC is likely to be biased high since exposure to vegetation is likely to be more random, and to materials with varying and lower concentrations. These assumptions likely overestimate the livestock EPCs at the Site, and therefore overestimate the EPCs for human intake estimates. For example, the EPC for beef muscle for the hypothetical future resident was estimated using Site-wide 95UCLs for soil, surface water, and vegetation, which resulted in an EPC of 1.6 mg/kg (dry weight) for selenium. For comparison purposes, ATSDR

(2003) estimates that the average selenium concentration in (affected) beef is approximately 0.25 mg/kg (cooked wet weight; approximately 1.25 mg/kg dry weight).

As discussed in Section 4.5.3, uptake coefficients for the risk estimates for selenium in livestock and wild game were primarily based on the 0.0034 d/kg value from Hintze et al. (2002). For comparison purposes, risk estimates were also calculated using uptake coefficients from Baes et al. (1984; 0.015 d/kg) and Cal-EPA (2012; 0.04 d/kg). The alternative selenium EPCs using these other uptake coefficients are presented in Appendices H.15 through H.17. The results using these alternative EPCs for each of the receptors are presented in Appendix J.8 (industrial worker - wild game), Appendix K.8 (hunter – wild game), Appendix L.8 (current seasonal rancher – livestock and wild game), Appendix M.8 (future seasonal rancher – livestock and wild game), Appendix Q.8 (Native American – wild game), and Appendix R.8 (hypothetical future resident – livestock and wild game). While there is variation between these uptake coefficients, which most likely relates to the underlying differences in study protocols and natural variability, the use of these various factors in the modeling does not result in a significantly different overall risk conclusions related to the potential risks to receptors with livestock and wild game intake. The small differences highlight the potential importance of considering site acclimation for livestock and wildlife. For the industrial worker, recreational hunter, and Native American receptors, the HQ for selenium and total non-cancer HIs were less than 1 for all of the alternatives (Appendices J.8, K.8, and Q.8), the same as summarized on Table 6-1. For the current seasonal rancher, although the selenium HQ ranged from 2E+00 to 3E+00, the total non-cancer HI was still 1E+01 (Appendix L.8), the same as summarized on Table 6-1. For the future seasonal rancher, although the selenium HQ ranged from 2E+00 to 4E+00, the total non-cancer HI was still 2E+01 (Appendix M.8), the same as summarized on Table 6-1. Finally, for the hypothetical future resident, the selenium HQ ranged from 3E+00 to 1E+01, and the total non-cancer HI ranged from 3E+01 (same as summarized on Table 6-1) to 4E+01 using the Cal-EPA uptake coefficient (Appendix R.8). In all cases, the use of alternative selenium uptake coefficients for uptake by livestock and wild game yielded similar overall risk conclusions.

EPCs for garden produce were estimated using uptake equations and transfer coefficients as recommended by USEPA (2005a). There appears to be a reasonably good correlation with estimated EPCs for garden produce and vegetation sampled at the Site; the values were generally within an order of magnitude of each other if the vegetation was not collected in overburden areas. It should be noted, however, that in a comparison by Alsop et al. (1996) they noted that exposure uptake models, such as the ones used in this evaluation, consistently over-predict measured tissue concentrations for plants and animals when soil concentrations exceed background.

Native Americans may use plant materials from the Site for making teas and traditional medicines or other products as well as during traditional ceremonies. Potential risks to plant exposure were evaluated for ingestion of culturally-significant plants and tea brewed with such plants, both considered complete and significant pathways. Exposure via inhalation of

culturally-significant plants is considered a complete but insignificant pathway because the potential exposure from smoke inhalation of the HH COPCs is assumed to be less than from exposure via direct ingestion of plants. In addition, it would be difficult to evaluate the smoke inhalation pathway because exposure assumptions related to this pathway for Native Americans are not available. Excluding potentially complete pathways could lead to an underestimate of overall risks for Native American receptors.

For the Native American receptor, ingestion of culturally-significant plants and exposure to tea was modeled from HH COPC concentrations in washed vegetation samples (1 unwashed sample). Native American receptors may not rinse vegetation prior to use. If vegetation is not rinsed prior to consumption or as part of the tea preparation process, then this EPC could potentially underestimate intake exposure. For the hypothetical future resident, exposure to watercress ingestion was evaluated using a single wild onion sample from the Site that was unwashed prior to analysis. If individuals rinse soil from vegetation consumed, this EPC potentially overestimates intake exposure. There is also uncertainty associated with the use of a single sample to estimate this exposure for the hypothetical residential receptor.

6.3.4 Toxicity Assessment

Standard USEPA sources were used to identify toxicity factors (Table 5-1) for the SSHHRA. USEPA's process for using studies or other sources for the toxicity information generates uncertainty. All of the toxicity values used in the risk assessment were taken from databases on USEPA's hierarchy of recommended toxicity values, which may not decrease uncertainty, but certainly provides for consistency across projects and ensures a specified and defined level of validation in their derivation.

Toxicity assessments for many of the COPCs involve the extrapolation of results from studies on animals. The following are standard assumptions applied by the USEPA when extrapolating the results of studies of carcinogenicity in animals to humans.

- Any chemical showing carcinogenic activity in any animal species will also be a human carcinogen.
- There is no threshold dose for carcinogens.
- The results of the most sensitive animal study are appropriate to apply to humans.
- Humans are more sensitive than the most sensitive animal species on a body weight basis.

Mathematical models are used by USEPA to estimate the possible responses due to exposure to chemicals at levels far below those tested in animals. These models contain several limitations, which should be considered when the results (e.g., risk estimates) are evaluated.

Primary among these limitations is the uncertainty in extrapolation of results obtained in animal research to humans and the shortcomings in extrapolating responses obtained from high-dose research studies to estimate responses at very low doses. For example, humans are typically exposed to environmental chemicals at levels that are less than a thousandth of the lowest dose tested on animals. Such doses may be easily degraded or eliminated by physiological internal mechanisms that are present in humans. Further, comparison values and reference values may be based on analyses of the most toxic form of a chemical, which may be different from the form occurring naturally in the environment or analytically measured. For example, if a comparison value is based on inorganic form of the chemical, and the analyses report total concentrations of the chemical, then risk could be overestimated.

Additionally, approaches typically used for designating RfDs are highly conservative. For example, USEPA (1989) applies a factor of 10 to a No-Observed-Adverse-Effect-Level (NOAEL) for a chemical in an animal study for animal-to-human extrapolation. An additional factor of 10 is applied for inter-individual variation in the human population, and additional factors of 10 may be applied to account for limitations in data quality or incomplete studies. Frequently, RfDs are derived from animal studies that have little quantitative bearing on potential adverse effects in humans. Some of this uncertainty may be reduced if the absorption, distribution, metabolic fate, and excretion parameters of a chemical are known.

Selenium is a nutritionally essential element for humans, and is naturally present in many foods. The oral RfD used in this risk assessment was 5 µg/kg-day (Table 5-1), while the Recommended Daily Allowance from USDA Dietary Guidelines for Americans is 0.688 µg/kg-day or 55 µg/day assuming the average adult weighs 80 kg. It is interesting to note that the RfD is the same as the Tolerable Upper Intake Level set forth in the Dietary Guidelines for Americans. Bioavailability of selenium was assumed to be 100 percent in this risk assessment, although inorganic compounds are often poorly absorbed from the gastrointestinal tract. The critical study used to develop the RfD, however, was based on an epidemiological study of individuals in an area of China with unusually high concentrations of selenium in the soil and food items. Therefore, the difference in bioavailability in this study when compared to the pathways evaluated in this risk assessment may not be very significant given the similar exposure conditions in the critical study and this risk assessment.

As discussed in Section 5.4, the Agencies requested that this SSHHRA present risk calculations for uranium using the intermediate-duration MRL of 0.0002 mg/kg-day for the RfD. The results using a range of uranium RfDs (0.003 mg/kg-day from IRIS, 0.0006 mg/kg-day from the Office of Ground Water and Drinking Water, 0.0002 mg/kg-day from ATSDR) are presented in Table 6-6 and the final table of each of the Appendices J through R. The use of the 0.0006 mg/kg-day RfD in risk calculations yields a five-fold increase in HQs for uranium, and no appreciable change (1.04-fold increase) in the overall HIs. The use of the 0.0002 mg/kg-day reference dose in risk calculations yields a fifteen-fold increase in HQs for uranium, and no appreciable change (1.1-fold increase) in the overall HIs. For most receptors, the HQ for uranium is below 1 using

any of the RfDs. For the hypothetical resident, the HQ for uranium is below 1 using the 0.003 mg/kg-day RfD, and the HQ is 1.8 using the 0.0002 mg/kg-day RfD (though it should be noted that other compounds have higher HQs and contribute more to the overall HI).

6.3.5 Risk Characterization Uncertainties

Often in risk assessments, uncertainty that errs away from conservatism may be introduced when toxicity values or SLVs are not available. As shown in Table 3-3 and Table 5-1, SLVs and toxicity values were available for all of the inorganic compounds evaluated in the risk assessment. It is believed, therefore, that the completeness of the toxicity information for the inorganic HH COPCs imparted very little uncertainty in this assessment.

Organic compounds were analyzed in the Townsite Area soil and domestic water supply. Of the 133 inorganic COIs, 105 compounds were screened out of the SSHHRA because the MDCs (or maximum non-detected concentrations) were lower than the SLVs for both soil and domestic water supply (Appendix F.5). As discussed in Section 3.2, 25 organic COIs were identified as uncertain HH COPCs (Table 3-8) and are evaluated qualitatively here. These compounds included COIs for which SLVs were not available, and COIs that were not detected in a given media yet had a maximum detection limit above the SLV. It is unknown what impact these uncertainties could have on overall risk estimates although it is believed to be minimal, since many of the organic COIs were not detected in the Townsite Area and most of the COIs had SLVs for at least one media.

A total of 9 of these COIs are identified as uncertain HH COPCs because they were lacking SLVs for one or both of the media. There were 5 COIs lacking soil SLVs, but these analytes were non-detected in soil, and were either non-detected in water and/or did not exceed water SLVs (Table 3-8). There were 4 analytes that lacked an SLV for both media (Table 3-8). However, these analytes were also non-detected in Site media, with the exception of carbazole. The overall risk from carbazole is believed to be minimal because it was not detected in any of the 12 soil samples and detected in 1 of 9 domestic water supply samples (frequency of 11 percent) at a concentration of 0.0011 mg/L (Appendix F.1 and F.3). Further, the detection was in an unfiltered sample at a well (GW-9-IS) which also had 2 other samples with non-detected carbazole concentrations. Although there is uncertainty about the risk, the fact that it was not detected in soils and was rarely detected in domestic water supply samples suggests that this analyte is not expected to cause risk.

Sixteen of these COIs are identified as uncertain HH COPCs because the detection limits were above SLVs in domestic water supply samples. These analytes were non-detected in water, and were either non-detected in soil and/or did not exceed soil SLVs (Table 3-8).

It appears from these multiple lines of evidence that these uncertain organic HH COPCs are not expected to be widespread contaminants at the Site or to present adverse risk. It is believed

that the uncertainty associated with these compounds not being retained for further quantitative evaluation does not impact the overall risk estimates for the Site.

6.3.6 Overall Impact of Uncertainties

Overall, the SSHHRA attempts to reduce the chances of underestimating exposure by using methods that result in conservative estimates of EPCs (e.g., 95UCLs or maximum values, sample data are not spatially weighted), and exposures (95th percentile of exposure parameters ranges used). When multiplied together, these data compound the uncertainties in the exposure assessments and result in estimated intakes (and resultant hazard estimates or cancer risks) that likely estimate exposure well over the 95th percentile.

The overall approach to reduce or minimize the chances of underestimating exposure has implications for interpreting the risk characterization. Conclusions have a very low degree of uncertainty for HH COPCs for which hazards or cancer risks were projected to be below critical thresholds or ranges. For HH COPCs with hazard or risk estimates above critical levels, the chances that risks exceed acceptable levels depend upon the extent to which the exposure parameters and EPCs actually represent current or future Site use. Risk management evaluation and decisions should consider these factors.

6.4 Risk Characterization Summary

Based on the conservative Tier 1 risk evaluation results, arsenic, selenium and thallium (based on calculated hazards/risks to the current and future seasonal rancher and hypothetical future resident), and radionuclides, were assessed in the Tier 2 evaluation. Cadmium, cobalt, and iron were evaluated as well because they contributed to the elevated HQ for the hypothetical future resident and current/future seasonal rancher (though to a much less degree than arsenic, selenium and thallium). Based on further consideration of the models used to estimate risks, and non-Site related risks associated with background concentrations, arsenic and selenium were identified as the most significant preliminary HH COCs by virtue of their contribution to total risk/hazard. These risks are primarily for the hypothetical future resident and current/future seasonal rancher receptors, and the risk driver are exposures related to potential use of domestic water supply (which is a compilation of data from adequately producing groundwater and seeps and springs) for domestic purposes.

Potential radiological risks associated with uranium and its decay products yielded ELCRs greater than 1E-05 for the current and future seasonal rancher, the current and future livestock herder, and the hypothetical future resident. However, only the ELCRs for the future seasonal rancher and hypothetical future resident exceeded USEPA's risk target goal of 3E-04 for radiological risks. Further, based on weight of evidence associated with potential radiogenic risks at the Site, and comparing with "comparison scenario" risks to a hypothetical future

residential receptor potentially exposed to Site-specific background soil uranium concentrations and water at concentrations equivalent to the Federal MCL for uranium as evaluated in Tier 2, it is believed that uranium and radionuclides do not pose significant health risks at the Site.

7.0 CONCLUSIONS

Human health risks at the Conda/Woodall Mountain Mine were evaluated through a process that is consistent with USEPA and IDEQ guidance, and was approved for the Conda Mine Site. The process includes a conservative screening of COIs to identify HH COPCs on which to focus detailed exposure and risk characterization. Identification of preliminary HH COCs will be used to help guide future risk management decisions at the Site.

The screening-level evaluation included comparing the maximum Site-wide concentrations for COIs against USEPA residential risk-based SLVs (Section 3). COIs for which Site-wide maximum concentrations exceeded the SLVs were then identified as HH COPCs for the risk assessment and carried into the more detailed exposure analysis and risk characterization.

Using standard equations and exposure parameters from USEPA guidance, the exposure analysis quantified intake of HH COPCs for eight human receptor scenarios identified during the BPF (Formation 2012a). These included: (1) industrial worker, (2) recreational hunter, (3) seasonal rancher, (4) livestock herder, (5) recreational trespasser, (6) Native American, (7) hypothetical future resident, and (8) off-Site recreational fisher. The exposure scenarios reflected a comprehensive range of exposure pathways, frequency, and duration that would be expected for the land use assumptions. HH COPCs were measured in soil/sediment, surface water, groundwater, vegetation, and fish, while the concentration of HH COPCs in livestock muscle and offal (beef and mutton), wild game muscle and offal, particulate dust in air, tea, above-ground produce (both protected and exposed), and below-ground produce were estimated using uptake models. Radiological activity for U-238 and its decay products were estimated from Site uranium concentrations. Exposure and risks were calculated for RME scenarios.

As a result of the Tier 1 risk characterization, arsenic, cobalt, cadmium, iron, selenium, and thallium were associated with an HQ greater than 1 for at least one pathway for the current and future seasonal rancher and the hypothetical future resident (Table 6-2). Arsenic was the only non-radiological HH COPC associated with cancer risks greater than the IDEQ recommended target level of 1E-05. Only the ELCRs for the current and future seasonal rancher and hypothetical future resident exceeded USEPA's risk target goal of 3E-04 for radiological risks from uranium and its decay products.

The highest potential risks and hazards were identified for the hypothetical future resident exposure scenario. However, the hypothetical future resident scenario is not representative of reasonably anticipated land use for the Mined Area, given the federal ownership of BLM lands, and that the remaining areas are privately owned by Simplot. The seasonal rancher (current/future) scenario had the second-highest exposure estimates and is more representative of current and potential future land use.

For the future seasonal rancher, cancer risks from arsenic exceeded the IDEQ recommended target level of 1E-05 for several pathways, including ingestion of drinking water from domestic water supply, meat from livestock, and produce (Appendix M.6). However, arsenic concentrations in soils over much of the Site are within expected natural background ranges, and risks from meat and produce exposure may not be higher than that expected under background conditions. Since Site-specific background concentrations for arsenic have not been approved, this conclusion remains uncertain.

Non-cancer hazard estimates for the seasonal rancher are primarily associated with ingestion of meat from livestock (cobalt and thallium), with minor contributions from surface water (selenium) and garden produce (cadmium) (Table 6-2, Table 6-3; Appendix M.1). Because it was necessary to model EPCs for meat (livestock and wild game) and garden produce, EPCs for these exposure media are highly uncertain. However, it is unlikely that exposures were underestimated because conservative exposure assumptions and standard methods from USEPA and Cal-EPA were used. The highest hazard estimates associated with the seasonal rancher were for selenium, cadmium, cobalt, and thallium, however, it should be noted that HQs for these HH COPCs were all below 4 (Table 6-2). Elevated selenium is clearly associated with many of the RMM areas. However, thallium and cobalt concentrations appear to be within the range of natural background concentrations for soils and so may not represent unacceptable risk specific to the Mine Site. As with arsenic, this conclusion may require additional consideration of Site-specific background samples or evaluation of background concentrations in other areas of the Southeast Idaho Phosphate Resource Area. Overall, it is believed that the risk posed by cadmium, cobalt, and thallium is insignificant when compared to other preliminary HH COCs at the Site.

Selenium and arsenic are considered to be the primary preliminary HH COCs for the Site, especially for domestic water supply. The highest concentrations of the preliminary HH COCs were associated with RMM or other mine disturbance, and these areas represent the biggest contribution to human health hazard and risk estimates. The areas also likely represent the biggest contribution to groundwater impacts and ecological risk for the Site. Selenium is the preliminary HH COC with most elevated concentrations primarily associated with RMM, and is the primary risk driver for human health. Elevated concentrations of other potential contaminants are largely co-located with selenium. As a result, selenium may be a good focus for consideration of risk management actions in the FS. The risk analysis will be used to support the development of various remedial alternatives and provide a basis for comparing potential health impacts of these alternatives in the forthcoming FS for the Conda/Woodall Mountain Mine.

8.0 REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. Toxicological Profile for Thallium. Prepared by Life Systems, Inc. and Clement International Corp. Prepared for ATSDR. Public Health Service. July.

ATSDR, 1995. Toxicological Profile for Polycyclic Aromatic Hydrocarbons. U.S. Department of Health and Human Services. Public Health Service. Atlanta, GA. August.

ATSDR, 2001. Health Consultation: Evaluation of Selenium in Beef, Elk, Sheep, and Fish in the Southeast Idaho Phosphate Resource Area, Southeast Idaho Selenium Project, Soda Springs, Caribou County, Idaho. EPA Facility ID: IDN001002245. U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Division of Health Assessment and Consultation, Atlanta, Georgia. June 27, 2001.

ATSDR, 2003. Toxicological Profile for Selenium. U.S. Department of Health and Human Services. Public Health Service. Atlanta, GA. September.

ATSDR, 2006. Public Health Assessment for Southeast Idaho Phosphate Mining Resource Area: Bannock, Bear Lake, Bingham, and Caribou Counties, ID. EPA Facility ID: IDN001002245. Prepared by Idaho Department of Health and Welfare Bureau of Community and Environmental Health under a cooperative agreement with U.S. Department of Health and Human Services. February 24, 2006.

ATSDR, 2007a. Toxicological Profile for Lead. U.S. Department of Health and Human Services. Public Health Service. Atlanta, GA. August.

ATSDR, 2007b. Toxicological Profile for Arsenic. U.S. Department of Health and Human Services. Public Health Service. Atlanta, GA. August.

ATSDR, 2013a. Selenium in Fish Tissue Blackfoot, Salt, and Bear River Watersheds, Southeast Idaho. Prepared by Idaho Department of Health and Welfare under a cooperative agreement with U.S. Department of Health and Human Services. Division of Community Health Investigations. Atlanta, GA. August.

ATSDR. 2013b. Toxicological Profile for Uranium. U.S. Department of Health and Human Services. Public Health Service. Atlanta, GA. February. Available at http://www.atsdr.cdc.gov/ToxProfiles/tp150.pdf.

Alsop, W.R., E.T. Hawkins, M.E. Stelljes, and W. Collins. 1996. Comparison of modeled and measured tissue concentrations for ecological receptors. Human and Ecological Risk Assessment: An International Journal 2(3): 539-557.

Baes, C.F. III, R.D. Sharp, A.L. Sjoreen, R.W. Shor. 1984. A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture. Oak Ridge National Laboratory. ORNL-5786. September.

Beyer, W.N., E.E. Connor and S. Gerould. 1994. Estimates of Soil Ingestion by Wildlife. Allen Press, Lawrence, KS.

Bradley, L.J.N., B.H. Magee, and S.L. Allen. 1994. Background Levels of Polycyclic Aromatic Hydrocarbons (PAH) and Selected Metals in New England Urban Soils. Journal of Soil Contamination 3(4): 1-13.

Bond, M.M. 2000. Characterization and Control of Selenium Releases from Mining in the Idaho Phosphate Region. University of Idaho Master's Thesis, February.

Bureau of Community and Environmental Health (BCEH). 2011. Idaho Fish Consumption Advisory Project Protocol. Boise: ID: Idaho Department of Health and Welfare.

Bureau of Land Management (BLM). 1997. Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management. August.

BLM, 2010. Proposed Resource Management Plan and Final Environmental Impact Statement. Volume I - Executive Summary, Chapters 1, 2, and 3. U.S. Department of Interior, Bureau of Land Management, Pocatello Field Office/Idaho Falls District. April 2010.

BLM, 2012a. Record of Decision and Approved Pocatello Resource Management Plan. Includes Attachment I – Supplement Information Report. U.S. Department of Interior, Bureau of Land Management, Pocatello Field Office/Idaho Falls District. April 2012.

BLM, 2012b. Range Pastures of Idaho (RANGE_NOC_GrazingPastures_ PUB_100K_POLY.shp). Spatial Data Set. BLM, Idaho State Office, Boise, ID. Available at http://cloud.insideidaho.org/data/blm. Dated Jan 2012; accessed Nov 2015.

California Environmental Protection Agency (Cal-EPA). 2012. Air Toxics Hot Spots Program Risk Assessment Guidelines: Technical Support Document for Exposure Assessment and Stochastic Analysis. Appendix K: Meat, Milk, and Egg Transfer Coefficients. Table K.2. August 2012.

City of Idaho Falls. 2015. Water Quality Report for Water Testing during the 2014 Calendar Year. Prepared by City of Idaho Falls, Water Division, ID. June 2015. Available at http://www.idahofallsidaho.gov/wwwroot/userfiles/files/pw/water_quality_report_-_2015.pdf. Accessed August 2015.

Formation Environmental (Formation). 2008. Final Conda/Woodall Mountain Mine RI/FS Work Plan. Prepared for J.R. Simplot Company.

Formation, 2012a. Final Conda/ Woodall Mountain Mine RI/FS Site-Specific Human Health Risk Assessment Baseline Problem Formulation. Prepared for J.R. Simplot Company. October.

Formation, 2012b. Final Conda/ Woodall Mountain Mine RI/FS Site-Specific Ecological Risk Assessment Baseline Problem Formulation. Prepared for J.R. Simplot Company. October

Formation, 2016. Final Conda/Woodall Mountain Mine Remedial Investigation Report. Prepared for J.R. Simplot Company. December.

Herring, J.R., R.I. Grauch, R.G. Tysdal, S.A. Wilson, G.A. Desborough. 2000. Chemical Composition of Weathered and Less Weathered Strata of the Meade Peak Phosphatic Shale Member of the Permian Phosphoria Formation, D. Measured Sections G and H, Sage Creek area of the Webster Range, Caribou County, Idaho. United States Geological Survey Open File Report 99-147-D.

Hintze, K., J. Gregory, P. Lardy, M.J. Marchello, and J.W. Finley. 2002. Selenium Accumulation in Beef: Effect of Dietary Selenium and Geographical Area of Animal Origin. J. Agric. Food Chem. 50:3938-3942.

Hydrometrics, Inc. (Hydrometrics), 2013. Project Report. Background Concentrations of Inorganic Constituents in Montana Surface Soils. Prepared for the Montana Department of Environmental Quality, Remediation Division/Site Response Section. September.

Idaho Administrative Procedures Act (IDAPA). 2015. Idaho Administrative Code. Department of Environmental Quality. Water Quality Standards. IDAPA 58.01.02, Section 210. Available at http://adminrules.idaho.gov/rules/current/58/0102.pdf. Accessed January 22, 2016.

Idaho Department of Environmental Quality (IDEQ). 2004. Idaho Risk Evaluation Manual Final. Available at: http://www.deq.idaho.gov/media/967298-risk_evaluation_manual_2004.pdf. July.

IDEQ, 2013. Blackfoot River Subbasin Assessment and Total Maximum Daily Loads; 2013 Addendum; HUC ID17040207. Idaho Department of Environmental Quality, Pocatello, ID. September 2013. Available at http://www.deq.idaho.gov/media/984232-blackfoot_river_sba_assessment_tmdl_addendum_2013.pdf.

IDEQ, 2014. Idaho's 2012 Integrated Report. Final. Idaho Department of Environmental Quality, Boise, ID. January 2014. Available at http://www.deq.idaho.gov/media/1117323/integrated-report-2012-final-entire.pdf.

IDEQ, 2015. Blackfoot River Subbasin Total Maximum Daily Loads Five-Year Review. August 2015.

Idaho Department of Environmental Quality, US Environmental Protection Agency, Bureau of Land Management (IDEQ/EPA/BLM). 2012 Administrative Settlement Agreement and Order on Consent for Performance of a Removal Action at Conda/Woodall Mountain Phosphate Mine, Pedro Creek Overburden Disposal Area in southeastern Idaho. October 11, 2012.

Idaho Department of Fish and Game (IDFG). 2012. E-mail communication containing location information for Idaho at-risk species designated by the Comprehensive Wildlife Conservation Strategy (CWCS). Data are part of the Idaho Fish and Wildlife Information System (IFWIS) managed by the Idaho Department of Fish and Game (IDFG). Data for Caribou County, ID received October 30, 2012.

Kay, R.T, T.L. Arnold, W.F. Cannon, D. Graham, E. Morton, and R. Bienert. 2003. Concentrations of Polynuclear Aromatic Hydrocarbons and Inorganic Constituents in Ambient Surface Soils, Chicago, Illinois: 2001-02. Water Resources Investigations Report 03-4105. U.S. Department of the Interior, U.S. Geological Survey, in cooperation with the Chicago Department of Environment.

Klaassen, C.D., H.O. Amdur, and J.E. Doull. 2007. Cassarett and Doull's Toxicology – The Basic Science of Poisons, Seventh Edition. MacMillan Publishing Company: New York, NY.

Kuck, L. 2003. An Evaluation of the Effects of Selenium in Elk, Mule Deer, and Moose in Southeastern Idaho. Prepared for MWH for the Idaho Mining Association Selenium Committee.

Lawler, T.L., J.B. Taylor, J.W. Finley, and J.S. Caton. 2004. Effect of supranutritional and organically bound selenium on performance, carcass characteristics, and selenium distribution in finishing beef steers. Journal of Animal Science 82: 1488-1493.

Love, S.L., K. Noble, and S. Parkinson. 2009. Introduction to Short Season Gardening in Idaho. Short-Season, High-Altitude Gardening, University of Idaho Extension, Bulletin 857. Published by the University of Idaho. April.

Montana Department of Environmental Quality (Montana DEQ). 2005. Montana Department of Environmental Quality Remediation Division. Action Level for Arsenic in Surface Soil. April 2005.

Montgomery Watson. 1999. Final 1998 Regional Investigation Report, Southeast Idaho Phosphate Resource Area Selenium Project. Idaho Mining Association Selenium Subcommittee. December.

Munkers, J.P. 2000. Abiotic and Biotic Processes in the Release and Control of Selenium in the Western Phosphate Resource Area. University of Idaho Master's Thesis. December 18.

MWH. 2015. On-Site and Background Areas Radiological and Soil Investigation Summary Report, P4's Ballard, Henry, and Enoch Valley Mines, Remedial Investigation and Feasibility Study. Prepared by MWH Americas, Inc. for P4 Production, LLC. Final. October.

NewFields. 2008. Final Conda\Woodall Mountain Remedial Investigation and Feasibility Study Work Plan. Prepared for J.R. Simplot Company. December.

Oregon Department of Environmental Quality (Oregon DEQ). 2013. Development of Oregon Background Metals Concentrations in Soil. Technical Report. Oregon Department of Environmental Quality. Land Quality Division Cleanup Program. March 2013.

Preuss, P.W. and A.M. Ehrlich. 1987. The Environmental Protection Agency's Risk Assessment Guidelines. J. Air Pollution Control Assoc. 37:784-791.

Shacklette, H.T. and J.G. Boerngen. 1984. Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. US. Geological Survey Professional Paper 1270.

Shoshone-Bannock Tribes. 2014. Culturally significant plants database for the Shoshone-Bannock Tribes. Shoshone-Bannock Tribes, Environmental Waste Management Program, Fort Hall, ID. Final. June.

Shoshone-Bannock Tribes. 2016. Shoshone-Bannock Exposure Scenario for use in Risk Assessment. Shoshone-Bannock Tribes, Environmental Waste Management Program, Fort Hall, ID. February.

Tetra Tech EM, Inc. (TTEMI). 2002. Final Area Wide Human Health and Ecological Risk Assessment, Selenium Project, Southeast Idaho Phosphate Mining Resource Area. Prepared for Idaho Department of Environmental Quality, December.

U.S. Census Bureau. 2010 Census data. Available at http://www.census.gov/popfinder/.

U.S. Environmental Protection Agency (USEPA). 1986. Guidelines for Carcinogenic Risk Assessment. Federal Register 51:33992.

USEPA, 1989. Risk Assessment Guidance for Superfund. Volume I, Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1-89/002. U.S. EPA, Office of Emergency and Remedial Response.

USEPA, 1991a. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors". Office of Solid Waste and Emergency Response (OSWER) Directive 9285.6-03, March 25, 1991.

USEPA, 1991b. Risk Assessment Guidance for Superfund Volume I, Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals). Interim. EPA/540/R-92/003. Office of Research and Development, Washington, D.C.

USEPA, 1991c. Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions. Office of Solid Waste and Emergency Response. OSWER Directive 9355.0-30. April 1991.

USEPA, 1992a. Guidance for Data Useability in Risk Assessment (Part A). OSWER Directive 9285.7-09A Office of Emergency and Remedial Response, Washington, D.C., April 1992.

USEPA, 1992b. Guidance on Risk Characterization for Risk Managers and Risk Assessors. U.S. EPA Office of the Administrator, Washington, D.C., February 26, 1992.

USEPA, 1992c. Supplemental Guidance to RAGS: Calculating the Concentration Term. USEPA Office of Solid Waste and Emergency Response, publication 9285.7-081, 1992.

USEPA, 1992d. Guidelines for Exposure Assessment. Federal Register 57(104). May.

USEPA, 1993. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure, Draft. November.

USEPA, 1995. Guidance for Risk Characterization. USEPA Science Policy Council. February 1995.

USEPA, 1996a. Soil Screening Guidance. USEPA OSWER, Washington D.C. EPA/540/R-96/018, July 1996.

USEPA, 2000. National Primary Drinking Water Regulations; Radionuclides; Final Rule. 40 CFR Parts 9, 141, and 142. December 7, 2000. Available at:https://www.federalregister.gov/articles/2000/12/07/00-30421/national-primary-drinking-water-regulations-radionuclides-final-rule.

USEPA, 2002a. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24, December 2002.

USEPA, 2002b. Role of Background in the CERCLA Cleanup Program. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. Office of Emergency and Remedial Response. April 26, 2002. OSWER 9285.6-07P.

USEPA, 2003. Human Health Toxicity Values in Superfund Risk Assessments. Memorandum from Michael Cook, Director (Office of Superfund Remediation and Technology Innovation) to Superfund National Policy Managers, Regions 1-10. OSWER Directive 9285.7-53. December 5, 2003. Available at https://rais.ornl.gov/documents/hhmemo.pdf.

USEPA, 2004a. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment. EPA/540/R/99/005, OSWER 9285.7-02EP, Final, July 2004.

USEPA, 2004b. USEPA Contract Laboratory Program. National Functional Guidelines for Inorganic Data Review. Final. Office of Superfund Remediation and Technology Innovation. OSWER 9240.1-45. EPA 540-R-04-004. October 2004.

USEPA, 2005a. Guidelines for Carcinogen Risk Assessment. EPA/630/P-03/001F.

USEPA, 2005b. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities. (HHRAP) Final. OSWER, EPA530-R-05-006. September 2005.

USEPA, 2007. Framework for Metals Risk Assessment. Office of the Science Advisor. EPA 120/R-07/001. March 2007.

USEPA, 2008. Memorandum with Subject: Recommended toxicity value for uranium, noncancer endpoint for the Eastern Michaud Flats Site. Memorandum from M. Stifelman (Office of Environmental Assessment) to K. Lynch (Office of Environmental Cleanup). July 10, 2008.

USEPA, 2009a. Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). EPA-540-R-070-002. OSWER 9285.7-82. January 2009.

USEPA, 2009b. Exposure Factors Handbook: 2009 Update. External Review Draft. Office of Research and Development, EPA/600/R-09/052A, July 2009. (released for public comment October 2009).

USEPA, 2011. Exposure Factors Handbook: 2011 Edition. Office of Research and Development, EPA/600/R-090/052F, September 2011.

USEPA, 2012a. Compilation and Review of Data on Relative Bioavailability of Arsenic in Soil and Recommendations for Default Value for Relative Bioavailability of Arsenic in Soil Documents. Memorandum from Becki Clark to Superfund National Policy Managers, Regions 1-10. OSWER Directive 9200.1-113. Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington DC. December 31, 2012.

USEPA, 2012b. Provisional Peer-Reviewed Toxicity Values for Thallium and Compounds. Superfund Health Risk Technical Support Center. National Center for Environmental Assessment. Office of Research and Development, US Environmental Protection Agency, Cincinnati, OH. October 25, 2012.

USEPA, 2013. ProUCL software, version 5.0.00 Available at http://www.epa.gov/osp/hstl/tsc/software.htm (website last updated October 18, 2013).

USEPA, 2014a. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. Memorandum from Dana Stalcup to Superfund National Policy Managers, Regions 1-10. OSWER Directive 9200.1-120. Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington DC. February 6, 2014.

USEPA, 2014b. Preliminary Remediation Goals (PRGs) for Radionuclides User's Guide. http://epa-prgs.ornl.gov/radionuclides/prg_guide.html.

USEPA. 2014c. Preliminary Remediation Goals (PRGs) for Radionuclides. Available at http://epa-prgs.ornl.gov/radionuclides/download.html. Tables released November 2014; website accessed July 15, 2015.

USEPA. 2014d. Memorandum: Distribution of the "Radiation Risk Assessment at CERCLA Sites: Q&A". From R.H. Richardson (Acting Director, Office of Superfund Remediation and Technology Innovation) to Superfund National Policy Managers, Regions 1-10. OSWER 9285.6-20. USEPA, Washington, D.C. June 13, 2014.

USEPA. 2015a. Final 2015 Updated National Recommended Human Health Criteria. EPA Office of Water, Office of Science and Technology (4304T). Available at http://water.epa.gov/scitech/swguidance/standards/criteria/current/hhfinal.cfm (Website updated June 29, 2015; accessed Sept 28, 2015).

USEPA. 2015b. National Primary Drinking Water Standards and National Secondary Drinking Water. Office of Water, EPA 816-F-03-016. Available at http://water.epa.gov/drink/contaminants/index.cfm. (Website last updated October 29, 2014; accessed Sept 28, 2015).

USEPA, 2015c. Preliminary Remediation Goal (PRG) Calculator. http://epa-prgs.ornl.gov/cgi-bin/radionuclides/rprg_search.

USEPA, 2016a. Risk-Based Screening Table - Generic Tables; Regional Screening Level Tables (November 2015). Available at http://www.epa.gov/risk/risk-based-screening-table-generic-tables.

USEPA, 2016b. Integrated Risk Information System (IRIS). Available at https://www.epa.gov/iris. (Website last updated June 27, 2016; accessed June 27, 2016).

USEPA, 2016c. Re: Uranium Toxicity Value for Soluble Uranium Compounds, Conda/Woodall Mountain Mine. Letter from R. Matthew Wilkening, USEPA Conda Mine Project Manager to Alan Prouty, Simplot. September 12, 2016.

USPEA, 2016d. Memorandum re: (Update) Evaluation of recent ATSDR sub-chronic oral MRL in place of outdated IRIS RfD for R-X Uranium. Memorandum from Superfund Technical Support Center, National Center for Environmental Assessment, U.S. Environmental Protection Agency, Cincinnati, OH to Marc Stifelman, EPA Region 10. August 11, 2016.

U.S. Environmental Protection Agency (USEPA) and U.S. Geological Survey (USGS). 2000. Radionuclides Notice of Data Availability Technical Support Document. Targeting and Analysis Branch, Standards and Risk Management Division, Office of Ground Water and Drinking Water, USEPA. Prepared by USEPA Office of Ground Water and Drinking Water in collaboration with USEPA Office of Indoor Air and Radiation and USGS. March. Available at https://www.epa.gov/sites/production/files/2015-09/documents/2009_04_16_radionuclides_regulation_radionuclides_rulemaking_techsupportdoc.pdf.

U.S. Forest Service (USFS) and National Park Service (NPS). 1998. Wild and Scenic Rivers and the Use of Eminent Domain. Technical Report of the Interagency Wild and Scenic Rivers Coordinating Council. November.

U.S. Geological Survey (USGS). 2015. Selenium in the Upper Blackfoot River Watershed, Southeastern Idaho, 2001-2012. US Department of the Interior. Prepared in Cooperation with the Bureau of Land Management. Scientific Investigations Report 2014-5203 Version 1.1. August 2015.

Wang, G, H.W. Mielke, C.G. Van Quach, and Q. Zhang. 2004. Determination of Polycyclic Aromatic Hydrocarbons and Trace Metals in New Orleans Soils and Sediments. Soil and Sediment Contamination: An International Journal 13(3): 313-327.

Western Regional Climate Center (WRCC). 2012. Historical Climate Information website. Accessed September 21, 2012. http://www.wrcc.dri.edu/index.html.

TABLES

TABLE 2-1
Summary of Culturally-Significant Plant Species

Plant species listed in Shoshone-Bannock		Alternative Scientific Name	Observed at Conda [3,4]		Included in Conda Vegetation Sample [3, 5]	
Common Name	**Scientific Name**	**(if different)[2]**	**Presence**	**Notes**	**Presence**	**Note**
Antelope brush	*Purshia tridentata*		Y		Y	In mixed-species samples
Arrowleaf balsamroot	*Balsmaorhiza sagittata*	*Balsamorhiza sagittata* (spelling)	Y		Y	In mixed-species samples
Aspen	*Populus* sp.	*Populus* spp. also includes cottonwoods	Y	Aspen and cottonwood both observed	Y	In mixed-species samples
Aster (dwarf purple)	*Erigeron* spp.		R	*Erigeron* spp. not specifically noted, but members of Asteraceae family observed (but not always identified to genus or species)	R	Species of Asteraceae family in mixed-species and single-species samples
Broom snakeweed	*Gutierresia sarothrae*	*Gutierrezia sarothrae* (spelling)	Y		Y	In mixed-species samples
Buckbrush	*Ceanothus velutinus*		Y		Y	In mixed-species samples
Buffaloberries	*Lepargyrea* spp.	*Shepherdia* spp. (nomenclature update)	N		N	
Cat-Tail	*Typha latifolia*		Y		N	
Cedar	*Cedrus*	*Cedrus* occurs in southeast US. Assume *Thuja* spp. (e.g., western red cedar)	N		N	
Chokecherry	*Prunus virginiana*		Y		Y	In mixed-species samples
Dandelion	*Taraxacum*		Y		Y	In mixed-species and single-species samples
Desert Parsley (fern)	*Lomatium dissectum*	Note: *Lomatium* spp. are not ferns.	Y/R	*Lomatium* spp. observed (but not keyed to species)	Y/R	*Lomatium* spp. in mixed-species samples
Elderberry (red)	*Sambucus racemosa*		N		N	
Golden currant	*Ribes aureum*		Y/R	*Ribes* spp. observed (but not keyed to species)	Y/R	*Ribes* spp. in mixed-species and single-species samples
Grasses	*Poaceae* (family)		Y		Y	In mixed-species and single-species samples
Honeysuckle	*Lonicera interrupta*		Y/R	*Lonicera* spp. observed (but not keyed to species)	Y/R	*Lonicera* spp. in mixed-species samples
Huckleberry	*Vaccinium* sp.		Y/R	*Vaccinium* spp. observed (but not keyed to species)	Y/R	*Vaccinium* spp. in mixed-species samples
Indian Cabbage	*Stanleya pinnata*		N		N	
Indian Paintbrush	*Castilleja* spp.		Y		N	
Indian Tea	*Ephedra* spp.		N		N	
Juniper	*Juniperus* spp		Y		Y	In mixed-species samples
Milkweed	*Asclepias speciosa*		N		N	
Oyster mushroom	*Pleurotus* sp.		Mushrooms not surveyed.			
Peppermint	*Mentha penardi*	Assume *Mentha penardii* (spelling) - updated nomenclature is *Mentha arvensis*	Y		N	
Prickly Pear	*Opuntia engelmanni*	*Opuntia engelmannii* (spelling)	N		N	
Puffballs	*Clavatia* sp.		Mushrooms not surveyed.			
Rabbitbrush (Gray)	*Chrysothamnus nauseosus*	*Ericameria nauseosa* (nomenclature update)	Y/R	*Chrysothamnus* spp. observed (but not keyed to species)	Y	In mixed-species samples
Russian Thistle	*Salsolala kali*	*Salsola kali* (spelling)	Y		N	
Sage (black)	*Artemisia nova*		R	*Artemisia* spp. observed (but not always keyed to species)	Y	*Artemisia* spp. in mixed-species and single-species samples
Sagebrush (big)	*Artemisia tridentata*		Y/R	*Artemisia* spp. observed (but not always keyed to species)	Y	*Artemisia* spp. in mixed-species and single-species samples
Service berry	*Amelanchier alnifolia*		Y		Y	In mixed-species and single-species samples
Sneezeweed	*Helenium hoopseil*	Assume *Helenium hoopesii* (spelling) - updated nomenclature is *Hymenoxys hoopesii*	R	*Helenium* spp. not specifically noted, but members of Asteraceae family observed (but not always identified to genus or species)	R	Species of Asteraceae family in mixed-species and single-species samples
Spearmint	*Mentha spicata*		R	Related species (*Mentha arvensis*) present.	N	
Stinging nettle	*Urtica dioica*		Y		Y	In mixed-species samples
Sunflower	*Wyethia longicaulis*		R	*Wyethia* spp. not specifically noted, but members of Asteraceae family observed (but not always identified to genus or species)	R	Species of Asteraceae family in mixed-species and single-species samples
Sunflower-Poor One	*Helianthus petioloaris*	*Helianthus petiolaris* (spelling)	R	*Helianthus* spp. not specifically noted, but members of Asteraceae family observed (but not always identified to genus or species)	R	Species of Asteraceae family in mixed-species and single-species samples
Sweet sage	*Artemisia dracunculoides*		R	*Artemisia* spp. observed (but not always keyed to species)	Y	*Artemisia* spp. in mixed-species and single-species samples
Sweetgrass	*Heirochloe odorata*	*Hierochloe odorata* (spelling)	N		N	
Thistle	*Cirsium*		Y	*Cirisum* spp. and other thistle species (e.g., *Carduus* spp.) observed (but not always identified to genus or species)	Y	Thistle species in single-species samples
Three-lobed sumac	*Rhus tribobata*	*Rhus trilobata* (spelling)	N		N	
Watercress	*Nasturtium officinale*		Y		N	
White Daisy	*Layia glandulosa*		R	*Layia* spp. not specifically noted, but members of Asteraceae family observed (but not always identified to genus or species)	R	Species of Asteraceae family in mixed-species and single-species samples
Wild carrot	*Carum gairdoeri*	Assume *Carum gairdner* i (spelling) - updated nomenclature is *Perideridia gairdneri*	Y		Y	In mixed-species samples
Wild Celery	*Apium* species		N		N	
Wild rose	*Rosacea* spn.	Rosaceae (spelling)	Y	*Rosa* spp. and other members of Rosaceae family observed.	Y	*Rosa* spp. in mixed-species samples
Yarrow	*Achillea lamulosa*	*Achilliea milliefolium* (nomenclature update)	Y		Y	In mixed-species and single-species samples

Notes:
1 = The 46 species listed in Attachment 1 (TABLE M-1 SHOSHONE-BANNOCK TRIBES VEGETATION TABLE) in Shoshone-Bannock Tribes (2016).
2 = Based on best interpretation of the species' name from the USDA (2016) PLANTS database.
3 = Presence is noted as: Y (Yes - present); N (No - not present); R (Related species is present; see notes).
4 = As observed during any sampling or monitoring activities (e.g., Table 4-17 in Revised Draft Final RI report), or opportunisitcally observed during the course of travels at the Site.
If a species is not noted as present, it does not mean that the species definitively does not occur at the Site.
5 = As listed in Table 4-16 of Conda Revised Draft Final RI Report (Formation 2016). It is noted whether the species was included in mixed-species samples or in single-species samples (or both).
Sources:
Formation Environmental (Formation). 2016. Revised Draft Final Conda/Woodall Mountain Mine Remedial Investigation Report. Prepared for J.R. Simplot Company. May.
Shoshone-Bannock Tribes. 2016. Shoshone-Bannock Exposure Scenario for use in Risk Assessment. Shoshone-Bannock Tribes, Environmental Waste Management Program, Fort Hall, ID. February.
U.S. Department of Agriculture (USDA). 2016. PLANTS database. Available at http://plants.usda.gov/. Accessed August 2016.

TABLE 2-2
Grazing Allotment Summary

Allotment Name	Allotment Number	Manage-ment Agency	Class of Live-stock	Season of Use	Animal Unit Months (AUMs)	Notes from BLM (2012a)	Allotment Area		Conda Mined Area		Conda Non-Mined Area		Allotment Area Outside of Mined/Non-Mined Areas
							Total Acres	Ownership Info	Total Acres, %	Ownership Info	Total Acres, %	Ownership Info	Total Acres, %
Woodall Spring	04338	BLM	Cattle	May 15 to September 30	57	Potentially impacted by selenium (Figure 12).	1613	75.6% Private; 24% BLM; 0.4% Simplot	7 (0.4%)	100% Simplot	1139 (70.6%)	68% Private; 32% BLM	467 (29.0%)
Woodall Ranch	04386	BLM	Cattle	May 16 to September 30	32	Potentially impacted by selenium (Figure 12).	645	74% Private; 26% BLM	None		150 (23.3%)	70% BLM; 30% Private	495 (76.7%)
Woodall Mountain	04554	BLM	Sheep	May 16 to September 30	216 total (153 suspended)	1180 public land acres affected by selenium.[b]	6890	61.5% Simplot; 25.2% BLM; 12.2% Private; 1.1% County	2820 (40.9%)	61% Simplot; 39% BLM	3588 (52.1%)	63% Simplot; 18% Private; 17% BLM; 2% County	482 (7.0%)
Conda Mine	10020	BLM	NA	NA	NA	--	437	93% BLM; 5% Simplot; 2% Private	392 (89.7%)	94% BLM; 6% Simplot	45 (10.3%)	82% BLM; 18% Private	None
Trail Canyon-1	04226	BLM	Sheep	May 1 to September 30	34 total (4 suspended)	123 public land acres affected by selenium.[b]	832	36% BLM; 33% Simplot; 30% Private; 1% County	436 (52.4%)	63% Simplot; 37% BLM	353 (42.4%)	59% Private; 39% BLM; 2% County	43 (5.2%)
Trail Canyon-2	04289	BLM	Sheep	May 1 to September 15	35 total (5 suspended)	25 public land acres affected by selenium.[b]	832	79.5% Private; 20.3% BLM; 0.2% Simplot	2 (0.2%)	100% Simplot	457 (55%)	63% Private; 37% BLM	373 (44.8%)
North Sulphur and Trail	14031	BLM	Sheep	May 15 to July 15	324	--	5022	50.1% Private; 37.1% BLM; 11.4% State of Idaho; 1.3% Simplot; County 0.1%	None		47 (0.9%)	96% BLM; 4% County	4975 (99.1%)
North Sulphur	20220	USFS	Sheep	June 16 to September 5	(a)	--	5953	99.5% USFS; 0.2% Simplot; 0.2% BLM; 0.1% Private	2 (0.03%)	100% Simplot	99 (1.7%)	96% USFS; 4% Simplot	5852 (98.3%)

Notes:

BLM = Bureau of Land Management

NA = Not Applicable

One Animal Unit Month (AUM) is equal to the amount of forage used to support one cow and one calf for one month (approximately 800 pounds of forage).

(a) - AUM information not provided; total of 1,050 ewes/lambs permitted in 2011 (USFS 2011).

(b) - Grazing allotments are indefinitely closed to sheep grazing due to elevated levels of selenium in water and plants. Closure will remain in place until such time selenium levels can be reduced to acceptable levels through containment or capping (BLM 2012a).

-- = No notes specifically provided for this allotment in text or Figure 12 of BLM (2012a).

Sources:

Bureau of Land Management (BLM). 2010. Proposed Resource Management Plan and Final Environmental Impact Statement. Volume I - Executive Summary, Chapters 1, 2, and 3. U.S. Department of Interior, Bureau of Land Management, Pocatello Field Office/Idaho Falls District. April 2010.

Bureau of Land Management (BLM). 2012a. Record of Decision and Approved Pocatello Resource Management Plan. Includes Attachment I – Supplement Information Report. U.S. Department of Interior, Bureau of Land Management, Pocatello Field Office/Idaho Falls District. April 2012.

Bureau of Land Management (BLM). 2012b. Range Pastures of Idaho (RANGE_NOC_GrazingPastures_PUB_100K_POLY.shp). Spatial Data Set. BLM, Idaho State Office, Boise, ID. Available at http://cloud.insideidaho.org/data/blm. Dated Jan 2012; accessed Nov 2015.

U.S. Forest Service (USFS). 2011. Range Management: 2011 Grazing Allotments (Soda Springs Ranger District). Caribou-Targhee National Forest, U.S. Forest Service. Available at http://www.fs.usda.gov/detailfull/ctnf/landmanagement/resourcemanagement/?cid=STELPRDB5144786&width=full.

U.S. Forest Service (USFS). 2008. Range allotments shapefile - in Geographic Information System (GIS) coverages provided by Caribou National Forest, via e-mail. April 2008.

TABLE 3-1
Site-Specific Human Health Risk Assessment Chemicals of Interest

Chemicals of Interest (COIs)	
CAS Number	**Analyte**
Inorganics - Metals / Metalloids	
7429-90-5	Aluminum
7440-36-0	Antimony
7440-38-2	Arsenic
7440-39-3	Barium
7440-41-7	Beryllium
7440-42-8	Boron
7440-43-9	Cadmium
7440-47-3	Chromium
7440-48-4	Cobalt
7440-50-8	Copper
7439-89-6	Iron
7439-92-1	Lead
7439-96-5	Manganese
7439-97-6	Mercury
7439-98-7	Molybdenum
7440-02-0	Nickel
7782-49-2	Selenium
7440-22-4	Silver
7440-28-0	Thallium
7440-61-1	Uranium
7440-62-2	Vanadium
7440-66-6	Zinc
Inorganics - Nutrients	
16984-48-8	Fluoride
14797-55-8	Nitrate, as N
Organics	
Volatile Organic Compounds	
Semivolatile Organic Compounds	
Radionuclides	
Uranium 238 and decay products	

TABLE 3-2
Information About Surface Soil Dataset

Depth range	Number of Samples	Brief Description of Samples
0 - 2 inches 0 - 4 inches 0 - 8 inches	282	Samples collected to support RI evaluation of nature and extent of mining-related effects.
0 - 6 inches 0 - 10.8 inches 0 - 12 inches 0 - 14.4 inches 0 - 18 inches	19	Borrow area samples collected to support characterization of NTCRA and FSPS low-seleniferous soil cover materials.
0 - 2 inches 0 - 12 inches	6	Samples (0 - 2 inches) collected at Decision Units (DUs) at NTCRA area; Average of 0 - 12 inch composite samples collected at test plots in FSPS area.
2 - 12 inches	25	Roadway samples were collected from 2 to 12 inches to evaluate whether the roads were constructed with seleniferous materials. These are included for exposure estimates related to dust generated from vehicle travel.

Notes:

FSPS = Field-Scale Pilot Study

NTCRA = Non-Time Critical Removal Action

Deeper soil samples (e.g., 0-24 inches, 0-30 inches, 12-42 inches, 18-42 inches, etc.) were not included in the soil dataset.

Refer to Figures 3-1 through 3-4 for surface soil sampling locations.

TABLE 3-3
Summary of Inorganic Chemicals in Site-Wide Surface Soil, Surface Water, and Domestic Water Supply

Media >>	Soil (mg/kg)					Surface Water (mg/L)					Domestic Water Supply (mg/L)				
Chemicals of Interest (COIs)	Detection Frequency	Range of Detection Limits for Samples Reporting as Non-Detect (ND)		Detected Concentrations		Detection Frequency	Range of Detection Limits for Samples Reporting as Non-Detect (ND)		Detected Concentrations		Detection Frequency	Range of Detection Limits for Samples Reporting as Non-Detect (ND)		Detected Concentrations	
		Minimum	Maximum	Minimum	Maximum		Minimum	Maximum	Minimum	Maximum		Minimum	Maximum	Minimum	Maximum
Metals/Metalloids															
Aluminum	100%			251	21900	78%	0.014	0.0767	0.0146	37.8	57%	0.002	0.0767	0.0021	258
Antimony	82%	0.06	1.2	0.056	11.4	29%	0.0001	0.002	0.00011025	0.0051	16%	0.0001	0.0065	0.00012	0.016
Arsenic	100%			1.7	46.3	60%	0.00014	0.0023893	0.00033	0.108	50%	0.000062	0.003	0.00028	0.163
Barium	100%			14.9	1340	100%			0.0024	0.331	77%	0.000043	0.05	0.0031	3.2
Beryllium	100%			0.027	2	4%	0.00016	0.00065	0.00054	0.0024	8%	0.00024	0.00065	0.00041	0.0198
Boron	98%	2.1	3.7	0.76	137	98%	0.0092	0.011	0.0085	0.0978	94%	0.0048	0.0211	0.0101	0.642
Cadmium	97%	0.053	0.07	0.097	119	65%	0.000031	0.0013	0.00002	0.0489	46%	0.00002	0.00072	0.000012	0.0727
Chromium	100%			4.5	1680	57%	0.00065	0.0024	0.001	1.09	52%	0.00024	0.0032	0.00028	1.9
Cobalt	100%			0.87	22.5	24%	0.00061	0.00084	0.00065	0.0051	31%	0.00064	0.0014	0.0007	0.09
Copper	100%			1.6	204	18%	0.0023	0.0089	0.0026	0.226	29%	0.0002	0.0069	0.00026	0.544
Iron	100%			1380	49500	83%	0.018	0.023	0.0217	39.1	67%	0.0045	0.058	0.0246	278
Lead	100%			1.3	1000	19%	0.000043	0.0043	0.000076	0.0309	24%	0.000043	0.0057	0.000121	0.212
Manganese	100%			66.9	4840	89%	0.00098	0.0019	0.0014	2.1	81%	0.00005	0.005	0.0013	5.98
Mercury	99%	0.003	0.01	0.012	0.88	2%	0.00006	0.000081	0.00007	0.00015	11%	0.00001	0.0002	0.00001	0.00076
Molybdenum	100%	0.17	0.17	0.7	87.7	78%	0.001	0.035	0.0015	0.223	45%	0.0018	0.05	0.0019	0.265
Nickel	100%			7.1	528	55%	0.0019	0.0095	0.0023	0.572	30%	0.00019	0.02	0.00065	1.37
Selenium	100%	0.16	0.16	0.084	624	88%	0.0001	0.001	0.00021	9.83	77%	0.0001	0.005	0.00021	15.4
Silver	64%	0.042	0.5	0.066	12.1	13%	0.00043	0.0018	0.00047	0.0114	4%	0.00043	0.0018	0.0005	0.0072
Thallium	69%	0.15	0.71	0.13	5.7	28%	0.000018	0.0049	0.000021	0.00048	18%	0.0000023	0.0049	0.000021	0.0048
Uranium	99%	0.0024	2.3	0.363	119	64%	0.00003	0.00195	0.0000485	0.032	57%	0.000114	0.03	0.000048	0.0631
Vanadium	100%			5.9	2610	91%	0.00044	0.0043	0.00047	1.22	64%	0.00044	0.05	0.00052	1.04
Zinc	100%			5.5	2930	72%	0.00094	0.0098	0.002	1.76	57%	0.0012	0.01	0.0013	5
Nutrients															
Fluoride	na					92%	0.013	0.5	0.022	3.81	91%	0.013	0.5	0.035	2.31
Nitrate						53%	0.0042	0.5	0.01	11.6	77%	0.0042	2.55	0.01	17.9

Notes:
COI = chemical of interest
mg/kg = milligram per kilogram
mg/L = milligram per liter
na = not available
Fluoride nor nitrate results are available for surface soils.
All soil results presented on dry weight basis.

TABLE 3-4
Summary of Organic Chemicals in Townsite Area Surface Soil and Domestic Water Supply

Media >>	Soil (mg/kg)					Domestic Water Supply (mg/L)				
Chemicals of Interest (COIs)	Detection Frequency	Range of Detection Limits for Samples Reporting as Non-Detect (ND)		Detected Concentrations		Detection Frequency	Range of Detection Limits for Samples Reporting as Non-Detect (ND)		Detected Concentrations	
		Minimum	Maximum	Minimum	Maximum		Minimum	Maximum	Minimum	Maximum
Acenaphthene	0%	0.02	0.02			0%	0.0002	0.0005		
Acenaphthylene	0%	0.02	0.02			0%	0.0002	0.0005		
Acetone	0%	0.01	0.01			0%	0.001	0.0025		
Acrylonitrile	0%	0.002	0.002			0%	0.0002	0.0005		
Aniline	0%	0.02	0.02			0%	0.0002	0.0005		
Anthracene	0%	0.02	0.02			0%	0.0002	0.0005		
Benzene	0%	0.002	0.002			0%	0.0002	0.0005		
Benzidine	0%	0.02	0.02			0%	0.0002	0.0005		
Benzo(ghi)perylene	33%	0.02	0.02	0.05	0.13	0%	0.0002	0.0005		
Benzo[a]anthracene	33%	0.02	0.02	0.05	0.14	0%	0.0002	0.0005		
Benzo[a]pyrene	33%	0.02	0.02	0.05	0.16	0%	0.0002	0.0005		
Benzo[b]fluoranthene	33%	0.02	0.02	0.05	0.18	0%	0.0002	0.0005		
Benzo[k]fluoranthene	25%	0.02	0.02	0.07	0.18	0%	0.0002	0.0005		
Benzyl alcohol	0%	0.02	0.02			0%	0.0002	0.0005		
bis(2-Chloroethoxy)methane	0%	0.02	0.02			0%	0.0002	0.0005		
bis(2-Chloroethyl)ether	0%	0.02	0.02			0%	0.0002	0.0005		
bis(2-chloroisopropyl)ether	0%	0.02	0.02			0%	0.0002	0.0005		
bis(2-Ethylhexyl)phthalate	33%	0.02	0.02	0.1	0.16	33%	0.0002	0.0005	0.00079	0.00128
Bromobenzene	0%	0.002	0.002			0%	0.0002	0.0005		
Bromochloromethane	0%	0.002	0.002			0%	0.0002	0.0005		
Bromodichloromethane	0%	0.002	0.002			0%	0.0002	0.0005		
Bromoform	0%	0.002	0.002			0%	0.0002	0.0005		
Bromomethane	0%	0.002	0.002			0%	0.0002	0.0005		
4-Bromophenyl-phenylether	0%	0.02	0.02			0%	0.0002	0.0005		
n-Butylbenzene	0%	0.002	0.002			0%	0.0002	0.0005		
sec-Butylbenzene	0%	0.002	0.002			0%	0.0002	0.0005		
tert-Butylbenzene	0%	0.002	0.002			0%	0.0002	0.0005		
Butylbenzylphthalate	0%	0.02	0.02			0%	0.0002	0.0005		
Carbazole	0%	0.02	0.02			11%	0.0002	0.0005	0.00108	0.00108
Carbon disulfide	0%	0.002	0.002			0%	0.0002	0.0005		
Carbon Tetrachloride	0%	0.002	0.002			0%	0.0002	0.0005		
4-Chloro-3-methylphenol	0%	0.02	0.02			0%	0.0002	0.0005		
4-Chloroaniline	0%	0.02	0.02			0%	0.0002	0.0005		
Chlorobenzene	0%	0.002	0.002			0%	0.0002	0.0005		
Chloroethane	0%	0.002	0.002			0%	0.0002	0.0005		
Chloroform	0%	0.002	0.002			0%	0.0002	0.0005		
Chloromethane	0%	0.002	0.002			0%	0.0002	0.0005		
2-Chloronaphthalene	0%	0.02	0.02			0%	0.0002	0.0005		
2-Chlorophenol	0%	0.02	0.02			0%	0.0002	0.0005		
4-Chlorophenyl-phenylether	0%	0.02	0.02			0%	0.0002	0.0005		
2-Chlorotoluene	0%	0.002	0.002			0%	0.0002	0.0005		
4-Chlorotoluene	0%	0.002	0.002			0%	0.0002	0.0005		
Chrysene	67%	0.02	0.02	0.05	0.17	0%	0.0002	0.0005		
Dibenz[a,h]anthracene	8%	0.02	0.02	0.1	0.1	0%	0.0002	0.0005		
Dibenzofuran	0%	0.02	0.02			0%	0.0002	0.0005		
1,2-Dibromo-3-chloropropane(DBCP)	0%	0.002	0.002			0%	0.0002	0.0005		
Dibromochloromethane	0%	0.002	0.002			0%	0.0002	0.0005		
1,2-Dibromoethane	0%	0.002	0.002			0%	0.0002	0.0005		
Dibromomethane	0%	0.002	0.002			0%	0.0002	0.0005		
1,2-Dichlorobenzene	0%	0.02	0.02			0%	0.0002	0.0005		
1,3-Dichlorobenzene	0%	0.02	0.02			22%	0.0002	0.0005	0.00051	0.0006
1,4-Dichlorobenzene	0%	0.02	0.02			0%	0.0002	0.0005		
3,3'-Dichlorobenzidine	0%	0.02	0.02			0%	0.0002	0.0005		
Dichlorodifluoromethane	0%	0.002	0.002			0%	0.0002	0.0005		
1,1-Dichloroethane	0%	0.002	0.002			0%	0.0002	0.0005		
1,2-Dichloroethane	0%	0.002	0.002			0%	0.0002	0.0005		
1,1-Dichloroethene	0%	0.002	0.002			0%	0.0002	0.0005		
cis-1,2-dichloroethene	0%	0.002	0.002			0%	0.0002	0.0005		
trans-1,2-Dichloroethene	0%	0.002	0.002			0%	0.0002	0.0005		
2,4-Dichlorophenol	0%	0.02	0.02			0%	0.0002	0.0005		
1,2-Dichloropropane	0%	0.002	0.002			0%	0.0002	0.0005		
1,3-Dichloropropane	0%	0.002	0.002			0%	0.0002	0.0005		
2,2-Dichloropropane	0%	0.002	0.002			0%	0.0002	0.0005		
1,1-Dichloropropene	0%	0.002	0.002			0%	0.0002	0.0005		
cis-1,3-Dichloropropene	0%	0.002	0.002			0%	0.0002	0.0005		
trans-1,3-Dichloropropene	0%	0.002	0.002			0%	0.0002	0.0005		
Diethylphthalate	0%	0.02	0.02			0%	0.0002	0.0005		
2,4-Dimethylphenol	0%	0.02	0.02			0%	0.0002	0.0005		
Dimethylphthalate	0%	0.02	0.02			0%	0.0002	0.0005		
Di-n-butylphthalate	0%	0.02	0.02			0%	0.0002	0.0005		

TABLE 3-4
Summary of Organic Chemicals in Townsite Area Surface Soil and Domestic Water Supply

Media >>	Soil (mg/kg)					Domestic Water Supply (mg/L)				
Chemicals of Interest (COIs)	Detection Frequency	Range of Detection Limits for Samples Reporting as Non-Detect (ND)		Detected Concentrations		Detection Frequency	Range of Detection Limits for Samples Reporting as Non-Detect (ND)		Detected Concentrations	
		Minimum	Maximum	Minimum	Maximum		Minimum	Maximum	Minimum	Maximum
4,6-Dinitro-2-methylphenol	0%	0.02	0.02			0%	0.0002	0.0005		
2,4-Dinitrophenol	0%	0.02	0.02			0%	0.0002	0.0005		
2,4-Dinitrotoluene	0%	0.02	0.02			0%	0.0002	0.0005		
2,6-Dinitrotoluene	0%	0.02	0.02			0%	0.0002	0.0005		
Di-n-octylphthalate	0%	0.02	0.02			0%	0.0002	0.0005		
1,2-Diphenyl hydrazine	0%	0.02	0.02			0%	0.0002	0.0005		
Ethylbenzene	0%	0.002	0.002			0%	0.0002	0.0005		
Fluoranthene	50%	0.02	0.02	0.05	0.29	0%	0.0002	0.0005		
Fluorene	0%	0.02	0.02			0%	0.0002	0.0005		
Hexachlorobenzene	0%	0.02	0.02			0%	0.0002	0.0005		
Hexachlorobutadiene	0%	0.02	0.02			0%	0.0002	0.0005		
Hexachlorocyclopentadiene	0%	0.02	0.02			0%	0.0002	0.0005		
Hexachloroethane	0%	0.02	0.02			0%	0.0002	0.0005		
2-hexanone (MBK)	0%	0.01	0.01			0%	0.001	0.0025		
Indeno[1,2,3-cd]pyrene	17%	0.02	0.02	0.1	0.14	0%	0.0002	0.0005		
Isophorone	0%	0.02	0.02			0%	0.0002	0.0005		
Isopropylbenzene (cumene)	0%	0.002	0.002			0%	0.0002	0.0005		
Methyl ethyl ketone (MEK)	8%	0.01	0.01	0.0807	0.0807	0%	0.001	0.0025		
Methyl isobutyl ketone (MIBK)	0%	0.01	0.01			0%	0.001	0.0025		
Methylene chloride	0%	0.01	0.01			0%	0.001	0.0025		
1-Methylnaphthalene	25%	0.02	0.02	0.05	0.09	0%	0.0002	0.0005		
2-Methylnaphthalene	50%	0.02	0.02	0.05	0.13	0%	0.0002	0.0005		
2-Methylphenol	0%	0.02	0.02			0%	0.0002	0.0005		
3+4-Methylphenol	0%	0.02	0.02			0%	0.0002	0.0005		
methyl-t-butyl ether (MTBE)	0%	0.002	0.002			0%	0.0002	0.0005		
Naphthalene	33%	0.02	0.02	0.05	0.09	0%	0.0002	0.0005		
2-Nitroaniline	0%	0.02	0.02			0%	0.0002	0.0005		
3-Nitroaniline	0%	0.02	0.02			0%	0.0002	0.0005		
4-Nitroaniline	0%	0.02	0.02			0%	0.0002	0.0005		
Nitrobenzene	0%	0.02	0.02			0%	0.0002	0.0005		
2-Nitrophenol	0%	0.02	0.02			0%	0.0002	0.0005		
4-Nitrophenol	0%	0.02	0.02			0%	0.0002	0.0005		
Nitrosodimethylamine	0%	0.02	0.02			0%	0.0002	0.0005		
n-Nitroso-di-n-propylamine	0%	0.02	0.02			0%	0.0002	0.0005		
n-Nitrosodiphenylamine	0%	0.02	0.02			0%	0.0002	0.0005		
Pentachlorophenol	0%	0.02	0.02			0%	0.0002	0.0005		
Phenanthrene	67%	0.02	0.02	0.05	0.24	0%	0.0002	0.0005		
Phenol	0%	0.02	0.02			0%	0.0002	0.0005		
p-isopropyltoluene	0%	0.002	0.002			0%	0.0002	0.0005		
n-Propylbenzene	0%	0.002	0.002			0%	0.0002	0.0005		
Pyrene	50%	0.02	0.02	0.06	0.18	0%	0.0002	0.0005		
Pyridine	0%	0.02	0.02			0%	0.0002	0.0005		
Styrene	0%	0.002	0.002			0%	0.0002	0.0005		
1,1,1,2-Tetrachloroethane	0%	0.002	0.002			0%	0.0002	0.0005		
1,1,2,2-Tetrachloroethane	0%	0.002	0.002			0%	0.0002	0.0005		
Tetrachloroethene	8%	0.002	0.002	0.0257	0.0257	0%	0.0002	0.0005		
2,3,4,6-Tetrachlorophenol	0%	0.02	0.02			0%	0.0002	0.0005		
2,3,5,6-Tetrachlorophenol	0%	0.02	0.02			0%	0.0002	0.0005		
Toluene	33%	0.002	0.002	0.0269	0.075	0%	0.0002	0.0005		
1,2,3-Trichlorobenzene	0%	0.002	0.002			0%	0.0002	0.0005		
1,2,4-Trichlorobenzene	0%	0.02	0.02			0%	0.0002	0.0005		
1,1,1-Trichloroethane	0%	0.002	0.002			0%	0.0002	0.0005		
1,1,2-Trichloroethane	0%	0.002	0.002			0%	0.0002	0.0005		
Trichloroethene	0%	0.002	0.002			0%	0.0002	0.0005		
Trichloroflouromethane	8%	0.002	0.002	0.0755	0.0755	0%	0.0002	0.0005		
2,4,5-Trichlorophenol	0%	0.02	0.02			0%	0.0002	0.0005		
2,4,6-Trichlorophenol	0%	0.02	0.02			0%	0.0002	0.0005		
1,2,3-Trichloropropane	0%	0.002	0.002			0%	0.0002	0.0005		
1,2,4-Trimethylbenzene	25%	0.002	0.002	0.0219	0.0517	0%	0.0002	0.0005		
1,3,5-Trimethylbenzene	17%	0.002	0.002	0.0175	0.0527	0%	0.0002	0.0005		
Vinyl Chloride	0%	0.002	0.002			0%	0.0002	0.0005		
m+p-Xylene	8%	0.002	0.002	0.0668	0.0668	0%	0.0002	0.0005		
o-Xylene	8%	0.002	0.002	0.0222	0.0222	0%	0.0002	0.0005		

Notes:

COI = chemical of interest

All soil results presented on dry weight basis.

mg/kg = milligram per kilogram

mg/L = milligram per liter

TABLE 3-5
Screening-Level Values for Selection of Human Health Chemicals of Potential Concern – Inorganic Chemicals

CASNo	Chemicals of Interest (COIs)	Source Materials/Soil Exposure		Surface Water Exposure				Groundwater Exposure		Selected Screening Level Value by Exposure Medium [7]		
		RSL Residential Soil RSLs [1]		IDAPA [2] (Water and Organism Consumption)	EPA NRWQC [3] (Water + Organism)	EPA MCL [4]	Alternative SLV [5] (HQ=0.1)	IDEQ 2004 (Risk-Based and MCL)[6]	Alternative SLV [5] (HQ=0.1)	Source Materials/ Soils [7]	Surface Water [8]	Ground-water [9]
		Carcinogenic Effect (TR=10^6)	Non-carcinogenic Effect (HQ=0.1)									
		mg/kg	mg/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/kg	mg/L	mg/L
Metals/Metalloids												
7429-90-5	Aluminum	--	7.70E+03	--	--	--	2.00E+00	--	2.00E+00	7.70E+03	2.00E+00	2.00E+00
7440-36-0	Antimony	--	3.10E+00	5.60E-03	5.60E-03	6.00E-03	--	6.00E-03	--	3.10E+00	5.60E-03	6.00E-03
7440-38-2	Arsenic	6.80E-01	3.50E+00	1.00E-02	1.80E-05	1.00E-02	--	1.00E-02	--	6.80E-01	1.00E-02	1.00E-02
7440-39-3	Barium	--	1.50E+03	--	1.00E+00	2.00E+00	--	2.00E+00	--	1.50E+03	1.00E+00	2.00E+00
7440-41-7	Beryllium	1.60E+03	1.60E+01	--	--	4.00E-03	--	4.00E-03	--	1.60E+01	4.00E-03	4.00E-03
7440-42-8	Boron	--	1.60E+03	--	--	--	4.00E-01	--	4.00E-01	1.60E+03	4.00E-01	4.00E-01
7440-43-9	Cadmium	2.10E+03	7.10E+00	--	--	5.00E-03	--	5.00E-03	--	7.10E+00	5.00E-03	5.00E-03
7440-47-3	Chromium, Total	--	1.20E+04 [b]	--	--	1.00E-01	--	1.00E-01	--	1.20E+04	1.00E-01	1.00E-01
7440-48-4	Cobalt	4.20E+02	2.30E+00	--	--	--	6.00E-04	--	6.00E-04	2.30E+00	6.00E-04	6.00E-04
7440-50-8	Copper	--	3.10E+02	--	1.30E+00	1.30E+00	--	1.30E+00	--	3.10E+02	1.30E+00	1.30E+00
7439-89-6	Iron	--	5.50E+03	--	--	--	1.40E+00	3.13E+00	--	5.50E+03	1.40E+00	3.13E+00
7439-92-1	Lead	--	4.00E+02	--	--	1.50E-02	--	1.50E-02	--	4.00E+02	1.50E-02	1.50E-02
7439-96-5	Manganese	--	1.80E+02	--	5.00E-02	--	--	2.50E-01	--	1.80E+02	5.00E-02	2.50E-01
7439-97-6	Mercury	--	1.10E+00	--	--	2.00E-03	--	2.00E-03	--	9.40E-01	2.00E-03	2.00E-03
7439-98-7	Molybdenum	--	3.90E+01	--	--	--	1.00E-02	--	1.00E-02	3.90E+01	1.00E-02	1.00E-02
7440-02-0	Nickel	1.50E+04	1.50E+02	6.10E-01	6.10E-01	--	--	2.09E-01	--	1.50E+02	6.10E-01	2.09E-01
7782-49-2	Selenium	--	3.90E+01	1.70E-01	1.70E-01	5.00E-02	--	5.00E-02	--	3.90E+01	1.70E-01	5.00E-02
7440-22-4	Silver	--	3.90E+01	--	--	--	9.40E-03	5.21E-02	--	3.90E+01	9.40E-03	5.21E-02
7440-28-0	Thallium	--	7.80E-02	2.40E-04	2.40E-04	2.00E-03	--	2.00E-03	--	7.80E-02	2.40E-04	2.00E-03
7440-61-1	Uranium	--	2.30E+01	--	--	3.00E-02	--	0.03 [a]	--	2.30E+01	3.00E-02	3.00E-02
7440-62-2	Vanadium	--	3.90E+01	--	--	--	8.60E-03	--	8.60E-03	3.90E+01	8.60E-03	8.60E-03
7440-66-6	Zinc	--	2.30E+03	7.40E+00	7.40E+00	--	--	3.13E+00	--	2.30E+03	7.40E+00	3.13E+00
Nutrients												
16984-48-8	Fluoride	--	3.10E+02	--	--	4.00E+00	--	4.00E+00	--	3.10E+02	4.00E+00	4.00E+00
14797-55-8	Nitrate	--	1.30E+04	--	1.00E+01	1.00E+01	--	1.00E+01	--	1.30E+04	1.00E+01	1.00E+01

Notes:

1. Regional Screening Level (RSL) source: U.S. Environmental Protection Agency (USEPA). 2016. Risk-Based Screening Table - Generic Tables; Regional Screening Level Tables (November 2015). Available at http://www.epa.gov/risk/risk-based-screening-table-generic-tables. (Website last updated December 21, 2015; accessed January 21, 2016). Includes links to associated regional screening levels (RSLs) and chemical-specific parameters. Information about criteria chosen for specific analytes is as follows: Antimony (metallic), Arsenic (inorganic), Beryllium and compounds, Boron and Borates only, Cadmium (diet) for soil and Cadmium (water) for water, Chromium III (Insoluble Salts), Lead and Compounds, Manganese (Non-Diet), Mercury (elemental), Nickel (soluble salts), Thallium (soluble salts), Uranium (soluble salts), Vanadium and compounds, Zinc and compounds.

2. Idaho Administrative Procedures Act (IDAPA). 2015. Idaho Administrative Code. Department of Environmental Quality. Water Quality Standards. IDAPA 58.01.02, Section 210. Available at http://adminrules.idaho.gov/rules/current/58/0102.pdf. Accessed January 22, 2016.

3. U.S. Environmental Protection Agency (USEPA). 2015a. Final 2015 Updated National Recommended Human Health Criteria. EPA Office of Water, Office of Science and Technology (4304T). Available at http://water.epa.gov/scitech/swguidance/standards/criteria/current/hhfinal.cfm (Website updated June 29, 2015; accessed Sept 28, 2015).

4. U.S. Environmental Protection Agency (USEPA). 2015b. National Primary Drinking Water Standards and National Secondary Drinking Water. Office of Water, EPA 816-F-03-016. Available at http://water.epa.gov/drink/contaminants/index.cfm. (Website last updated October 29, 2014; accessed Sept 28, 2015). The EPA MCL for Chromium (total) is used for Chromium III and Chromium VI.

5. Alternative screening level values (SLVs) for surface water and groundwater are residential tapwater Regional Screening Levels (RSLs). Source: U.S. Environmental Protection Agency (USEPA). 2016. Risk-Based Screening Table - Generic Tables; Regional Screening Level Tables (November 2015). Available at http://www.epa.gov/risk/risk-based-screening-table-generic-tables. (Website last updated December 21, 2015; accessed January 21, 2016).

6. Idaho Department of Environmental Quality (IDEQ 2004). Idaho Risk Evaluation Manual Final (July 2004), Available at: http://www.deq.idaho.gov/media/967298-risk_evaluation_manual_2004.pdf. Table 3-3 Target Levels for Ground Water Ingestion. Checked for updates Sept 28, 2015. Values are either risk-based values or Maximum contaminant levels (MCLs).

a. Uranium was not included in IDEQ (2004) and so the MCL is from USEPA (2015b).

7. Screening Level for source material/soil is the minimum RSL for the carcinogenic or noncarcinogenic effect for residential soil.

8. Screening Level for surface water selected based on the following hierarchy:
- IDAPA Water Quality Standards, Human Health for consumption of Water & Organisms
- EPA National Recommended Water Quality Criteria, Human Health for consumption of Water & Organisms
- EPA National Primary Drinking Water Regulations; Maximum Contaminant Levels (MCLs)
- Alternative SL (EPA Residential Tapwater RSLs)

9. Screening Level for groundwater selected based on the following hierarchy:
- IDEQ Table 3-3 Target Levels for Ground Water Ingestion
- Alternative SL (EPA Residential Tapwater RSLs)

b. When there are no screening values for Total Chromium, Chromium III values were presented.

TABLE 3-6
Screening-Level Values for Selection of Human Health Chemicals of Potential Concern – Organic Chemicals

		RSL Residential Soil Exposure [1]		Groundwater Exposure		Selected Screening Level by Exposure Medium	
CASNo	Chemicals of Interest (COIs)	Carcinogenic Effect (TR=10^6)	Non-carcinogenic Effect (HQ=0.1)	IDEQ 2004 (Risk-Based and MCL)[2]	Alternative SLV [3] (HQ=0.1)	Source Materials/ Soils [4]	Groundwater [5]
		mg/kg	mg/kg	mg/L	mg/L	mg/kg	mg/L
83-32-9	Acenaphthene	--	3.60E+02	6.26E-01	--	3.60E+02	6.26E-01
208-96-8	Acenaphthylene [a]	--	3.60E+02	6.26E-01	--	3.60E+02	6.26E-01
67-64-1	Acetone	--	6.10E+03	9.39E+00	--	6.10E+03	9.39E+00
107-13-1	Acrylonitrile	2.50E-01	1.60E+00	1.03E-04	--	2.50E-01	1.03E-04
62-53-3	Aniline	9.50E+01	4.40E+01	9.80E-03	--	4.40E+01	9.80E-03
120-12-7	Anthracene	--	1.80E+03	3.13E+00	--	1.80E+03	3.13E+00
71-43-2	Benzene	1.20E+00	8.20E+00	5.00E-03	--	1.20E+00	5.00E-03
92-87-5	Benzidine	5.30E-04	1.90E+01	2.43E-07	--	5.30E-04	2.43E-07
191-24-2	Benzo(ghi)perylene [a]	--	1.80E+02	3.13E-01	--	1.80E+02	3.13E-01
56-55-3	Benzo[a]anthracene	1.60E-01	--	7.65E-05	--	1.60E-01	7.65E-05
50-32-8	Benzo[a]pyrene	1.60E-02	--	2.00E-04	--	1.60E-02	2.00E-04
205-99-2	Benzo[b]fluoranthene	1.60E-01	--	7.65E-05	--	1.60E-01	7.65E-05
207-08-9	Benzo[k]fluoranthene	1.60E+00	--	7.65E-04	--	1.60E+00	7.65E-04
100-51-6	Benzyl alcohol	--	6.30E+02	3.13E+00	--	6.30E+02	3.13E+00
111-91-1	bis(2-Chloroethoxy)methane	--	1.90E+01	--	5.90E-03	1.90E+01	5.90E-03
111-44-4	bis(2-Chloroethyl)ether	2.30E-01	--	5.08E-05	--	2.30E-01	5.08E-05
108-60-1	bis(2-chloroisopropyl)ether	--	3.10E+02	4.17E-01	--	3.10E+02	4.17E-01
117-81-7	bis(2-Ethylhexyl)phthalate	3.90E+01	1.30E+02	6.00E-03	--	3.90E+01	6.00E-03
108-86-1	Bromobenzene	--	2.90E+01	--	6.20E-03	2.90E+01	6.20E-03
74-97-5	Bromochloromethane	--	1.50E+01	--	8.30E-03	1.50E+01	8.30E-03
75-27-4	Bromodichloromethane	2.90E-01	1.60E+02	9.01E-04	--	2.90E-01	9.01E-04
75-25-2	Bromoform	1.90E+01	1.60E+02	7.00E-03	--	1.90E+01	7.00E-03
74-83-9	Bromomethane	--	6.80E-01	1.46E-02	--	6.80E-01	1.46E-02
101-55-3	4-Bromophenyl-phenylether	--	--	3.72E-06	--	--	3.72E-06
104-51-8	n-Butylbenzene	--	3.90E+02	--	1.00E-01	3.90E+02	1.00E-01
135-98-8	sec-Butylbenzene	--	7.80E+02	1.04E-01	--	7.80E+02	1.04E-01
98-06-6	tert-Butylbenzene	--	7.80E+02	1.04E-01	--	7.80E+02	1.04E-01
85-68-7	Butylbenzylphthalate	2.90E+02	1.30E+03	2.09E+00	--	2.90E+02	2.09E+00
86-74-8	Carbazole	--	--	--	--	--	--
75-15-0	Carbon disulfide	--	7.70E+01	1.04E+00	--	7.70E+01	1.04E+00
56-23-5	Carbon tetrachloride	6.50E-01	1.00E+01	5.00E-03	--	6.50E-01	5.00E-03
59-50-7	4-Chloro-3-methylphenol	--	6.30E+02	--	1.40E-01	6.30E+02	1.40E-01
106-47-8	4-Chloroaniline	2.70E+00	2.50E+01	4.17E-02	--	2.70E+00	4.17E-02
108-90-7	Chlorobenzene	--	2.80E+01	1.00E-01	--	2.80E+01	1.00E-01
75-00-3	Chloroethane	--	1.40E+03	1.93E-02	--	1.40E+03	1.93E-02
67-66-3	Chloroform	3.20E-01	2.00E+01	1.80E-03	--	3.20E-01	1.80E-03
74-87-3	Chloromethane	--	1.10E+01	4.30E-03	--	1.10E+01	4.30E-03
91-58-7	2-Chloronaphthalene	--	4.80E+02	8.34E-01	--	4.80E+02	8.34E-01
95-57-8	2-Chlorophenol	--	3.90E+01	5.21E-02	--	3.90E+01	5.21E-02
7005-72-3	4-Chlorophenyl-phenylether	--	--	--	--	--	--
95-49-8	2-Chlorotoluene	--	1.60E+02	2.09E-01	--	1.60E+02	2.09E-01
106-43-4	4-Chlorotoluene	--	1.60E+02	--	2.50E-02	1.60E+02	2.50E-02
218-01-9	Chrysene	1.60E+01	--	7.65E-03	--	1.60E+01	7.65E-03
53-70-3	Dibenz[a,h]anthracene	1.60E-02	--	7.65E-06	--	1.60E-02	7.65E-06
132-64-9	Dibenzofuran	--	7.30E+00	4.17E-02	--	7.30E+00	4.17E-02
96-12-8	1,2-Dibromo-3-chloropropane (DBCP)	5.30E-03	4.70E-01	2.00E-04	--	5.30E-03	2.00E-04
124-48-1	Dibromochloromethane	8.30E+00	1.60E+02	6.65E-04	--	8.30E+00	6.65E-04
106-93-4	1,2-Dibromoethane	3.60E-02	7.30E+00	5.00E-05	--	3.60E-02	5.00E-05
74-95-3	Dibromomethane	--	2.40E+00	--	8.30E-04	2.40E+00	8.30E-04
95-50-1	1,2-Dichlorobenzene	--	1.80E+02	6.00E-01	--	1.80E+02	6.00E-01
541-73-1	1,3-Dichlorobenzene	--	--	9.39E-03	--	--	9.39E-03
106-46-7	1,4-Dichlorobenzene	2.60E+00	3.40E+02	7.50E-02	--	2.60E+00	7.50E-02
91-94-1	3,3'-Dichlorobenzidine	1.20E+00	--	1.24E-04	--	1.20E+00	1.24E-04
75-71-8	Dichlorodifluoromethane	--	8.70E+00	2.09E+00	--	8.70E+00	2.09E+00
75-34-3	1,1-Dichloroethane	3.60E+00	1.60E+03	1.04E+00	--	3.60E+00	1.04E+00
107-06-2	1,2-Dichloroethane	4.60E-01	3.10E+00	5.00E-03	--	4.60E-01	5.00E-03
75-35-4	1,1-Dichloroethene	--	2.30E+01	7.00E-03	--	2.30E+01	7.00E-03
156-59-2	cis-1,2-dichloroethene	--	1.60E+01	7.00E-02	--	1.60E+01	7.00E-02
156-60-5	trans-1,2-Dichloroethene	--	1.60E+02	1.00E-01	--	1.60E+02	1.00E-01
120-83-2	2,4-Dichlorophenol	--	1.90E+01	3.13E-02	--	1.90E+01	3.13E-02
78-87-5	1,2-Dichloropropane	1.00E+00	1.60E+00	5.00E-03	--	1.00E+00	5.00E-03
142-28-9	1,3-Dichloropropane	--	1.60E+02	--	3.70E-02	1.60E+02	3.70E-02
594-20-7	2,2-Dichloropropane [a]	1.00E+00	1.60E+00	5.00E-03	--	1.00E+00	5.00E-03
563-58-6	1,1-Dichloropropene	--	--	--	--	--	--
10061-01-5	cis-1,3-Dichloropropene [a]	1.80E+00	7.20E+00	5.59E-04	--	1.80E+00	5.59E-04
10061-02-6	trans-1,3-Dichloropropene [a]	1.80E+00	7.20E+00	5.59E-04	--	1.80E+00	5.59E-04
84-66-2	Diethylphthalate	--	5.10E+03	8.34E+00	--	5.10E+03	8.34E+00
105-67-9	2,4-Dimethylphenol	--	1.30E+02	2.09E-01	--	1.30E+02	2.09E-01
131-11-3	Dimethylphthalate	--	--	1.04E+02	--	--	1.04E+02
84-74-2	Di-n-butylphthalate	--	6.30E+02	1.04E+00	--	6.30E+02	1.04E+00
534-52-1	4,6-Dinitro-2-methylphenol	--	5.10E-01	--	1.50E-04	5.10E-01	1.50E-04
51-28-5	2,4-Dinitrophenol	--	1.30E+01	2.09E-02	--	1.30E+01	2.09E-02
121-14-2	2,4-Dinitrotoluene	1.70E+00	1.30E+01	8.22E-05	--	1.70E+00	8.22E-05
606-20-2	2,6-Dinitrotoluene	3.60E-01	1.90E+00	8.22E-05	--	3.60E-01	8.22E-05
117-84-0	Di-n-octylphthalate	--	6.30E+01	4.17E-01	--	6.30E+01	4.17E-01
122-66-7	1,2-Diphenyl hydrazine	6.80E-01	--	6.98E-05	--	6.80E-01	6.98E-05
100-41-4	Ethylbenzene	5.80E+00	3.40E+02	7.00E-01	--	5.80E+00	7.00E-01

TABLE 3-6
Screening-Level Values for Selection of Human Health Chemicals of Potential Concern – Organic Chemicals

		RSL Residential Soil Exposure [1]		Groundwater Exposure		Selected Screening Level by Exposure Medium	
CASNo	Chemicals of Interest (COIs)	Carcinogenic Effect (TR=10^6)	Non-carcinogenic Effect (HQ=0.1)	IDEQ 2004 (Risk-Based and MCL)[2]	Alternative SLV [3] (HQ=0.1)	Source Materials/ Soils [4]	Groundwater [5]
		mg/kg	mg/kg	mg/L	mg/L	mg/kg	mg/L
206-44-0	Fluoranthene	--	2.40E+02	4.17E-01	--	2.40E+02	4.17E-01
86-73-7	Fluorene	--	2.40E+02	4.17E-01	--	2.40E+02	4.17E-01
118-74-1	Hexachlorobenzene	2.10E-01	6.30E+00	1.00E-03	--	2.10E-01	1.00E-03
87-68-3	Hexachlorobutadiene	1.20E+00	7.80E+00	7.16E-04	--	1.20E+00	7.16E-04
77-47-4	Hexachlorocyclopentadiene	--	1.80E-01	5.00E-02	--	1.80E-01	5.00E-02
67-72-1	Hexachloroethane	1.80E+00	4.50E+00	3.99E-03	--	1.80E+00	3.99E-03
591-78-6	2-hexanone (MBK)	--	2.00E+01	--	3.80E-03	2.00E+01	3.80E-03
193-39-5	Indeno[1,2,3-cd]pyrene	1.60E-01	--	7.65E-05	--	1.60E-01	7.65E-05
78-59-1	Isophorone	5.70E+02	1.30E+03	5.88E-02	--	5.70E+02	5.88E-02
98-82-8	Isopropylbenzene (cumene)	--	1.90E+02	1.04E+00	--	1.90E+02	1.04E+00
78-93-3	Methyl ethyl ketone (MEK)	--	2.70E+03	6.26E+00	--	2.70E+03	6.26E+00
108-10-1	Methyl isobutyl ketone (MIBK)	--	3.30E+03	--	6.30E-01	3.30E+03	6.30E-01
75-09-2	Methylene chloride	5.70E+01	3.50E+01	7.45E-03	--	3.50E+01	7.45E-03
90-12-0	1-Methylnaphthalene	1.80E+01	4.20E+02	--	1.10E-03	1.80E+01	1.10E-03
91-57-6	2-Methylnaphthalene	--	2.40E+01	4.17E-02	--	2.40E+01	4.17E-02
95-48-7	2-Methylphenol (cresol, o-)	--	3.20E+02	5.21E-01	--	3.20E+02	5.21E-01
108-39-4, 106-44-5	3+4-Methylphenol [b]	--	3.20E+02	5.21E-02	--	3.20E+02	5.21E-02
1634-04-4	methyl-t-butyl ether (MTBE)	4.70E+01	1.50E+03	1.69E-02	--	4.70E+01	1.69E-02
91-20-3	Naphthalene	3.80E+00	1.30E+01	2.09E-01	--	3.80E+00	2.09E-01
88-74-4	2-Nitroaniline	--	6.30E+01	3.13E-02	--	6.30E+01	3.13E-02
99-09-2	3-Nitroaniline [a]	2.70E+01	2.50E+01	1.47E-03	--	2.50E+01	1.47E-03
100-01-6	4-Nitroaniline	2.70E+01	2.50E+01	1.47E-03	--	2.50E+01	1.47E-03
98-95-3	Nitrobenzene	5.10E+00	1.30E+01	5.21E-03	--	5.10E+00	5.21E-03
88-75-5	2-Nitrophenol [a]	--	--	8.34E-02	--	--	8.34E-02
100-02-7	4-Nitrophenol	--	--	8.34E-02	--	--	8.34E-02
62-75-9	Nitrosodimethylamine	2.00E-03	5.30E-02	1.10E-06	--	2.00E-03	1.10E-06
621-64-7	n-Nitroso-di-n-propylamine	7.80E-02	--	7.98E-06	--	7.80E-02	7.98E-06
86-30-6	n-Nitrosodiphenylamine	1.10E+02	--	1.14E-02	--	1.10E+02	1.14E-02
87-86-5	Pentachlorophenol	1.00E+00	2.50E+01	1.00E-03	--	1.00E+00	1.00E-03
85-01-8	Phenanthrene [a]	--	1.80E+03	3.13E-01	--	1.80E+03	3.13E-01
108-95-2	Phenol	--	1.90E+03	3.13E+00	--	1.90E+03	3.13E+00
99-87-6	p-isopropyltoluene	--	--	--	--	--	--
103-65-1	n-Propylbenzene	--	3.80E+02	--	6.60E-02	3.80E+02	6.60E-02
129-00-0	Pyrene	--	1.80E+02	3.13E-01	--	1.80E+02	3.13E-01
110-86-1	Pyridine	--	7.80E+00	--	2.00E-03	7.80E+00	2.00E-03
100-42-5	Styrene	--	6.00E+02	1.00E-01	--	6.00E+02	1.00E-01
630-20-6	1,1,1,2-Tetrachloroethane	2.00E+00	2.30E+02	2.15E-03	--	2.00E+00	2.15E-03
79-34-5	1,1,2,2-Tetrachloroethane	6.00E-01	1.60E+02	2.79E-04	--	6.00E-01	2.79E-04
127-18-4	Tetrachloroethene	2.40E+01	8.10E+00	5.00E-03	--	8.10E+00	5.00E-03
58-90-2	2,3,4,6-Tetrachlorophenol	--	1.90E+02	--	2.40E-02	1.90E+02	2.40E-02
88-06-2	2,3,5,6-Tetrachlorophenol	4.90E+01	6.30E+00	--	4.10E-03	6.30E+00	4.10E-03
108-88-3	Toluene	--	4.90E+02	1.00E+00	--	4.90E+02	1.00E+00
87-61-6	1,2,3-Trichlorobenzene	--	6.30E+00	--	7.00E-04	6.30E+00	7.00E-04
120-82-1	1,2,4-Trichlorobenzene	2.40E+01	5.80E+00	7.00E-02	--	5.80E+00	7.00E-02
71-55-6	1,1,1-Trichloroethane	--	8.10E+02	2.00E-01	--	8.10E+02	2.00E-01
79-00-5	1,1,2-Trichloroethane	1.10E+00	1.50E-01	5.00E-03	--	1.50E-01	5.00E-03
79-01-6	Trichloroethene	9.40E-01	4.10E-01	5.00E-03	--	4.10E-01	5.00E-03
75-69-4	Trichloroflouromethane	--	2.30E+03	3.13E+00	--	2.30E+03	3.13E+00
95-95-4	2,4,5-Trichlorophenol	--	6.30E+02	1.04E+00	--	6.30E+02	1.04E+00
88-06-2	2,4,6-Trichlorophenol	4.90E+01	6.30E+00	1.04E-03	--	6.30E+00	1.04E-03
96-18-4	1,2,3-Trichloropropane	5.10E-03	4.80E-01	7.98E-06	--	5.10E-03	7.98E-06
95-63-6	1,2,4-Trimethylbenzene	--	5.80E+00	5.21E-01	--	5.80E+00	5.21E-01
108-67-8	1,3,5-Trimethylbenzene	--	7.80E+01	5.21E-01	--	7.80E+01	5.21E-01
75-01-4	Vinyl Chloride	5.90E-02	7.00E+00	2.00E-03	--	5.90E-02	2.00E-03
m+p-Xylene	m+p-Xylene [c][d]	--	5.50E+01	1.00E+01	--	5.50E+01	1.00E+01
95-47-6	o-Xylene [d]	--	6.50E+01	1.00E+01	--	6.50E+01	1.00E+01

Notes:

a. The following surrogates were used for analytes lacking values: Acenaphthylene used for Acenaphthene; Pyrene used for Benzo(ghi)perylene; 1,2-Dichloropropane used for 2,2-Dichloropropane; 4-Nitroaniline used for 3-Nitroaniline; 4-Nitrophenol used for 2-Nitrophenol; Anthracene used for Phenanthrene; 1,3-Dichloropropene used for cis-1,3-Dichloropropene and trans-1,3-Dichloropropene.

1. Regional Screening Level (RSL) source: U.S. Environmental Protection Agency (USEPA). 2016. Risk-Based Screening Table - Generic Tables; Regional Screening Level Tables (November 2015). Available at http://www.epa.gov/risk/risk-based-screening-table-generic-tables. (Website last updated December 21, 2015; accessed January 21, 2016). Includes links to associated regional screening levels (RSLs) and chemical-specific parameters. Information about criteria chosen for specific analytes is as follows:

b. 3+4-Methylphenol RSLs are based on the lesser of the RSLs for m-cresol and p-cresol.

c. m+p-Xylene RSLs are based on the lesser of the RSLs for m-xylene and p-xylene.

2. Idaho Department of Environmental Quality (IDEQ 2004). Idaho Risk Evaluation Manual Final (July 2004), Available at: http://www.deq.idaho.gov/media/967298-risk_evaluation_manual_2004.pdf. Table 3-3 Target Levels for Ground Water Ingestion. Checked for updates September 28, 2015. Values are either risk-based values or Maximum contaminant levels (MCLs).

3. Alternative screening level values (SLVs) for groundwater are residential tapwater Regional Screening Levels (RSLs) - the lower of the carcinogenic screening level (target risk=1.0E-6) or non-carcinogenic screening level (hazard index=0.1). Source: U.S. Environmental Protection Agency (USEPA). 2016. Risk-Based Screening Table - Generic Tables; Regional Screening Level Tables (November 2015). Available at http://www.epa.gov/risk/risk-based-screening-table-generic-tables. (Website last updated December 21, 2015; accessed January 21, 2016). Includes links to associated regional screening levels (RSLs) and chemical-specific parameters.

d. Total Xylenes value used for m+p-Xylene and o-xylene.

4. Screening Level for source material/soil is the minimum RSL for the carcinogenic or noncarcinogenic effect for residential soil.

5. Screening Level for groundwater selected based on the following hierarchy:

- IDEQ Table 3-3 Target Levels for Ground Water Ingestion
- Alternative SL (EPA Residential Tapwater RSLs)

TABLE 3-7
Summary of Human Health Chemicals of Potential Concern – Inorganic Chemicals

COIs/HH COPCs[1]	Max exceeds SOIL Screening Level?	Max exceeds SURFACE WATER Screening Level?	Max exceeds DOMESTIC WATER SUPPLY Screening Level?	Overall HH COPC to be evaluated in Risk Characterization?
Aluminum	**Yes**	**Yes**	**Yes**	**Yes**
Antimony	**Yes**	No	**Yes**	**Yes**
Arsenic	**Yes**	**Yes**	**Yes**	**Yes**
Barium	No	No	**Yes**	**Yes**
Beryllium	No	No	**Yes**	**Yes**
Boron	No	No	**Yes**	**Yes**
Cadmium	**Yes**	**Yes**	**Yes**	**Yes**
Chromium	No	**Yes**	**Yes**	**Yes**
Cobalt	**Yes**	**Yes**	**Yes**	**Yes**
Copper	No	No	No	No
Iron	**Yes**	**Yes**	**Yes**	**Yes**
Lead	**Yes**	**Yes**	**Yes**	**Yes[2]**
Manganese	**Yes**	**Yes**	**Yes**	**Yes**
Mercury	No	No	No	No
Molybdenum	**Yes**	**Yes**	**Yes**	**Yes**
Nickel	**Yes**	No	**Yes**	**Yes**
Selenium	**Yes**	**Yes**	**Yes**	**Yes**
Silver	No	**Yes**	No	**Yes**
Thallium	**Yes**	**Yes**	**Yes**	**Yes**
Uranium	**Yes**	**Yes**	**Yes**	**Yes**
Vanadium	**Yes**	**Yes**	**Yes**	**Yes**
Zinc	**Yes**	No	**Yes**	**Yes**
Fluoride	NA	No	No	No
Nitrate	NA	**Yes**	**Yes**	**Yes[2]**

Notes:

Refer to Appendix C for all screening evaluation details.

1 - HH COPCs identified during screening process are highlighted in gray; uncertain HH COPCs are in bold font.

2 - Lead and nitrates were not evaluated quantitatively in the SSHHRA because a small number of samples tested exceeded the screening values in all three media. They were evaluated qualitatively in Section 3.0 of the report.

COI = chemical of interest
HH COPCs = Human Health Chemicals of Potential Concern
NA = no data available
SSHHRA = site-specific human health risk assessment

TABLE 3-8
Summary of Human Health Chemicals of Potential Concern – Organic Chemicals

COIs/HH COPCs[1,2]	Detected in Soil?	Max exceeds SOIL Screening Level?	Detected in Domestic Water Supply?	Max exceeds DOMESTIC WATER SUPPLY Screening Level?	Overall HH COPC to be evaluated in Risk Characterization?
Acrylonitrile	no	No	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
Benzidine	no	**Uncertain - DL>SLV (but all NDs)**	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
Benzo[a]anthracene	yes	No	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
Benzo[a]pyrene	yes	**Yes**	no	**Uncertain - DL>SLV (but all NDs)**	**Yes - qualitative evaluation**
Benzo[b]fluoranthene	yes	**Yes**	no	**Uncertain - DL>SLV (but all NDs)**	**Yes - qualitative evaluation**
bis(2-Chloroethyl)ether	no	No	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
4-Bromophenyl-phenylether	no	**Uncertain - no SLV (but all NDs)**	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
Carbazole	no	**Uncertain - no SLV (but all NDs)**	yes	**Uncertain - no SLV**	**Uncertain - qualitative evaluation**
4-Chlorophenyl-phenylether	no	**Uncertain - no SLV (but all NDs)**	no	**Uncertain - no SLV (but all NDs)**	**Uncertain - qualitative evaluation**
Dibenz[a,h]anthracene	yes	**Yes**	no	**Uncertain - DL>SLV (but all NDs)**	**Yes - qualitative evaluation**
1,2-Dibromo-3-chloropropane(DBCP)	no	No	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
1,2-Dibromoethane	no	No	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
1,3-Dichlorobenzene	no	**Uncertain - no SLV (but all NDs)**	yes	No	**Uncertain - qualitative evaluation**
3,3'-Dichlorobenzidine	no	No	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
1,1-Dichloropropene	no	**Uncertain - no SLV (but all NDs)**	no	**Uncertain - no SLV (but all NDs)**	**Uncertain - qualitative evaluation**
Dimethylphthalate	no	**Uncertain - no SLV (but all NDs)**	no	No	**Uncertain - qualitative evaluation**
4,6-Dinitro-2-methylphenol	no	No	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
2,4-Dinitrotoluene	no	No	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
2,6-Dinitrotoluene	no	No	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
1,2-Diphenyl hydrazine	no	No	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
Indeno[1,2,3-cd]pyrene	yes	No	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
2-Nitrophenol	no	**Uncertain - no SLV (but all NDs)**	no	No	**Uncertain - qualitative evaluation**
4-Nitrophenol	no	**Uncertain - no SLV (but all NDs)**	no	No	**Uncertain - qualitative evaluation**
Nitrosodimethylamine	no	**Uncertain - DL>SLV (but all NDs)**	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
n-Nitroso-di-n-propylamine	no	No	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
p-isopropyltoluene	no	**Uncertain - no SLV (but all NDs)**	no	**Uncertain - no SLV (but all NDs)**	**Uncertain - qualitative evaluation**
1,1,2,2-Tetrachloroethane	no	No	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**
1,2,3-Trichloropropane	no	No	no	**Uncertain - DL>SLV (but all NDs)**	**Uncertain - qualitative evaluation**

Notes:

Refer to Appendix F for all screening evaluation details.

1 - HH COPCs identified during screening process are highlighted in gray; uncertain HH COPCs are in bold font.

2 - Organic COIs that screened out of the evaluation are not listed on this table; refer to Appendix F.

Uncertain - no SLV = There is not an SLV for this COI.

Uncertain - no SLV (but all NDs) = There is not an SLV for this COI, but the COI was not detected in any sample.

Uncertain - DL>SLV (but all NDs) =The maximum non-detected value (i.e., detection limit) exceeds the SLV, but the COI was not detected in any sample.

COI = chemical of interest

DL = Detection limit

HH COPCs = Human Health Chemicals of Potential Concern

NA = no data available

ND = non-detect

SLV = screening level value

SSHHRA = site-specific human health risk assessment

TABLE 4-1
Tier 1 Receptors and Exposure Factors Descriptions

Receptor[1]	Age Group[2]	General Description of Exposure Area	Ingestion - Inorganic Media[3]			Ingestion - Food[3]					Dermal[3]			Inhalation				External Radiation
			Soil[4]	Surface Water (SW)	Domestic Water Supply (DWS)[5]	Livestock[6]	Wild Game[6]	Garden Produce	Aquatic/Terrestrial Culturally-Significant Plant Ingestion[7, 8]	Culturally-Significant Tea Consumption	Soil[4]	Surface Water (SW)	Domestic Water Supply (DWS)[5]	Soil[4]	Surface Water (SW)	Domestic Water Supply (DWS)[5]	Indoor Radon Inhalation	
Industrial Worker (Current and Future)	Adult	Mined Area	C - 95UCL of Mined Area soils	N	C - 95UCL of Simplot Culinary Well (GW-11)	N	C - Game EPCs based on 95UCL of Site-wide soils, SW, and vegetation	N	N	N	C - 95UCL of Mined Area soils	N	C - 95UCL of Simplot Culinary Well (GW-11)	C - 95UCL of Mined Area soils	N	N	N	C - 95UCL of Mined Area soils
Recreational Hunter (Current and Future)	Adult and Youth	Site-wide	C - 95UCL of Site-wide soils	C - 95UCL of Site-wide SW data	N	N	C - Game EPCs based on 95UCL of Site-wide surface soils, SW, and vegetation	N	N	N	C - 95UCL of Site-wide soils	C - 95UCL of Site-wide SW data	N	C - 95UCL of Site-wide soils	N	N	N	C - 95UCL of Site-wide soils
Seasonal Rancher (Current)	Adult	Non-Mined Area	C - 95UCL of Non-Mined Area soils	N	C - 95UCL of DWS from Non-Mined Area Private Land	C - Livestock EPCs based on 95UCL of Non-Mined Area soils, surface water, and vegetation	C - Game EPCs based on 95UCL of Site-wide soils, SW, and vegetation	N	N	N	C - 95UCL of Non-Mined Area soils	N	C - 95UCL of DWS from Non-Mined Area Private Land	C - 95UCL of Non-Mined Area soils	N	N	N	C - 95UCL of Non-Mined Area soils
Seasonal Rancher (Future)	Adult, Youth, Older Child, Young Child	Non-Mined Area and Mined Area BLM Land	C - 95UCL of soils in Non-Mined Area and Mined Area BLM Land	N	C - 95UCL of all Site-wide DWS [9]	C - Livestock EPCs based on 95UCL of Non-Mined Area and Mined Area BLM Land soils, SW, and vegetation	C - Game EPCs based on 95UCL of Site-wide soils, SW, and vegetation	C - Vegetation concentration based on 95UCL of soils from Non-Mined Area and Mined Area BLM Land	N	N	C - 95UCL of soils in Non-Mined Area and Mined Area BLM Land	N	C - 95UCL of all Site-wide DWS	C - 95UCL of soils in Non-Mined Area and Mined Area BLM Land	N	N	N	C - 95UCL of soils in Non-Mined Area and Mined Area BLM Land
Livestock Herder (Current)	Adult	Non-Mined Area	C - 95UCL of Non-Mined Area soils	C - 95UCL of Non-Mined Area SW	N	N	N	N	N	N	C - 95UCL of Non-Mined Area soils	C - 95UCL of Non-Mined Area SW	N	C - 95UCL of Non-Mined Area soils	N	N	N	C - 95UCL of Non-Mined Area soils
Livestock Herder (Future)	Adult	Non-Mined Area and Mined Area BLM Land	C - 95UCL of soils in Non-Mined Area and Mined Area BLM Land	C - 95UCL of SW in Non-Mined Area and Mined Area BLM Land	N	N	N	N	N	N	C - 95UCL of soils in Non-Mined Area and Mined Area BLM Land	C - 95UCL of SW in Non-Mined Area and Mined Area BLM Land	N	C - 95UCL of soils in Non-Mined Area and Mined Area BLM Land	N	N	N	C - 95UCL of soils in Non-Mined Area and Mined Area BLM Land

TABLE 4-1
Tier 1 Receptors and Exposure Factors Descriptions

Receptor[1]	Age Group[2]	General Description of Exposure Area	Ingestion - Inorganic Media[3]			Ingestion - Food[3]					Dermal[3]			Inhalation				External Radiation
			Soil[4]	Surface Water (SW)	Domestic Water Supply (DWS)[5]	Livestock[6]	Wild Game[6]	Garden Produce	Aquatic/Terrestrial Culturally-Significant Plant Ingestion[7, 8]	Culturally-Significant Tea Consumption	Soil[4]	Surface Water (SW)	Domestic Water Supply (DWS)[5]	Soil[4]	Surface Water (SW)	Domestic Water Supply (DWS)[5]	Indoor Radon Inhalation	
Recreational Trespasser (Current and Future)	Adult, Youth, and Older Child	Site-wide	C - 95UCL of Site-wide soils	C - 95UCL of Site-wide SW data	N	N	N	N	N	N	C - 95UCL of Site-wide soils	C - 95UCL of Site-wide SW data	N	C - 95UCL of Site-wide soils	N	N	N	C - 95UCL of Site-wide soils
Native American (Current and Future)	Adult, Youth, Older Child, Young Child	Non-Mined Area and Mined Area BLM Land	C - 95UCL of soils in Non-Mined Area and Mined Area BLM Land	C - 95UCL of SW in Non-Mined Area and Mined Area BLM Land	N	N	C - Game EPCs based on 95UCL of Site-wide soils, SW, and vegetation	N	C- Culturally-significant plant consumption based on 95UCL of relevant samples in Non-Mined Area and Mined Area BLM Land[7]	C - Culturally-significant tea consumption based on 95UCL of willow and sage samples in Non-Mined Area and Mined Area BLM Land	C - 95UCL of soils in Non-Mined Area and Mined Area BLM Land	C - 95UCL of SW in Non-Mined Area and Mined Area BLM Land	N	C - 95UCL of soils in Non-Mined Area and Mined Area BLM Land	N	N	N	C - 95UCL of soils in Non-Mined Area and Mined Area BLM Land
Hypothetical Resident (Future)	Adult, Youth, Older Child, Young Child	Site-wide	C - 95UCL of Site-wide soils	N	C - 95UCL of all Site-wide DWS	C - Livestock EPCs based on 95UCL of Site-wide soils, SW, and vegetation	C - Game EPCs based on 95UCL of Site-wide soils, SW, and vegetation	C - Vegetation concentration based on 95UCL of Site-wide soils	C- Site-specific culturally-significant plant species data (wild onion; 1 sample)[8]	N	C - 95UCL of Site-wide soils	N	C - 95UCL of all Site-wide DWS	C - 95UCL of Site-wide soils	N	N	C - 95UCL of Site-wide soils	C - 95UCL of Site-wide soils

Notes:

Refer to Figure 4-1 (Conceptual Site Model) for more information about exposure pathways. Figures 4-2 through 4-5 show the exposure areas.

1 - Receptors that are evaluated quantitatively are listed on this table. Exposures to Off-Site Recreational Fishers are evaluated qualitatively.

2 - Age groups are defined as: Adult (16+ years of age), Youth (6 years up to 16 years of age), Older Child (2 years up to 6 years of age), Young Child (0 years up to 2 years of age).

3 - Complete exposure pathways are the focus of this table. Potentially complete but insignificant pathways (e.g., aquatic sediment; culturally-significant plant smoke inhalation, dermal application of salve) are not presented on this table.

C - Complete exposure pathway.

N - Incomplete or insignificant exposure pathway.

4 - Surface soils are soils (including samples from residual mining material: overburden, tailings, waste rock) and non-aquatic sediment. Aquatic sediment exposure is considered potentially complete but insignificant and so is not listed on this table.

5 - Domestic Water Supply (DWS) is defined as water from 1) groundwater wells from all formations (except for two wells from Meade Peak formation), and 2) all springs.

6 - Samples of all plant types (browse, grasses, forbs, aquatic species) used in EPCs for livestock including beef and mutton and wild game.

7 - Culturally-significant plant ingestion for the Native American receptor includes samples of vegetation from Non-Mined Area and Mined Area BLM Land that were comprised of culturally-significant plant species that are identifed on Table 2-1.

8 - Culturally-significant plant ingestion is watercress for the Hypothetical Resident receptor. There is an overall lack of significant populations of this species at the Site. Watercress was identified at one small spring in the southeast corner of the Non-Mined Area, near Camp G Creek at the base of a foothill east of the Site and unimpacted by mine activities. No samples were therefore taken from this population. There are results for 1 sample of wild onion collected at the Site that is used for the EPC instead.

9 - The exposure area for the Future Seasonal Rancher is Non-Mined Area and Mined Area BLM Land, but the Site-wide DWS dataset was used to represent that potential future exposure.

95UCL - 95th upper confidence level on the mean

DWS - Domestic Water Supply

EPC - Exposure Point Concentration

SW - Surface Water

TABLE 4-2
Exposure Factors Input (Industrial Worker - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
General	ATc	Averaging time, cancer	days	25,550	Recommended value (USEPA 1989)	25,550	Recommended value (USEPA 1989)
	ATnc	Averaging time, noncancer	days	9,125	Recommended value (USEPA 1989)	3,285	Recommended value (USEPA 1989)
	CF	Conversion Factor	kg/mg	1.0E-06		1.0E-06	
	PEF	Particulate Emission Factor	m^3/kg	3.3E+09	Calculated using parameters from Boise ID and a 30 acre site (USEPA 1996)	3.3E+09	Calculated using parameters from Boise ID and a 30 acre site (USEPA 1996)
	ED	Exposure Duration	years	25	Recommended value for workers (USEPA 2014)	9	Recommended value for workers (USEPA 1991b)
Adult (16+years of age)							
General	BW_a	Body Weight	kg	80	Recommended value for adults (USEPA 2014)	80	Recommended value for adults (USEPA 2014)
	$ADAF_a$	Age-Dependent Adjustment Factor	unitless	1	USEPA (2005c)	1	USEPA (2005c)
	ED_a	Exposure Duration	years	25	Recommended RME residential exposure is 30 years subtracting any years as a child or youth (USEPA 1989,1991b)	9	Recommended CTE residential exposure is 9 years subtracting any years as a child or youth (USEPA 1993b)
Source Material/Soil Exposure Pathways							
General	EF_a	Exposure Frequency to Site Soil	days/yr	25	5 work weeks (Professional Judgment)	7	1 work week (Professional Judgment)
Inhalation	ET_o	Exposure time - Outdoor	hr/hr	0.33	8 hour work day/24 hours	0.33	8 hour work day/24 hours
Ingestion	IRS_a	Soil Ingestion Rate	mg/day	100	Recommended RME residential exposure for adults in USEPA (2014) and recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011a)	50	Recommended CTE residential exposure for adults in USEPA (1993b) and recommended daily ingestion rate of soil and outdoor settled dust Table 5-1 (USEPA 2011a)
Dermal	SAS_a	Exposure skin surface area per day	cm^2/day	3,527	Recommended RME value for adult industrial senario (USEPA 2014)	3,527	Recommended CTE value for adult industrial senario (USEPA 2014)
	AF_a	Adherence factor	mg/cm^2	0.12	Recommended value for worker (USEPA 2014)	0.02	Recommended geometric mean for groundskeeper workers USEPA 2004 Exhibit 3-3 pg. 3-15
Domestic Water Supply Exposure Pathways							
General	$EFDW_a$	Exposure Frequency	days/yr	25	5 work weeks (Professional Judgment)	7	1 work week (Professional Judgment)
Ingestion	$IRDW_a$	Domestic Water Supply Ingestion Rate	L/day	1.0	Daily drinking water ingestion rate for adults at work (USEPA 1991a)	0.5	One-half the individual's daily water intake per USEPA (1991a) using time-weighted drinking water mean ingestion rate for ages 16 to 41 years per Table 3-1 of USEPA (2011a)

TABLE 4-2
Exposure Factors Input (Industrial Worker - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Dermal	$SADW_a$	Exposure skin surface area per day	cm^2/day	2,807	Mean surface area by body part for face, forearms, and hands in USEPA 2011a Table 7-2, time-weighted for male and female children combined 16 years to <21 and adult male 21+ years based on a 25 year work duration (age 16-41) Assumes workers are wearing long pants and short-sleeved shirts. *EPA standard Value is 18,000 cm2/day but is based on total body surface area for adults showering/bathing pathway, this pathway was adjusted for site specific conditions. Mean value used due to inverse relationship between surface area and risk.	2,807	Mean surface area by body part for face, forearms, and hands in USEPA 2011a Table 7-2, time-weighted for male and female children combined 16 years to <21 and adult male 21+ years based on a 25 year work duration (age 16-41) Assumes workers are wearing long pants and short-sleeved shirts. *EPA standard Value is 18,000 cm2/day but is based on total body surface area for adults showering/bathing pathway, this pathway was adjusted for site specific conditions.
	$EVDW_a$	Event Frequency	event/day	5	Assumes hands are washed 5 times in the work period/day, Professional judgement	5	Assumes hands are washed 5 times in the work period/day, Professional judgement
	$teventDW_a$	Event duration	hr/event	0.03	Assumes hands are washed for 2 minutes each event, Professional judgement	0.03	Assumes hands are washed for 2 minutes each event, Professional judgement
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/year	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_a$	Ingestion Rate of Skeletal Muscle	g/kg/day	1.05	Time-weighted ingestion rate of game for ages 16-41 years using 95th percentile rate from Table 13-41, USEPA (2011); per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.343	Time-weighted ingestion rate of game for ages 16-41 years using mean rate from Table 13-41 USEPA (2011); Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRWGO_a$	Ingestion Rate of Offal or Organs	g/kg/day	0.002	No RME intake, same as CTE consumption per day	0.002	Table 11-13, USEPA (2011) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_{wg}	Fraction of diet Site-derived	unitless	1.0	Assumes all game meat is from Site	1.0	Assumes all game meat is from Site

Notes:
RME - reasonable maximum exposure
CTE - central tendency exposure
USEPA - United States Environmental Protection Agency
95%tile - 95th Percentile
Recommended values from USEPA (2011a) are 95th percentile values for RME and mean values for CTE, unless specified.

TABLE 4-2
Exposure Factors Input (Recreational Hunter - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
General	ATc	Averaging time, cancer	days	25,550	Recommended value (USEPA 1989)	25,550	Recommended value (USEPA 1989)
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (USEPA 1989) - Total Exposure Duration in days	3,285	Recommended value (USEPA 1989) - Total Exposure Duration in days
	CF	Conversion Factor	kg/mg	1.0E-06		1.0E-06	
	PEF	Particulate Emission Factor	m^3/kg	3.3E+09	Calculated using parameters from Boise ID and a 30 acre site (USEPA 1996)	3.3E+09	Calculated using parameters from Boise ID and a 30 acre site (USEPA 1996)
	ED	Cumulative Exposure Duration	years	30	Summation of exposure duration of each life phase below	9	Summation of exposure duration of each life phase below
Adult (16+years of age)							
General	BW_a	Body Weight	kg	80	Recommended value for adults (USEPA 2014)	80	Recommended value for adults (USEPA 2014)
	$ADAF_a$	Age-Dependent Adjustment Factor	unitless	1	USEPA (2005c)	1	USEPA (2005c)
	ED_a	Exposure Duration	years	20	Recommended RME residential exposure is 30 years subtracting 10 years as youth (USEPA 1991b)	7	Recommended CTE residential exposure is 9 years (USEPA 1993b), subtracting 2 years as child
Source Material/Soil Exposure Pathways							
General	EFS_a	Exposure Frequency to Site Soil	days/yr	14	14 days within the hunting season (May through October) each year. Value within reported expsoure frequency range in Appendix A surveys, and other regional risk assessments.	6	1 day per month for the season of Mid-May through October each year. Value within reported expsoure frequency range in Appendix A surveys.
Inhalation	ET_o	Exposure time - Outdoor	hr/hr	0.42	10 hour day/24 hours	0.42	10 hour day/24 hours
Ingestion	IRS_a	Soil Ingestion Rate	mg/day	100	Recommended RME residential exposure for adults in USEPA (2014) and recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011)	50	Recommended CTE residential exposure for adults in USEPA (1993b) and recommended daily ingestion rate of soil and outdoor settled dust Table 5-1 (USEPA 2011a)
Dermal	SAS_a	Exposure skin surface area per day	cm^2/day	3,527	Recommended RME value for adult industrial senario (USEPA 2014)	3,527	Recommended RME value for adult industrial senario (USEPA 2014)
	AF_a	Adherence factor	mg/cm^2	0.12	Recommended value for worker (USEPA 2014)	0.02	Recommended geometric mean for groundskeeper workers USEPA 2004 Exhibit 3-3 pg. 3-15

TABLE 4-2
Exposure Factors Input (Recreational Hunter - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Surface Water Exposure Pathways							
General	$EFSW_a$	Exposure Frequency	days/yr	14	14 days within the hunting season (May through October) each year. Value within reported expsoure frequency range in Appendix A surveys, and other regional risk assessments.	6	1 day per month for the season of Mid-May through October each year. Value within reported expsoure frequency range in Appendix A surveys.
Ingestion	$IRSW_a$	Surface Water Ingestion Rate	L/day	0.24	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 1 cup of water. Professional Judgment	0.12	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 0.5 cup of water Professional Judgment
Dermal	$SASW_a$	Exposure skin surface area per day	cm^2/day	5,364	Mean surface area by body part for face, forearms, lower legs, and hands in USEPA 2011a Table 7-2, time-weighted for male and female children combined 16 years to <21 and adult male 21+ years based on a 20 year work duration (age 16-36) Assumes receptors are wearing long pants and short-sleeved shirts. *EPA standard Value is 18,000 cm2/day but is based on total body surface area for adults showering/bathing pathway, this pathway was adjust for site specific conditions. Mean value used due to inverse relationship between surface area and risk.	5,364	Mean surface area by body part for face, forearms, lower legs, and hands in USEPA 2011a Table 7-2, time-weighted for male and female children combined 16 years to <21 and adult male 21+ years based on a 20 year work duration (age 16-36) Assumes receptors are wearing long pants and short-sleeved shirts. *EPA standard Value is 18,000 cm2/day but is based on total body surface area for adults showering/bathing pathway, this pathway was adjust for site specific conditions.
	$EVSW_a$	Event Frequency	event/day	0.25	Professional Judgment; assume 1/4 time wade in the water	0.25	Professional Judgment; assume 1/4 time may contact water
Dermal (cont.)	$teventSW_a$	Event duration	hr/event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event

TABLE 4-2
Exposure Factors Input (Recreational Hunter - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/yr	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_a$	Ingestion Rate of Skeletal Muscle	g/kg/day	1.04	Time-weighted ingestion rate of game for ages 16-36 years using 95th percentile rate from Table 13-41, USEPA (2011); per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.342	Time-weighted ingestion rate of game for ages 16-36 years using mean rate from Table 13-41 USEPA (2011); Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
Wild Game (cont)	$IRWGO_a$	Ingestion Rate of Offal or Organs	g/kg/day	0.002	No RME intake, same as CTE consumption per day	0.002	Table 11-13, USEPA (2011) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_{wg}	Fraction of diet Site-derived	unitless	1.0	Assumes all game meat is from Site	1.0	Assumes all game meat is from Site
Youth (6 years up to 16 years of age)							
General	BW_{16}	Body Weight	kg	44.3	Time-weighted body weight for ages 6 to 16 years using recommended weight by age in Table 8-1, USEPA (2011a)	44.3	Time-weighted body weight for ages 6 to 16 years using recommended weight by age in Table 8-1, USEPA (2011a)
	$ADAF_{16}$	Age-Dependent Adjustment Factor	unitless	3	USEPA (2005c)	3	USEPA (2005c)
	ED_{16}	Exposure Duration	years	10	Years of exposure from 6 up to 16 years of age	2	Years of exposure from 6 to 16 years of age
Source Material/Soil Exposure Pathways							
General	EFS_{16}	Exposure Frequency to Site Soil	days/yr	14	14 days within the hunting season (May through October) each year. Value within reported expsoure frequency range in Appendix A surveys, and other regional risk assessments.	6	1 day per month for the season of Mid-May through October each year. Value within reported expsoure frequency range in Appendix A surveys.
Inhalation	ET_o	Exposure time - Outdoor	hr/hr	0.42	10 hour day/24 hours	0.42	10 hour day/24 hours
Ingestion	IRS_{16}	Soil Ingestion Rate	mg/day	100	Recommended daily ingestion rate of soil and dust (indoor and outdoor) (USEPA 2011a)	50	Recommended daily ingestion rate of soil and outdoor settled dust (USEPA 2011a)

TABLE 4-2
Exposure Factors Input (Recreational Hunter - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Dermal	SAS_{16}	Exposure skin surface area per day	cm^2/day	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)
	AF_{16}	Adherence factor	mg/cm^2	0.12	Recommended value for worker (USEPA 2014)	0.02	Recommended geometric mean for groundskeeper workers USEPA 2004 Exhibit 3-3 pg. 3-15
Surface Water Exposure Pathways							
General	$EFSW_{16}$	Exposure Frequency	days/yr	14	14 days within the hunting season (May through October) each year. Value within reported expsoure frequency range in Appendix A surveys, and other regional risk assessments.	6	1 day per month for the season of Mid-May through October each year. Value within reported expsoure frequency range in Appendix A surveys.
Ingestion	$IRSW_{16}$	Surface Water Ingestion Rate	L/day	0.24	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 1 cup of water- Professional Judgment	0.12	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 0.5 cup of water- Professional Judgment
Dermal	$SASW_{16}$	Exposure skin surface area per day	cm^2/day	3,285	Time-weighted surface area for ages 6 to 16 years using recommended mean surface area by age for face, hands, forearms, and lower legs in Table 7–2, USEPA (2011a) per recommended residential exposure USEPA (2004) through wearing shorts. *EPA standard Value is 6,600 cm2/day but is based on total body surface area for child showering/bathing pathway, this pathway was adjusted for site specific conditions. Mean value used due to inverse relationship between surface area and risk.	3,285	Time-weighted surface area for ages 6 to 16 years using recommended mean surface area by age for face, hands, forearms, and lower legs in Table 7–2, USEPA (2011a) per recommended residential exposure USEPA (2004 through wearing shorts. *EPA standard Value is 6,600 cm2/day but is based on total body surface area for child showering/bathing pathway, this pathway was adjusted for site specific conditions.
	$EVSW_{16}$	Event Frequency	event/day	0.25	Professional Judgment; assume 1/4 time wade in the water	0.25	Professional Judgment; assume 1/4 time may contact water
	$teventSW_{16}$	Event duration	hr/event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event

TABLE 4-2
Exposure Factors Input (Recreational Hunter - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/yr	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_{16}$	Ingestion Rate of Skeletal Muscle	g/kg/day	1.17	Time-weighted ingestion rate of game for ages 6 to 16 years using 95th percentile rate from Table 13-41, USEPA (2011);Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.423	Time-weighted ingestion rate of game for ages 6 to 16 years using mean rate from Table 13-41, USEPA (2011); Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRWGO_{16}$	Ingestion Rate of Offal or Organs	g/kg/day	0.004	No RME intake, same as CTE consumption per day	0.004	Table 11-13, USEPA (2011) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_{wg}	Fraction of diet Site-derived	unitless	1.0	Assumes all game meat is from Site	1.0	Assumes all game meat is from Site

Notes:
RME - reasonable maximum exposure
CTE - central tendency exposure
USEPA - United States Environmental Protection Agency
95%tile - 95th Percentile
Recommended values from USEPA (2011) are 95th percentile values for RME and mean values for CTE, unless specified.

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Current)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
General	ATc	Averaging time, cancer	days	25,550	Recommended value (USEPA 1989)	25,550	Recommended value (USEPA 1989)
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (USEPA 1989) - Total Exposure Duration in days	3,285	Recommended value (USEPA 1989) - Total Exposure Duration in days
	CF	Conversion Factor	kg/mg	1.0E-06		1.0E-06	
	PEF	Particulate Emission Factor	m^3/kg	3.3E+09	Calculated using parameters from Boise ID and a 30 acre site (USEPA 1996)	3.3E+09	Calculated using parameters from Boise ID and a 30 acre site (USEPA 1996)
	ED	Cumulative Exposure Duration	years	30	Summation of exposure duration of each life phase below	9	Summation of exposure duration of each life phase below
Adult (16+years of age)							
General	BW_a	Body Weight	kg	80	Recommended value for adults (USEPA 2014)	80	Recommended value for adults (USEPA 2014)
	$ADAF_a$	Age-Dependent Adjustment Factor	unitless	1	USEPA (2005c)	1	USEPA (2005c)
	ED_a	Exposure Duration	years	30	Recommended RME residential exposure is 30 years subtracting any years as a child or youth (USEPA 1989,1991b)	9	Recommended CTE residential exposure is 9 years subtracting any years as a child or youth (USEPA 1993b)
Source Material/Soil Exposure Pathways							
General	EFS_a	Exposure Frequency to Site Soil	days/yr	154	End of May through October each year	154	End of May through October each year
Inhalation	ET_o	Exposure time - Outdoor	hr/hr	0.42	10 hours/day	0.42	10 hours/day
Ingestion	IRS_a	Soil Ingestion Rate	mg/day	100	Recommended RME residential exposure for adults in USEPA (2014) and recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011a)	50	Recommended CTE residential exposure for adults in USEPA (1993b) and recommended daily ingestion rate of soil and outdoor settled dust Table 5-1 (USEPA 2011a)
Dermal	SAS_a	Exposure skin surface area per day	cm^2/day	6,032	Recommended RME value for residential adults (USEPA 2014)	6,032	Recommended CTE value for residential adults (USEPA 2014)
	AF_a	Adherence factor	mg/cm^2	0.30	Recommended 95th percentile for construction worker (USEPA 2004) USEPA 2004 Exhibit 3-3 pg. 3-15	0.10	Recommended geometric mean for groundskeeper workers (USEPA 2004) USEPA 2004 Exhibit 3-3 pg. 3-15

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Current)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Domestic Water Supply Exposure Pathways							
General	$EFDW_a$	Exposure Frequency	days/yr	154	End of May through October each year	154	End of May through October each year
Ingestion	$IRDW_a$	Groundwater Ingestion Rate	L/day	2.5	Daily drinking water ingestion rate for adults (USEPA 2014)	1.0	Time-weighted drinking water mean ingestion rate for ages 16 to 46 years per Table 3-1 of USEPA (2011a)
Dermal	$SADW_a$	Exposure skin surface area per day	cm^2/day	20,900	Recommended value for residential water surface area-adult (USEPA 2014)	20,900	Recommended value for residential water surface area-adult (USEPA 2014)
	$EVDW_a$	Event Frequency	event/day	1	Recommended value for residential adult showering/bathing (USEPA 2004)	1	Recommended value for residential adult showering/bathing (USEPA 2004)
	$teventDW_a$	Event duration	hr/event	0.71	Recommended value for residential adult water exposure time (USEPA 2014).	0.28	Recommended value for adult showering/bathing from Table 6-1, USEPA (2011a)
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/year	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_a$	Ingestion Rate of Skeletal Muscle	g/kg/day	1.08	Time-weighted ingestion rate of game for ages 16-46 years using 95th percentile rate from Table 13-41, USEPA (2011); per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.347	Time-weighted ingestion rate of game for ages 16-46 years using mean rate from Table 13-41 USEPA (2011); Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRWGO_a$	Ingestion Rate of Offal or Organs	g/kg/day	0.002	No RME intake, same as CTE consumption per day	0.002	Table 11-13, USEPA (2011) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_{wg}	Fraction of diet Site-derived	unitless	1.0	Assumes all game meat is from Site	1.0	Assumes all game meat is from Site

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Current)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Beef	IRM_a	Ingestion Rate of Skeletal Muscle	g/kg/day	2.33	Time-weighted ingestion rate of homegrown beef for ages 16-46 years using 95th percentile rate from Table 13-33, USEPA (2011); per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.780	Time-weighted ingestion rate of homegrown beef for ages 16-46 years using mean rate from Table 13-33, USEPA (2011); per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	IRO_a	Ingestion Rate of Offal or Organs	g/kg/day	0.006	No RME intake, doubled CTE consumption per day for an assumption of 1 lb (453.5924 g) of organ meat consumed during a year. Adjusted for receptor group body weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.002	Table 11-13, USEPA (2011) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_B	Fraction of diet Site-derived	unitless	1.0	Assumes all homegrown meat is from Site	1.0	Assumes all homegrown meat is from Site
Mutton	$IRMM_a$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.008	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the 95th%tile for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 16-46 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.002	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the mean for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 16-46 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRMO_a$	Ingestion Rate of Offal or Organs	g/kg/day	0.006	No RME intake, doubled CTE consumption per day for an assumption of 1 lb (453.5924 g) of organ meat consumed during a year. Adjusted for receptor group body weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.002	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_m	Fraction of diet Site-derived	unitless	1.0	Assumes all homegrown meat is from Site	1.0	Assumes all homegrown meat is from Site

Notes:
RME - reasonable maximum exposure
CTE - central tendency exposure
USEPA - United States Environmental Protection Agency
95%tile - 95th Percentile
Recommended values from USEPA (2011a) are 95th percentile values for RME and mean values for CTE, unless specified.

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
General	ATc	Averaging time, cancer	days	25,550	Recommended value (USEPA 1989)	25,550	Recommended value (USEPA 1989)
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (USEPA 1989) - Total Exposure Duration in days	3,285	Recommended value (USEPA 1989) - Total Exposure Duration in days
	CF	Conversion Factor	kg/mg	1.0E-06		1.0E-06	
	PEF	Particulate Emission Factor	m^3/kg	3.3E+09	Calculated using parameters from Boise ID and a 30 acre site (USEPA 1996)	3.3E+09	Calculated using parameters from Boise ID and a 30 acre site (USEPA 1996)
	ED	Cumulative Exposure Duration	years	30	Summation of exposure duration of each life phase below	9	Summation of exposure duration of each life phase below
Adult (16+years of age)							
General	BW_a	Body Weight	kg	80	Recommended value for adults (USEPA 2014)	80	Recommended value for adults (USEPA 2014)
	$ADAF_a$	Age-Dependent Adjustment Factor	unitless	1	USEPA (2005c)	1	USEPA (2005c)
	ED_a	Exposure Duration	years	14	Recommended RME residential exposure is 30 years subtracting any years as a child or youth (USEPA 1989,1991b)	4	Recommended CTE residential exposure is 9 years subtracting any years as a child or youth (USEPA 1993b)
Source Material/Soil Exposure Pathways							
General	EFS_a	Exposure Frequency to Site Soil	days/yr	154	End of May through October each year	154	End of May through October each year
Inhalation	ET_o	Exposure time - Outdoor	hr/hr	0.42	10 hours/day	0.42	10 hours/day
Ingestion	IRS_a	Soil Ingestion Rate	mg/day	100	Recommended RME residential exposure for adults in USEPA (2014) and recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011a)	50	Recommended CTE residential exposure for adults in USEPA (1993b) and recommended daily ingestion rate of soil and outdoor settled dust Table 5-1 (USEPA 2011a)
Dermal	SAS_a	Exposure skin surface area per day	cm^2/day	6,032	Recommended RME value for residential adults (USEPA 2014)	6,032	Recommended CTE value for residential adults (USEPA 2014)
	AF_a	Adherence factor	mg/cm^2	0.30	Recommended 95th percentile for construction worker (USEPA 2004)	0.10	Recommended geometric mean for groundskeeper workers (USEPA 2004)
Domestic Water Supply Exposure Pathways							
General	$EFDW_a$	Exposure Frequency	days/yr	154	Recommended residential exposure frequency (USEPA 1989)	154	End of May through October each year
Ingestion	$IRDW_a$	Domestic Water Supply Ingestion Rate	L/day	2.5	Daily drinking water ingestion rate for adults (USEPA 2014)	1.0	Time-weighted drinking water mean ingestion rate for ages 16 to 36 years per Table 3-1 of USEPA (2011a)

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Dermal	$SADW_a$	Exposure skin surface area per day	cm^2/day	20,900	Recommended value for residential water surface area- adult (USEPA 2014)	20,900	Recommended value for residential water surface area- adult (USEPA 2014)
	$EVDW_a$	Event Frequency	event/day	1	Recommended value for residential adult showering/bathing (USEPA 2004)	1	Recommended value for residential adult showering/bathing (USEPA 2004)
	$teventDW_a$	Event duration	hr/event	0.71	Recommended value for residential adult water exposure time (USEPA 2014).	0.28	Recommended value for adult showering/bathing from Table 6-1, USEPA (2011a)
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/year	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_a$	Ingestion Rate of Skeletal Muscle	g/kg/day	1.06	Time-weighted ingestion rate of game for ages 16-30 years using 95th percentile rate from Table 13-41, USEPA (2011); per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.349	Time-weighted ingestion rate of game for ages 16-30 years using mean rate from Table 13-41 USEPA (2011); Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRWGO_a$	Ingestion Rate of Offal or Organs	g/kg/day	0.002	No RME intake, same as CTE consumption per day	0.002	Table 11-13, USEPA (2011) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_{wg}	Fraction of diet Site-derived	unitless	1	Assumes all game meat is from Site	1	Assumes all game meat is from Site
Beef	IRM_a	Ingestion Rate of Skeletal Muscle	g/kg/day	2.24	Time-weighted ingestion rate of homegrown beef for ages 16-30 years using 95th percentile rate from Table 13-33, USEPA (2011); per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.777	Time-weighted ingestion rate of homegrown beef for ages 16-30 years using mean rate from Table 13-33, USEPA (2011); per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	IRO_a	Ingestion Rate of Offal or Organs	g/kg/day	0.006	No RME intake, doubled CTE consumption per day for an assumption of 1 lb (453.5924 g) of organ meat consumed during a year. Adjusted for receptor group body weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.002	Table 11-13, USEPA (2011) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_B	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Mutton	$IRMM_a$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.008	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the 95th%tile for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 16-30 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.002	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the mean for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 16-30 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRMO_a$	Ingestion Rate of Offal or Organs	g/kg/day	0.006	No RME intake, doubled CTE consumption per day for an assumption of 1 lb (453.5924 g) of organ meat consumed during a year. Adjusted for receptor group body weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.002	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_m	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site
Homegrown Produce	$IREAP_a$	Ingestion Rate of Exposed Aboveground Produce	g/kg/day	0.35	Time-weighted ingestion rate of exposed above ground vegetables for ages 16-30 years using 95th percentile rate from Table 13-60, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.11	Time-weighted ingestion rate of exposed above ground vegetables for ages 16-30 years using mean rate from Table 13-60, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content
	F_{eap}	Fraction of Exposed Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRPAP_a$	Ingestion Rate of Protected Aboveground Produce	g/kg/day	0.24	Time-weighted ingestion rate of protected above ground vegetables for ages 16-30 years using 95th percentile rate from Table 13-61, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.077	Time-weighted ingestion rate of protected above ground vegetables for ages 16-30 years using mean rate from Table 13-61, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content
	F_{pap}	Fraction of Protected Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRBP_a$	Ingestion Rate of Belowground Produce	g/kg/day	0.31	Time-weighted ingestion rate of below ground vegetables for ages 16-30 years using 95th percentile rate from Table 13-62, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.089	Time-weighted ingestion rate of below ground vegetables for ages 16-30 years using mean rate from Table 13-62, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Homegrown Produce (cont.)	F_{bgp}	Fraction of Belowground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
Youth (6 years up to 16 years of age)							
General	BW_{16}	Body Weight	kg	44.3	Time-weighted body weight for ages 6 to 16 years using recommended weight by age in Table 8-1, USEPA (2011a)	44.3	Time-weighted body weight for ages 6 to 16 years using recommended weight by age in Table 8-1, USEPA (2011a)
	$ADAF_{16}$	Age-Dependent Adjustment Factor	unitless	3	USEPA (2005c)	3	USEPA (2005c)
	ED_{16}	Exposure Duration	years	10	Years of exposure from 6 up to 16 years of age	2	Years of exposure from 6 up to 16 years of age
Source Material/Soil Exposure Pathways							
General	EFS_{16}	Exposure Frequency to Site Soil	days/yr	154	End of May through October each year	154	End of May through October each year
Inhalation	ET_{o16}	Exposure time - Outdoor	hr/hr	0.42	10 hours/day - likely overestimate in May, Aug, Sept, and October	0.42	10 hours/day - likely overestimate in May, Aug, Sept, and October
Ingestion	IRS_{16}	Soil Ingestion Rate	mg/day	100	Recommended RME residential exposure for adults in USEPA (2014 and recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011)	50	Recommended CTE residential exposure for adults in USEPA (1993b) and recommended daily ingestion rate of soil and outdoor settled dust Table 5-1 (USEPA 2011a)
Dermal	SAS_{16}	Exposure skin surface area per day	cm^2/day	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)
	AF_{16}	Adherence factor	mg/cm^2	0.30	Recommended 95th percentile for construction worker (USEPA 2004)	0.10	Recommended geometric mean for construction workers (USEPA 2004)
Domestic Water Supply Exposure Pathways							
General	$EFDW_{16}$	Exposure Frequency	days/yr	154	Recommended residential exposure frequency (USEPA 1989)	154	End of May through October each year
Ingestion	$IRDW_{16}$	Domestic Water Supply Ingestion Rate	L/day	1.69	Time-weighted drinking water 95%tile ingestion rate for ages 6 to 16 years per Table 3-1 of USEPA (2011a)	0.574	Time-weighted drinking water mean ingestion rate for ages 6 to 16 years per Table 3-1 of USEPA (2011a)
Dermal	$SADW_{16}$	Exposure skin surface area per day	cm^2/day	13,350	Time-weighted surface area for ages 6 to 16 years using total surface area in Table 7–1, USEPA (2011a) *Mean value used due to inverse relationship between surface area and risk.	13,350	Time-weighted surface area for ages 6 to 16 years using total surface area in Table 7–1, USEPA (2011a) *Mean value used due to inverse relationship between surface area and risk.
	$EVDW_{16}$	Event Frequency	event/day	1	Recommended value for residential adult showering/bathing (USEPA 2004)	1	Recommended value for residential adult showering/bathing Exhibit 3-2 (USEPA 2004)
	$teventDW_{16}$	Event duration	hr/event	0.68	Time-weighted 95%tile length of shower for ages 6 to 16 years per in Table 16-1, USEPA (2011a)	0.30	Time-weighted mean length of shower for ages 6 to 16 years per in Table 16-1, USEPA (2011a)

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/year	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_a$	Ingestion Rate of Skeletal Muscle	g/kg/day	1.17	Time-weighted ingestion rate of game for ages 6 to 16 years using 95th percentile rate from Table 13-41, USEPA (2011); Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.423	Time-weighted ingestion rate of game for ages 6 to 16 years using mean rate from Table 13-41, USEPA (2011); Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRWGO_a$	Ingestion Rate of Offal or Organs	g/kg/day	0.004	No RME intake, same as CTE consumption per day	0.004	Table 11-13, USEPA (2011) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_{wg}	Fraction of diet Site-derived	unitless	1	Assumes all game meat is from Site	1	Assumes all game meat is from Site
Beef	$IRBM_{16}$	Ingestion Rate of Skeletal Muscle	g/kg/day	3.532	Time-weighted ingestion rate of homegrown beef for ages 6 to 16 years using 95%tile rate from Table 13-33, USEPA (2011a); per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	1.167	Time-weighted ingestion rate of homegrown beef for ages 6 to 16 years using mean rate from Table 13-33, USEPA (2011a); perTable 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRBO_{16}$	Ingestion Rate of Offal or Organs	g/kg/day	0.011	No RME intake, doubled CTE consumption per day for an assumption of 1 lb (453.5924 g) of organ meat consumed during a year. Adjusted for receptor group body weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.004	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_B	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Mutton	$IRMM_{16}$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.028	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the 95th%tile for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 6-16 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.008	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the mean for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 6-16 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRMO_{16}$	Ingestion Rate of Offal or Organs	g/kg/day	0.011	No RME intake, doubled CTE consumption per day for an assumption of 1 lb (453.5924 g) of organ meat consumed during a year. Adjusted for receptor group body weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.004	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_m	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site
Homegrown Produce	$IREAP_{16}$	Ingestion Rate of Exposed Aboveground Produce	g/kg/day	0.463	Time-weighted ingestion rate of exposed above ground vegetables for ages 6-16 years using 95th percentile rate from Table 13-60, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.126	Time-weighted ingestion rate of exposed above ground vegetables for ages 6 to 16 years using mean rate from Table 13-60, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content
	F_{eap}	Fraction of Exposed Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRPAP_{16}$	Ingestion Rate of Protected Aboveground Produce	g/kg/day	0.28	Time-weighted ingestion rate of protected above ground vegetables for ages 6-16 years using 95th percentile rate from Table 13-61, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.097	Time-weighted ingestion rate of protected above ground vegetables for ages 6 to 16 years using mean rate from Table 13-61, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content
	F_{pap}	Fraction of Protected Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRBP_{16}$	Ingestion Rate of Belowground Produce	g/kg/day	0.47	Time-weighted ingestion rate of below ground vegetables for ages 6-16 years using 95th percentile rate from Table 13-62, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.117	Time-weighted ingestion rate of below ground vegetables for ages 6 to 16 years using mean rate from Table 13-62, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Homegrown Produce (cont.)	F_{bgp}	Fraction of Belowground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
Older Child (2 years up to 6 years of age)							
General	BW_6	Body Weight	kg	17.4	Time-weighted body weight for ages 2 to 6 years using recommended weight by age in Table 8-1, USEPA (2011a)	17.4	Time-weighted body weight for ages 2 to 6 years using recommended weight by age in Table 8-1, USEPA (2011a)
	$ADAF_6$	Age-Dependent Adjustment Factor	unitless	3	USEPA (2005c)	3	USEPA (2005c)
	ED_6	Exposure Duration	years	4	Years of exposure from 2 up to 6 years of age	2	Years of exposure from 2 up to 6 years of age
Source Material/Soil Exposure Pathways							
General	EFS_6	Exposure Frequency to Site Soil	days/yr	154	End of May through October each year (no snow)	154	End of May through October each year
Inhalation	ET_{o6}	Exposure time - Outdoor	hr/hr	0.069	Time-weighted rate for daily outdoor time for ages 2 to 6 years using mean values (there are no 95%tile values) from Table 16-1, USEPA (2011a).	0.069	Time-weighted rate for daily outdoor time for ages 2 to 6 years using mean values from Table 16-1, USEPA (2011a).
Ingestion	IRS_6	Soil Ingestion Rate	mg/day	200	Recommended daily RME residential child exposure in USEPA (2014)	100	Recommended daily RME residential child exposure in USEPA (1991a)
Dermal	SAS_6	Exposure skin surface area per day	cm^2/day	2,373	Recommended RME value for child residential scenario (USEPA 2014)	2,373	Recommended RME value for child residential scenario (USEPA 2014)
	AF_6	Adherence factor	mg/cm^2	0.2	Recommended value for residential children (USEPA 2004)	0.2	Recommended value for residential children (USEPA 2004)
Domestic Water Supply Exposure Pathways							
General	$EFDW_6$	Exposure Frequency	days/yr	154	Recommended residential exposure frequency (USEPA 1989)	154	End of May through October each year
Ingestion	$IRDW_6$	Domestic Water Supply Ingestion Rate	L/day	0.98	Time-weighted drinking water 95%tile ingestion rate for ages 2 to 6 years per Table 3-1 of USEPA (2011a)	0.98	Time-weighted drinking water mean ingestion rate for ages 2 to 6 years per Table 3-1 of USEPA (2011a)
Dermal	$SADW_6$	Exposure skin surface area per day	cm^2/day	7,200	Time-weighted surface area for ages 2 to 6 years using total surface area in Table 7–2, USEPA (2011a) *Mean value used due to inverse relationship between surface area and risk.	7,200	Time-weighted surface area for ages 2 to 6 years using total surface area in Table 7–2, USEPA (2011a) *Mean value used due to inverse relationship between surface area and risk.
	$EVDW_5$	Event Frequency	event/day	1	Recommended value for residential children showering/bathing (USEPA 2004)	1	Recommended value for residential children showering/bathing (USEPA 2004)
	$teventDW_6$	Event duration	hr/event	0.94	Time-weighted 95%tile length of bath for ages 2 to 6 years per in Table 16-1, USEPA (2011a)	0.94	Time-weighted mean length of bath for ages 2 to 6 years per in Table 16-1, USEPA (2011a)

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/year	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_a$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.015	AWHHERA (TTEMI 2002) for estimated skeletal muscle consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.006	AWHHERA (TTEMI 2002) for estimated skeletal muscle consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRWGO_a$	Ingestion Rate of Offal or Organs	g/kg/day	0.002	AWHHERA (TTEMI 2002) for estimated organ meat, sausage, and offal consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.0007	AWHHERA (TTEMI 2002) for estimated organ meat, sausage, and offal consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_{wg}	Fraction of diet Site-derived	unitless	0.29	AWHHERA (TTEMI 2002). Per Table 11-38, USEPA (2011).	0.29	AWHHERA (TTEMI 2002). Per Table 11-38, USEPA (2011).
Beef	$IRBM_6$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.70	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the 95th%tile for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 2-6 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.27	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the mean for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 2-6 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRBO_6$	Ingestion Rate of Offal or Organs	g/kg/day	0.01	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	--	Assumes this age group does not consume significant amounts of organ meats
	Fb	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Mutton	$IRMM_6$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.014	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the 95th%tile for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 2-6 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.005	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the mean for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 2-6 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRMO_6$	Ingestion Rate of Offal or Organs	g/kg/day	0.011	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	-	Assumes this age group does not consume significant amounts of organ meats
	F_m	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site
Homegrown Produce	$IREAP_6$	Ingestion Rate of Exposed Aboveground Produce	g/kg/day	0.77	Time-weighted ingestion rate of exposed above ground vegetables for ages 2-6 years using 95th percentile rate from Table 13-60, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content.	0.22	Time-weighted ingestion rate of exposed above ground vegetables for ages 2 to 6 years using mean rate from Table 13-60, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content
	F_{eap}	Fraction of Exposed Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRPAP_6$	Ingestion Rate of Protected Aboveground Produce	g/kg/day	0.62	Time-weighted ingestion rate of protected above ground vegetables for ages 2-6 years using 95th percentile rate from Table 13-61, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.16	Time-weighted ingestion rate of protected above ground vegetables for ages 2 to 6 years using mean rate from Table 13-61, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content
	F_{pap}	Fraction of Protected Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRBP_6$	Ingestion Rate of Belowground Produce	g/kg/day	0.61	Time-weighted ingestion rate of below ground vegetables for ages 2-6 years using 95th percentile rate from Table 13-62, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.16	Time-weighted ingestion rate of below ground vegetables for ages 2 to 6 years using mean rate from Table 13-62, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Homegrown Produce (cont.)	F_{bgp}	Fraction of Belowground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
Young Child (0 years up to 2 years of age)							
General	BW_2	Body Weight	kg	9.6	Time-weighted body weight for ages 0 to 2 years using recommended weight by age in Table 8-1, USEPA (2011a)	9.6	Time-weighted body weight for ages 0 to 2 years using recommended weight by age in Table 8-1, USEPA (2011a)
	$ADAF_2$	Age-Dependent Adjustment Factor	unitless	10	USEPA (2005c)	10	USEPA (2005c)
	ED_2	Exposure Duration	years	2	Years of exposure from 0 up to 2 years of age	1	Years of exposure from 0 up to 2 years of age
Source Material/Soil Exposure Pathways							
General	EFS_2	Exposure Frequency to Site Soil	days/yr	154	End of May through October each year	154	End of May through October each year
Inhalation	ET_{o2}	Exposure time - Outdoor	hr/hr	0.040	Time-weighted rate for daily outdoor time for ages 0 to 2 years using mean values from Table 16-1, USEPA (2011a).	0.040	Time-weighted rate for daily outdoor time for ages 0 to 2 years using mean values from Table 16-1, USEPA (2011a).
Ingestion	IRS_2	Soil Ingestion Rate	mg/day	200	Recommended daily RME residential child exposure in USEPA (2014)	100	Recommended daily RME residential child exposure in USEPA (1991a)
Dermal	SA_2	Exposure skin surface area per day	cm^2/day	2,373	Recommended RME value for child residential scenario (USEPA 2014)	2,373	Recommended RME value for child residential scenario (USEPA 2014)
	AF_2	Adherence factor	mg/cm^2	0.2	Recommended value for residential children (USEPA 2004)	0.2	Recommended value for residential children (USEPA 2004)
Domestic Water Supply Exposure Pathways							
General	$EFDW_2$	Exposure Frequency	days/yr	154	Recommended residential exposure frequency (USEPA 1989)	154	End of May through October each year
Ingestion	$IRDW_2$	Domestic Water Supply Ingestion Rate	L/day	0.923	Time-weighted drinking water 95%tile ingestion rate for ages 0 to 2 years per Table 3-1 of USEPA (2011a)	0.298	Time-weighted drinking water mean ingestion rate for ages 0 to 2 years per Table 3-1 of USEPA (2011a)
Dermal	$SADW_2$	Exposure skin surface area per day	cm^2/day	4,630	Time-weighted surface area for ages 0 to 2 years using total surface area in Table 7–2, USEPA (2011a) *Mean value used due to inverse relationship between surface area and risk.	4,630	Time-weighted surface area for ages 0 to 2 years using total surface area in Table 7–2, USEPA (2011a)
	$EVDW_2$	Event Frequency	event/day	1	Recommended value for residential children showering/bathing (USEPA 2004)	1	Recommended value for residential children showering/bathing (USEPA 2004)
	$teventDW_2$	Event duration	hr/event	0.52	Time-weighted 95%tile length of bath for ages 0 to 2 years per in Table 16-1, USEPA (2011a)	0.35	Time-weighted mean length of bath for ages 0 to 2 years per in Table 16-1, USEPA (2011a)

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/year	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_a$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.015	AWHHERA (TTEMI 2002) for estimated skeletal muscle consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.006	AWHHERA (TTEMI 2002) for estimated skeletal muscle consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRWGO_a$	Ingestion Rate of Offal or Organs	g/kg/day	0.002	AWHHERA (TTEMI 2002) for estimated organ meat, sausage, and offal consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.001	AWHHERA (TTEMI 2002) for estimated organ meat, sausage, and offal consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_{wg}	Fraction of diet Site-derived	unitless	0.290	AWHHERA (TTEMI 2002). Per Table 11-38, USEPA (2011).	0.290	AWHHERA (TTEMI 2002). Per Table 11-38, USEPA (2011).
Beef	$IRBM_2$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.391	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the 95th%tile for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 0-2 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.145	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the mean for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 0-2 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRBO_2$	Ingestion Rate of Offal or Organs	g/kg/day	0.021	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	NA	Assumes this age group does not consume significant amounts of organ meats
	F_B	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Mutton	$IRMM_2$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.0097813	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the 95th%tile for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 0-2 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.0036191	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the mean for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 0-2 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRMO_2$	Ingestion Rate of Offal or Organs	g/kg/day	0.021	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	--	Assumes this age group does not consume significant amounts of organ meats
	F_m	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site

TABLE 4-2
Exposure Factors Input (Seasonal Rancher - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Homegrown Produce	$IREAP_2$	Ingestion Rate of Exposed Aboveground Produce	g/kg/day	0.60	Time-weighted ingestion rate of exposed above ground vegetables for ages 1 to 2 years using 95%tile rate from Table 13-60, USEPA (2011a);per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content.	0.17	Time-weighted ingestion rate of exposed above ground vegetables for ages 1 to 2 years using mean rate from Table 13-60, USEPA (2011a); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content.
	Feap	Fraction of Exposed Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRPAP_2$	Ingestion Rate of Protected Aboveground Produce	g/kg/day	0.47	Time-weighted ingestion rate of protected above ground vegetables for ages 1 to 2 years using 95%tile rate from Table 13-61, USEPA (2011a); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content.	0.123	Time-weighted ingestion rate of protected above ground vegetables for ages 1 to 2 years using mean rate from Table 13-61, USEPA (2011a); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content.
	Fpap	Fraction of Protected Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRBP_2$	Ingestion Rate of Belowground Produce	g/kg/day	0.52	Time-weighted ingestion rate of below ground vegetables for ages 1 to 2 years using 95%tile rate from Table 13-62, USEPA (2011a);per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content.	0.126	Time-weighted ingestion rate of below ground vegetables for ages 1 to 2 years using mean rate from Table 13-62, USEPA (2011a); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content.
	Fbgp	Fraction of Belowground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site

Notes:
RME - reasonable maximum exposure
CTE - central tendency exposure
USEPA - United States Environmental Protection Agency
95%tile - 95th Percentile
Recommended values from USEPA (2011a) are 95th percentile values for RME and mean values for CTE, unless specified.

TABLE 4-2
Exposure Factors Input (Livestock Herder - Current/Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
General	ATc	Averaging time, cancer	days	25,550	Recommended value (USEPA 1989)	25,550	Recommended value (USEPA 1989)
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (USEPA 1989) - Total Exposure Duration in days	3,285	Recommended value (USEPA 1989) - Total Exposure Duration in days
	CF	Conversion Factor	kg/mg	1.0E-06		1.0E-06	
	PEF	Particulate Emission Factor	m^3/kg	3.3E+09	Calculated using parameters from Boise ID and a 30 acre site (USEPA 1996)	3.3E+09	Calculated using parameters from Boise ID and a 30 acre site (USEPA 1996)
	ED	Cumulative Exposure Duration	years	30	Summation of exposure duration of each life phase below	9	Summation of exposure duration of each life phase below
Adult (16+years of age)							
General	BW_a	Body Weight	kg	80	Recommended value for adults (USEPA 2014)	80	Recommended value for adults (USEPA 2014)
	$ADAF_a$	Age-Dependent Adjustment Factor	unitless	1	USEPA (2005c)	1	USEPA (2005c)
	ED_a	Exposure Duration	years	30	Recommended RME residential exposure is 30 years subtracting any years as a child or youth (USEPA 1989,1991b)	9	Recommended CTE residential exposure is 9 years subtracting any years as a child or youth (USEPA 1993b)
Source Material/Soil Exposure Pathways							
General	EFS_a	Exposure Frequency to Site Soil	days/yr	154	End of May through October each year	154	End of May through October each year
Inhalation	ET_o	Exposure time - Outdoor	hr/hr	0.42	10 hour day/24 hours	0.42	10 hour day/24 hours
Ingestion	IRS_a	Soil Ingestion Rate	mg/day	100	Recommended RME residential exposure for adults in USEPA (2014) and recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011a)	50	Recommended CTE residential exposure for adults in USEPA (1993b) and recommended daily ingestion rate of soil and outdoor settled dust Table 5-1 (USEPA 2011a)
Dermal	SAS_a	Exposure skin surface area per day	cm^2/day	6,032	Recommended RME value for residential adults (USEPA 2014)	6,032	Recommended CTE value for residential adults (USEPA 2014)
	AF_a	Adherence factor	mg/cm^2	0.4	Recommended 95th percentile for children playing in dry soil (USEPA 2004) More conservative value chosen because receptor is expected to be riding ATV and exposed to more soil	0.04	Recommended geometric mean for groundskeeper workers (USEPA 2004) More conservative value chosen because receptor is expected to be riding ATV and exposed to more soil

TABLE 4-2
Exposure Factors Input (Livestock Herder - Current/Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Surface Water Exposure Pathways							
General	$EFSW_a$	Exposure Frequency	days/yr	154	End of May through October each year	154	End of May through October each year
Ingestion	$IRSW_a$	Surface Water Ingestion Rate	L/day	0.24	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 1 cup of water. Professional Judgment	0.12	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 0.5 cup of water Professional Judgment
Dermal	$SASW_a$	Exposure skin surface area per day	cm^2/day	2,829	Mean surface area by body part for face, forearms, and hands in EFH 2011a Table 7-2, time-weighted for male and female children combined 16 years to <21 and adult male 21+ years based on a 30 year work duration (age 16-46) Assumes receptors are wearing long pants and short-sleeved shirts. *EPA standard Value is 18,000 cm2/day but is based on total body surface area for adults showering/bathing pathway, this pathway was adjust for site specific conditions. Mean value used due to inverse relationship between surface area and risk.	2,829	Mean surface area by body part for face, forearms, and hands in EFH 2011a Table 7-2, time-weighted for male and female children combined 16 years to <21 and adult male 21+ years based on a 30 year work duration (age 16-46) Assumes receptors are wearing long pants and short-sleeved shirts. *EPA standard Value is 18,000 cm2/day but is based on total body surface area for adults showering/bathing pathway, this pathway was adjust for site specific conditions. Mean value used due to inverse relationship between surface area and risk.
	$EVSW_a$	Event Frequency	event/day	0.25	Professional Judgment; assume 1/4 time wade in the water	0.25	Professional Judgment; assume 1/4 time may contact water
	$teventSW_a$	Event duration	hr/event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event

Notes:
RME - reasonable maximum exposure
CTE - central tendency exposure
USEPA - United States Environmental Protection Agency
95%tile - 95th Percentile
Recommended values from USEPA (2011a) are 95th percentile values for RME and mean values for CTE, unless specified.

TABLE 4-2
Exposure Factors Input (Recreational Trespasser - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
General	ATc	Averaging time, cancer	days	25,550	Recommended value (USEPA 1989)	25,550	Recommended value (USEPA 1989)
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (USEPA 1989) - Total Exposure Duration in days	3,285	Recommended value (USEPA 1989) - Total Exposure Duration in days
	CF	Conversion Factor	kg/mg	1.0E-06		1.0E-06	
	PEF	Particulate Emission Factor	m^3/kg	3.3E+09	Calculated using parameters from Boise ID and a 30 acre site (USEPA 1996)	3.3E+09	Calculated using parameters from Boise ID and a 30 acre site (USEPA 1996)
	ED	Cumulative Exposure Duration	years	30	Summation of exposure duration of each life phase below	9	Summation of exposure duration of each life phase below
Adult (16+years of age)							
General	BW_a	Body Weight	kg	80	Recommended value for adults (USEPA 2014)	80	Recommended value for adults (USEPA 2014)
	$ADAF_a$	Age-Dependent Adjustment Factor	unitless	1	USEPA (2005c)	1	USEPA (2005c)
	ED_a	Exposure Duration	years	18	Recommended RME residential exposure is 30 years subtracting any years as a child or youth (USEPA 1989,1991b)	5	Recommended CTE residential exposure is 9 years subtracting any years as a child or youth (USEPA 1993b)
Source Material/Soil Exposure Pathways							
General	EFS_a	Exposure Frequency to Site Soil	days/yr	24	1 day per week for the season of Mid-May through October each year (24 wks)	6	1 day per month for the season of Mid-May through October each year
Inhalation	ET_o	Exposure time - Outdoor	hr/hr	0.17	4 hour day/24 hours	0.17	4 hour day/24 hours
Ingestion	IRS_a	Soil Ingestion Rate	mg/day	100	Recommended RME residential exposure for adults in USEPA (2014) and recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011a)	50	Recommended CTE residential exposure for adults in USEPA (1993b) and recommended daily ingestion rate of soil and outdoor settled dust Table 5-1 (USEPA 2011a)
Dermal	SAS_a	Exposure skin surface area per day	cm^2/day	6,032	Recommended RME value for residential adults (USEPA 2014)	6,032	Recommended CTE value for residential adults (USEPA 2014)
	AF_a	Adherence factor	mg/cm^2	0.4	Recommended 95th percentile for children playing in dry soil (USEPA 2004) More conservative value chosen because receptor is expected to be riding ATV and exposed to more soil	0.04	Recommended geometric mean for groundskeeper workers (USEPA 2004) More conservative value chosen because receptor is expected to be riding ATV and exposed to more soil

TABLE 4-2
Exposure Factors Input (Recreational Trespasser - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Surface Water Exposure Pathways							
General	$EFSW_a$	Exposure Frequency	days/yr	24	1 day per week for the season of Mid-May through October each year (24 wks)	6	1 day per month for the season of Mid-May through October each year
Ingestion	$IRSW_a$	Surface Water Ingestion Rate	L/day	0.24	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 1 cup of water. Professional Judgment	0.12	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 0.5 cup of water Professional Judgment
Dermal	$SASW_a$	Exposure skin surface area per day	cm^2/day	5,330	Mean surface area by body part for face, forearms, lower legs, and hands in USEPA 2011a Table 7-2, time-weighted for male and female children combined 16 years to <21 and adult male 21+ years based on a 18 year work duration (age 16-34) Assumes receptors are wearing long pants and short-sleeved shirts. *EPA standard Value is 18,000 cm2/day but is based on total body surface area for adults showering/bathing pathway, this pathway was adjust for site specific conditions. Mean value used due to inverse relationship between surface area and risk.	5,330	Mean surface area by body part for face, forearms, lower legs, and hands in USEPA 2011a Table 7-2, time-weighted for male and female children combined 16 years to <21 and adult male 21+ years based on a 18 year work duration (age 16-34) Assumes receptors are wearing long pants and short-sleeved shirts. *EPA standard Value is 18,000 cm2/day but is based on total body surface area for adults showering/bathing pathway, this pathway was adjust for site specific conditions. Mean value used due to inverse relationship between surface area and risk
	$EVSW_a$	Event Frequency	event/day	0.25	Professional Judgment; assume 1/4 time wade in the water	0.25	Professional Judgment; assume 1/4 time may contact water
Dermal (cont.)	$teventSW_a$	Event duration	hr/event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event
Youth (6 years up to 16 years of age)							
General	BW_{16}	Body Weight	kg	44.3	Time-weighted body weight for ages 6 to 16 years using recommended weight by age in Table 8-1, USEPA (2011a)	44.3	Time-weighted body weight for ages 6 to 16 years using recommended weight by age in Table 8-1, USEPA (2011a)
	$ADAF_{16}$	Age-Dependent Adjustment Factor	unitless	3	USEPA (2005c)	3	USEPA (2005c)
	ED_{16}	Exposure Duration	years	10	Years of exposure from 6 up to 16 years of age	2	Years of exposure from 6 up to 16 years of age

TABLE 4-2
Exposure Factors Input (Recreational Trespasser - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Source Material/Soil Exposure Pathways							
General	EFS_{16}	Exposure Frequency to Site Soil	days/yr	24	1 day per week for the season of Mid-May through October each year (24 wks)	6	1 day per month for the season of Mid-May through October each year
Inhalation	ET_o	Exposure time - Outdoor	hr/hr	0.17	4 hour day/24 hours	0.17	4 hour day/24 hours
Ingestion	IRS_{16}	Soil Ingestion Rate	mg/day	100	Recommended RME residential exposure for adults in USEPA (2014) and recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011a)	50	Recommended daily ingestion rate of soil and outdoor settled dust Table 5-1 (USEPA 2011a)
Dermal	SAS_{16}	Exposure skin surface area per day	cm^2/day	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)
	AF_{16}	Adherence factor	mg/cm^2	0.4	Recommended 95th percentile for children playing in dry soil (USEPA 2004)	0.04	Recommended geometric mean for children playing in dry soil (USEPA 2004)
Surface Water Exposure Pathways							
General	$EFSW_{16}$	Exposure Frequency	days/yr	24	1 day per week for the season of Mid-May through October each year (24 wks)	6	1 day per month for the season of Mid-May through October each year
Ingestion	$IRSW_{16}$	Surface Water Ingestion Rate	L/day	0.24	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 1 cup of water- Professional Judgment	0.12	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 0.5 cup of water- Professional Judgment
Dermal	$SASW_{16}$	Exposure skin surface area per day	cm^2/day	3,285	Time-weighted surface area for ages 6 to 16 years using recommended mean surface area by age for face, hands, forearms, and lower legs in Table 7–2, USEPA (2011a) per recommended residential exposure USEPA (2004 through wearing shorts. *EPA standard Value is 6,600 cm2/day but is based on total body surface area for child showering/bathing pathway, this pathway was adjusted for site specific conditions. Mean value used due to inverse relationship between surface area and risk.	3,285	Time-weighted surface area for ages 6 to 16 years using recommended mean surface area by age for face, hands, forearms, and lower legs in Table 7–2, USEPA (2011a) per recommended residential exposure USEPA (2004 through wearing shorts. *EPA standard Value is 6,600 cm2/day but is based on total body surface area for child showering/bathing pathway, this pathway was adjusted for site specific conditions.
	$EVSW_{16}$	Event Frequency	event/day	0.25	Professional Judgment; assume 1/4 time wade in the water	0.25	Professional Judgment; assume 1/4 time may contact water
	$teventSW_{16}$	Event duration	hr/event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event

TABLE 4-2
Exposure Factors Input (Recreational Trespasser - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Older Child (2 years up to 6 years of age)							
General	BW_6	Body Weight	kg	17.4	Time-weighted body weight for ages 2 to 6 years using recommended weight by age in Table 8-1, USEPA (2011)	17.4	Time-weighted body weight for ages 2 to 6 years using recommended weight by age in Table 8-1, USEPA (2011)
	$ADAF_6$	Age-Dependent Adjustment Factor	unitless	3	USEPA (2005c)	3	USEPA (2005c)
	ED_6	Exposure Duration	years	2	Years of exposure from 4 up to 6 years of age	2	Years of exposure from 4 up to 6 years of age
Source Material/Soil Exposure Pathways							
General	EFS_6	Exposure Frequency to Site Soil	days/yr	24	1 day per week for the season of Mid-May through October each year (24 wks)	6	1 day per month for the season of Mid-May through October each year
Inhalation	ET_o	Exposure time - Outdoor	hr/hr	0.17	4 hour day/24 hours	0.17	4 hour day/24 hours
Ingestion	IRS_6	Soil Ingestion Rate	mg/day	100	Recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011a)	50	Recommended daily ingestion rate of soil and outdoor settled dust Table 5-1 (USEPA 2011a)
Dermal	SAS_6	Exposure skin surface area per day	cm^2/day	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)
	AF_6	Adherence factor	mg/cm^2	0.4	Recommended 95th percentile for children playing in dry soil (USEPA 2004)	0.04	Recommended geometric mean for children playing in dry soil (USEPA 2004)
Surface Water Exposure Pathways							
General	$EFSW_6$	Exposure Frequency	days/yr	24	1 day per week for the season of Mid-May through October each year (24 wks)	6	1 day per month for the season of Mid-May through October each year
Ingestion	$IRSW_6$	Surface Water Ingestion Rate	L/day	0.24	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 1 cup of water-Professional Judgment	0.12	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 0.5 cup of water-Professional Judgment

TABLE 4-2
Exposure Factors Input (Recreational Trespasser - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Dermal	$SASW_6$	Exposure skin surface area per day	cm^2/day	1,738	Time-weighted surface area for ages 2 to 6 years using recommended mean surface area by age for face, hands, forearms, lower legs in Table 7–2, USEPA (2011a) per recommended residential exposure USEPA (2004) *EPA standard Value is 6,600 cm2/day but is based on total body surface area for child showering/bathing pathway, this pathway was adjusted for site specific conditions. Mean value used due to inverse relationship between surface area and risk.	1,738	Time-weighted surface area for ages 2 to 6 years using recommended mean surface area by age for face, hands, forearms, lower legs in Table 7–2, USEPA (2011a) per recommended residential exposure USEPA (2004) *EPA standard Value is 6,600 cm2/day but is based on total body surface area for child showering/bathing pathway, this pathway was adjusted for site specific conditions.
	$EVSW_6$	Event Frequency	event/day	0.25	Professional Judgment; assume 1/4 time wade in the water	0.25	Professional Judgment; assume 1/4 time may contact water
	$teventSW_6$	Event duration	hr/event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event

Notes:
RME - reasonable maximum exposure
CTE - central tendency exposure
USEPA - United States Environmental Protection Agency
95%tile - 95th Percentile
Recommended values from USEPA (2011a) are 95th percentile values for RME and mean values for CTE, unless specified.

TABLE 4-2
Exposure Factors Input (Native American - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
General	ATc	Averaging time, cancer	days	25,550	Recommended value (USEPA 1989)	25,550	Recommended value (USEPA 1989)
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (USEPA 1989) - Total Exposure Duration in days	10,950	Recommended value (USEPA 1989) - Total Exposure Duration in days
	CF	Conversion Factor	kg/mg	1.0E-06		1.0E-06	
	PEF	Particulate Emission Factor	m^3/kg	3.3E+09	Calculated using parameters from Boise ID and a 30 acre site (USEPA 1996)	3.3E+09	Calculated using parameters from Boise ID and a 30 acre site (USEPA 1996)
	ED	Cumulative Exposure Duration	years	30	Summation of exposure duration of each life phase below	30	Summation of exposure duration of each life phase below
Adult (16+years of age)							
General	BW_a	Body Weight	kg	80	Recommended value for adults (USEPA 2014)	80	Recommended value for adults (USEPA 2014)
	$ADAF_a$	Age-Dependent Adjustment Factor	unitless	1	USEPA (2005c)	1	USEPA (2005c)
	ED_a	Exposure Duration	years	14	Recommended RME residential exposure is 30 years subtracting any years as a child or youth (USEPA 1989,1991b)	14	Recommended CTE residential exposure is 9years subtracting any years as a child or youth (USEPA 1993b)
Source Material/Soil Exposure Pathways							
General	EFS_a	Exposure Frequency to Site Soil	days/yr	24	1 day per week for the season of Mid-May through October each year (24 wks)	6	1 day per month for the season of Mid-May through October each year
Inhalation	ET_o	Exposure time - Outdoor	hr/hr	0.42	10 hour day/24 hours	0.42	10 hour day/24 hours
Ingestion	IRS_a	Soil Ingestion Rate	mg/day	100	Recommended RME residential exposure for adults in USEPA (2014) and recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011a)	50	Recommended CTE residential exposure for adults in USEPA (1993b) and recommended daily ingestion rate of soil and outdoor settled dust Table 5-1 (USEPA 2011a)
Dermal	SAS_a	Exposure skin surface area per day	cm^2/day	6,032	Recommended RME value for residential adults (USEPA 2014)	6,032	Recommended CTE value for residential adults (USEPA 2014)
	AF_a	Adherence factor	mg/cm^2	0.10	Recommended 95th percentile for groundskeeper workers (USEPA 2004)	0.02	Recommended geometric mean for groundskeeper workers (USEPA 2004)
Surface Water Exposure Pathways							
General	$EFSW_a$	Exposure Frequency	days/yr	24	1 day per week for the season of Mid-May through October each year (24 wks)	6	1 day per month for the season of Mid-May through October each year
Ingestion	$IRSW_a$	Surface Water Ingestion Rate	L/day	0.24	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 1 cup of water. Professional Judgment	0.12	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 0.5 cup of water Professional Judgment

TABLE 4-2
Exposure Factors Input (Native American - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Dermal	$SASW_a$	Exposure skin surface area per day	cm^2/day	5,235	Mean surface area by body part for face, forearms, lower legs, and hands in USEPA 2011a Table 7-2, time-weighted for male and female children combined 16 years to <21 and adult male 21+ years based on a 14 year work duration (age 16-30) Assumes receptors are wearing shorts and short-sleeved shirts. *EPA standard Value is 18,000 cm2/day but is based on total body surface area for adults showering/bathing pathway, this pathway was adjust for site specific conditions. Mean value used due to inverse relationship between surface area and risk.	5,235	Mean surface area by body part for face, forearms, lower legs and hands in USEPA 2011a Table 7-2, time-weighted for male and female children combined 16 years to <21 and adult male 21+ years based on a 14 year work duration (age 16-30) Assumes receptors are wearing shorts and short-sleeved shirts. *EPA standard Value is 18,000 cm2/day but is based on total body surface area for adults showering/bathing pathway, this pathway was adjust for site specific conditions.
	$EVSW_a$	Event Frequency	event/day	0.25	Professional Judgment; assume 1/4 time wade in the water	0.25	Professional Judgment; assume 1/4 time may contact water
Dermal (cont.)	$teventSW_a$	Event duration	hr/event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/year	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_a$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.00009	Value taken from AWHHERA's RME Table 6-1 (TTEMI 2002) Native American Wild Game Ingestion Rate - Offal. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.0004	Value taken from AWHHERA's CTE Table 6-2 (TTEMI 2002) Native American Wild Game Ingestion Rate - Skeletal Muscle. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRWGO_a$	Ingestion Rate of Offal or Organs	g/kg/day	0.00009	Value taken from AWHHERA's RME Table 6-1 (TTEMI 2002) Native American Wild Game Ingestion Rate - Offal. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.00004	Value taken from AWHHERA's CTE Table 6-2 (TTEMI 2002) Native American Wild Game Ingestion Rate - Offal. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_{wg}	Fraction of diet Site-derived	unitless	0.29	AWHHERA (TTEMI 2002) reported that hunters had a 29% chance of encountering and taking an impacted elk from the Idaho Game Management Units 66A and 76 (SE Idaho Phosphate Mining Resource Area)	0.29	AWHHERA (TTEMI 2002) reported that hunters had a 29% chance of encountering and taking an impacted elk from the Idaho Game Management Units 66A and 76 (SE Idaho Phosphate Mining Resource Area)

TABLE 4-2
Exposure Factors Input (Native American - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Tea	IRT_a	Ingestion Rate	L/day	0.288	Value taken from AWHHERA's RME Table 6-1 (TTEMI 2002) Native American Plant-based Tea Ingestion Rate	0.144	Value taken from AWHHERA's CTE Table 6-2 (TTEMI 2002) Native American Plant-based Tea Ingestion Rate
	F_t	Fraction of diet Site-derived	unitless	0.25	Assumes the Native American harvest their wild plant needs from this Site every four years per AWHHERA's RME Table 6.1 (TTEMI 2002)	0.125	Value taken from AWHHERA's CTE Table 6-2 (TTEMI 2002) Native American Fraction Plant Ingestion; assumed to be one half of the RME value
Aquatic/ Terrestrial Plant Ingestion	F_t	Fraction of diet Site-derived	unitless	0.25	Value taken from AWHHERA's RME Table 7-1 (TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion	0.125	Value taken from AWHHERA's CTE Table 7-2 (TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion
	$IRP_{Aq/T}$	Ingestion Rate of Plant	(kg [DW]/kg/day)	4.75E-05	Value derived from AWHHERA's RME (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total RME intake of vegetables by NA estimated to be 9.5 g/kg-day (Table 9-20-9-22; summed 95% intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 5% for conservative RME exposure (Table 9-5; summed all vegetable-specific intakes). Assumed both vegetables are 90% water (Table 9-37)	1.22E-05	Value derived from AWHHERA's CTE (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total CTE intake of vegetables by NA estimated to be 3.04g/kg-day (Table 9-20-9-22; summed mean intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 4% for CTE exposure (Table 9-5; summed all vegetable-specific intakes). Assumed both vegetables are 90% water (Table 9-37).
Youth (6 years up to 16 years of age)							
General	BW_{16}	Body Weight	kg	44.3	Time-weighted body weight for ages 6 to 16 years using recommended weight by age in Table 8-1, USEPA (2011a)	44.3	Time-weighted body weight for ages 6 to 16 years using recommended weight by age in Table 8-1, USEPA (2011a)
	$ADAF_{16}$	Age-Dependent Adjustment Factor	unitless	3	USEPA (2005c)	3	USEPA (2005c)
	ED_{16}	Exposure Duration	years	10	Years of exposure from 6 up to 16 years of age	10	Years of exposure from 6 up to 16 years of age
Source Material/Soil Exposure Pathways							
General	EFS_{16}	Exposure Frequency to Site Soil	days/yr	24	1 day per week for the season of Mid-May through October each year (24 wks)	6	1 day per month for the season of Mid-May through October each year
Inhalation	ET_o	Exposure time - Outdoor	hr/hr	0.42	10 hour day/24 hours	0.42	10 hour day/24 hours
Ingestion	IRS_{16}	Soil Ingestion Rate	mg/day	100	Recommended RME residential exposure for adults in USEPA (2014) and recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011a)	50	Recommended daily ingestion rate of soil and outdoor settled dust Table 5-1 (USEPA 2011a)

TABLE 4-2
Exposure Factors Input (Native American - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Dermal	SAS_{16}	Exposure skin surface area per day	cm^2/day	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)
	AF_{16}	Adherence factor	mg/cm^2	0.10	Recommended 95th percentile for groundskeeper workers (USEPA 2004)	0.02	Recommended geometric mean for groundskeeper workers (USEPA 2004)
Surface Water Exposure Pathways							
General	$EFSW_{16}$	Exposure Frequency	days/yr	24	1 day per week for the season of Mid-May through October each year (24 wks)	6	1 day per month for the season of Mid-May through October each year
Ingestion	$IRSW_{16}$	Surface Water Ingestion Rate	L/day	0.24	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 1 cup of water- Professional Judgment	0.12	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 0.5 cup of water- Professional Judgment
Dermal	$SASW_{16}$	Exposure skin surface area per day	cm^2/day	3,285	Time-weighted surface area for ages 6 to 16 years using recommended mean surface area by age for face, hands, forearms, and lower legs in Table 7–2, USEPA (2011a) per recommended residential exposure USEPA (2004) through wearing shorts. *EPA standard Value is 6,600 cm2/day but is based on total body surface area for child showering/bathing pathway, this pathway was adjusted for site specific conditions. Mean value used due to inverse relationship between surface area and risk.	3,285	Time-weighted surface area for ages 6 to 16 years using recommended meansurface area by age for face, hands, forearms, and lower legs in Table 7–2, USEPA (2011a) per recommended residential exposure USEPA (2004 through wearing shorts. *EPA standard Value is 6,600 cm2/day but is based on total body surface area for child showering/bathing pathway, this pathway was adjusted for site specific conditions.
	$EVSW_{16}$	Event Frequency	event/day	0.25	Professional Judgment; assume 1/4 time wade in the water	0.25	Professional Judgment; assume 1/4 time may contact water
	$teventSW_{16}$	Event duration	hr/event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event

TABLE 4-2
Exposure Factors Input (Native American - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/year	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_{16}$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.0014	Value taken from AWHHERA's RME Table 6-1 (TTEMI 2002) Native American Wild Game Ingestion Rate - Skeletal Muscle. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.0006	Value taken from AWHHERA's CTE Table 6-2 (TTEMI 2002) Native American Wild Game Ingestion Rate - Skeletal Muscle. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRWGO_{16}$	Ingestion Rate of Offal or Organs	g/kg/day	0.00014	Value taken from AWHHERA's RME Table 6-1 (TTEMI 2002) Native American Wild Game Ingestion Rate - Offal. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.00006	Value taken from AWHHERA's CTE Table 6-2 (TTEMI 2002) Native American Wild Game Ingestion Rate - Offal. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_{wg}	Fraction of diet Site-derived	unitless	0.29	AWHHERA (TTEMI 2002) reported that hunters had a 29% chance of encountering and taking an impacted elk from the Idaho Game Management Units 66A and 76 (SE Idaho Phosphate Mining Resource Area)	0.29	AWHHERA (TTEMI 2002) reported that hunters had a 29% chance of encountering and taking an impacted elk from the Idaho Game Management Units 66A and 76 (SE Idaho Phosphate Mining Resource Area)
Tea	IRT_{16}	Ingestion Rate	L/day	0.034	Value taken from AWHHERA's RME Table 6-1 (TTEMI 2002) Native American Plant-based Tea Ingestion Rate	0.017	Value taken from AWHHERA's CTE Table 6-2 (TTEMI 2002) Native American Plant-based Tea Ingestion Rate
	F_t	Fraction of diet Site-derived	unitless	0.25	Assumes the Native American harvest their wild plant needs from this Site every four years per AWHHERA's RME Table 6.1 (TTEMI 2002)	0.125	Value taken from AWHHERA's CTE Table 6-2 (TTEMI 2002) Native American Fraction Plant Ingestion; assumed to be one half of the RME value
Aquatic/ Terrestrial Plant Ingestion	F_t	Fraction of diet Site-derived	unitless	0.25	Value taken from AWHHERA's RME Table 7-1 (TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion	0.125	Value taken from AWHHERA's CTE Table 7-2 (TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion
	$IRP_{Aq/T}$	Ingestion Rate of Plant	(kg [DW]/kg/day)	4.75E-05	Value derived from AWHHERA's RME (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total RME intake of vegetables by NA estimated to be 9.5 g/kg-day (Table 9-20-9-22; summed 95% intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 5% for conservative RME exposure (Table 9-5; summed all vegetable-specific intakes for whole population, no specific NA receptor). Assumed both vegetables are 90% water (Table 9-37)	1.22E-05	Value derived from AWHHERA's CTE (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total CTE intake of vegetables by NA estimated to be 3.04g/kg-day (Table 9-20-9-22; summed mean intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 4% for CTE exposure (Table 9-5; summed all vegetable-specific intakes for whole population, no specific NA receptor). Assumed both vegetables are 90% water (Table 9-37).

TABLE 4-2
Exposure Factors Input (Native American - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Older Child (2 years up to 6 years of age)							
General	BW_6	Body Weight	kg	17.4	Time-weighted body weight for ages 2 to 6 years using recommended weight by age in Table 8-1, USEPA (2011a)	17.4	Time-weighted body weight for ages 2 to 6 years using recommended weight by age in Table 8-1, USEPA (2011a)
	$ADAF_6$	Age-Dependent Adjustment Factor	unitless	3	USEPA (2005c)	3	USEPA (2005c)
	ED_6	Exposure Duration	years	4	Years of exposure from 2 up to 6 years of age	4	Years of exposure from 2 up to 6 years of age
Source Material/Soil Exposure Pathways							
General	EFS_6	Exposure Frequency to Site Soil	days/yr	24	1 day per week for the season of Mid-May through October each year (24 wks)	6	1 day per month for the season of Mid-May through October each year
Inhalation	ET_o	Exposure time - Outdoor	hr/hr	0.42	10 hour day/24 hours	0.42	10 hour day/24 hours
Ingestion	IRS_6	Soil Ingestion Rate	mg/day	100	Recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011a)	50	Recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011a)
Dermal	SAS_6	Exposure skin surface area per day	cm^2/day	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)
	AF_6	Adherence factor	mg/cm^2	0.4	Recommended 95th percentile for children playing in dry soil (USEPA 2004)	0.04	Recommended geometric mean for children playing in dry soil (USEPA 2004)
Surface Water Exposure Pathways							
General	$EFSW_6$	Exposure Frequency	days/yr	24	1 day per week for the season of Mid-May through October each year (24 wks)	6	1 day per month for the season of Mid-May through October each year
Ingestion	$IRSW_6$	Surface Water Ingestion Rate	L/day	0.24	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 1 cup of water-Professional Judgment	0.12	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 0.5 cup of water-Professional Judgment
Dermal	$SASW_6$	Exposure skin surface area per day	cm^2/day	1,738	Time-weighted surface area for ages 2 to 6 years using recommended mean surface area by age for face, hands, forearms, lower legs in Table 7–2, USEPA (2011a) per recommended residential exposure USEPA (2004) through wearing shorts. *EPA standard Value is 6,600 cm2/day but is based on total body surface area for child showering/bathing pathway, this pathway was adjusted for site specific conditions. Mean value used due to inverse relationship between surface area and risk.	1,738	Time-weighted surface area for ages 2 to 6 years using recommended mean surface area by age for face, hands, forearms, lower legs in Table 7–2, USEPA (2011a) per recommended residential exposure USEPA (2004) through wearing shorts. *EPA standard Value is 6,600 cm2/day but is based on total body surface area for child showering/bathing pathway, this pathway was adjusted for site specific conditions.
	$EVSW_6$	Event Frequency	event/day	0.25	Professional Judgment; assume 1/4 time wade in the water	0.25	Professional Judgment; assume 1/4 time may contact water

TABLE 4-2
Exposure Factors Input (Native American - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Dermal (cont.)	$teventSW_6$	Event duration	hr/event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/year	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_6$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.701209174	Table 13-33, USEPA (2011a) reports no intakes of game for this age group. This ingestion rate assumes that the receptor population eats game at the rate the total population would be beef; as this assumption is probably conservative no Native American meat ingestion factor was applied. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for all Beef in g/day as well as total meat intake. The Ratio of Beef to total meat intake was applied to the 95th%tile for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 2 to 6 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.27258802	Table 13-33, USEPA (2011a) reports no intakes of game for this age group. This ingestion rate assumes that the receptor population eats game at the rate the total population would be beef; as this assumption is probably conservative no Native American meat ingestion factor was applied. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for all Beef in g/day as well as total meat intake. The Ratio of Beef to total meat intake was applied to the mean for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 2 to 6 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRWGO_6$	Ingestion Rate of Offal or Organs	g/kg/day	-	Assumes this age group does not consume significant amounts of organ meats	-	Assumes this age group does not consume significant amounts of organ meats
	F_{wg}	Fraction of diet Site-derived	unitless	0.29	Assumes all game meat is from Site	0.29	AWHHERA (TTEMI 2002) reported that hunters had a 29% chance of encountering and taking an impacted elk from the Idaho Game Management Units 66A and 76 (SE Idaho Phosphate Mining Resource Area)
Tea	IRT_6	Ingestion Rate	L/day	0.008	Per Table 3-69, USEPA 2011a the relative ratio of the 95th%tile of tea consumption to the mean tea consumption rate for women aged 15 to 49 was approximately 4 times. Therefore, conservative estimate of the RME is 4xCTE [Note: AWHHERA (TTEMI 2002) estimated the RME/CTE=2]	0.002	Time-weighted mean daily consumption rate (ml/day) for tea for ages 2 to 6 years using tea rates in Table 3-63, USEPA (2011a) and adjusted for receptor group body weight.
	F_t	Fraction of diet Site-derived	unitless	0.25	Assumes the Native American harvest their wild plant needs from this Site every four years per AWHHERA's RME Table 6.1 (TTEMI 2002)	0.125	Value taken from AWHHERA's CTE Table 6-2 (TTEMI 2002) Native American Fraction Plant Ingestion; assumed to be one half of the RME value

TABLE 4-2
Exposure Factors Input (Native American - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Aquatic/ Terrestrial Plant Ingestion	F_t	Fraction of diet Site-derived	unitless	0.25	Value taken from AWHHERA's RME Table 7-1 (TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion	0.125	Value taken from AWHHERA's CTE Table 7-2 (TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion
	$IRP_{Aq/T}$	Ingestion Rate of Plant	(kg [DW]/kg/day)	4.75E-05	Value derived from AWHHERA's RME (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total RME intake of vegetables by NA estimated to be 9.5 g/kg-day (Table 9-20-9-22; summed 95% intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 5% for conservative RME exposure (Table 9-5; summed all vegetable-specific intakes for whole population, no specific NA receptor). Assumed both vegetables are 90% water (Table 9-37)	1.22E-05	Value derived from AWHHERA's CTE (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total CTE intake of vegetables by NA estimated to be 3.04g/kg-day (Table 9-20-9-22; summed mean intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 4% for CTE exposure (Table 9-5; summed all vegetable-specific intakes for whole population, no specific NA receptor). Assumed both vegetables are 90% water (Table 9-37).
Young Child (0 years up to 2 years of age)							
General	BW_2	Body Weight	kg	9.6	Time-weighted body weight for ages 0 to 2 years using recommended weight by age in Table 8-1, USEPA (2011a)	9.6	Time-weighted body weight for ages 0 to 2 years using recommended weight by age in Table 8-1, USEPA (2011a)
	$ADAF_2$	Age-Dependent Adjustment Factor	unitless	10	USEPA (2005c)	10	USEPA (2005c)
	ED_2	Exposure Duration	years	2	Years of exposure from 0 up to 2 years of age	2	Years of exposure from 0 up to 2 years of age
Source Material/Soil Exposure Pathways							
General	EFS_2	Exposure Frequency to Site Soil	days/yr	24	1 day per week for the season of Mid-May through October each year (24 wks)	6	1 day per month for the season of Mid-May through October each year
Inhalation	ET_o	Exposure time - Outdoor	hr/hr	0.42	10 hour day/24 hours	0.42	10 hour day/24 hours
Ingestion	IRS_2	Soil Ingestion Rate	mg/day	100	Recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011aa)	50	Recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011a)
Dermal	SA_2	Exposure skin surface area per day	cm^2/day	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)
	AF_2	Adherence factor	mg/cm^2	0.2	Recommended value for residential children (USEPA 2004)	0.2	Recommended value for residential children (USEPA 2004)

TABLE 4-2
Exposure Factors Input (Native American - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Surface Water Exposure Pathways							
General	$EFSW_6$	Exposure Frequency	days/yr	24	1 day per week for the season of Mid-May through October each year (24 wks)	6	1 day per month for the season of Mid-May through October each year
Ingestion	$IRSW_6$	Surface Water Ingestion Rate	L/day	0.24	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 1 cup of water-Professional Judgment	0.12	Receptor brings water to Site; might either supplement water consumption due to availability or incidental ingest while wading. Assumes 0.5 cup of water-Professional Judgment
Dermal	$SASW_6$	Exposure skin surface area per day	cm^2/day	1,211	Time-weighted surface area for ages 0 to 2 years using recommended mean surface area by age for face, hands, forearms, lower leg in Table 7–2, USEPA (2008) per recommended residential exposure USEPA (2004)	1,211	Time-weighted surface area for ages 4 to 6 years using recommended mean surface area by age for face, hands, forearms, lower legs, and feet in Table 7–2, USEPA (2011aa) per recommended residential exposure USEPA (2004) *EPA standard Value is 6,600 cm2/day but is based on total body surface area for child showering/bathing pathway, this pathway was adjusted for site specific conditions.
	$EVSW_6$	Event Frequency	event/day	0.25	Professional Judgment; assume 1/4 time wade in the water	0.25	Professional Judgment; assume 1/4 time may contact water
	$teventSW_6$	Event duration	hr/event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event	0.25	Professional Judgment; due to water temperature assume 15 minutes per event
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/year	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_2$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.391252747	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. This ingestion rate assumes that the receptor population eats game at the rate the total population would be beef; as this assumption is probably conservative no Native American meat ingestion factor was applied. USEPA (2011aa) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the 95th%tile for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 20-69 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.14476352	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. This ingestion rate assumes that the receptor population eats game at the rate the total population would be beef; as this assumption is probably conservative no Native American meat ingestion factor was applied.USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the mean for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 20-69 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRWGO_2$	Ingestion Rate of Offal or Organs	g/kg/day	-	Assumes this age group does not consume significant amounts of organ meats	-	Assumes this age group does not consume significant amounts of organ meats

TABLE 4-2
Exposure Factors Input (Native American - Current and Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Wild Game	F_{wg}	Fraction of diet Site-derived	unitless	0.29	Assumes all game meat is from Site	0.29	AWHHERA (TTEMI 2002) reported that hunters had a 29% chance of encountering and taking an impacted elk from the Idaho Game Management Units 66A and 76 (SE Idaho Phosphate Mining Resource Area)
Tea	IRT_2	Ingestion Rate	L/day	0.002	Per Table 3-69, USEPA 2011a the relative ratio of the 95th%tile of tea consumption to the mean tea consumption rate for women aged 15 to 49 was approximately 4 times. Therefore, conservative estimate of the RME is 4xCTE [Note: AWHHERA (TTEMI 2002) estimated the RME/CTE=2]	0.0005	Time-weighted mean daily consumption rate (ml/day) for tea for ages 0 to 2 years using tea rates in Table 3-47, USEPA (2011a) and adjusted for receptor group body weight.
	F_t	Fraction of diet Site-derived	unitless	0.25	Assumes the Native American harvest their wild plant needs from this Site every four years per AWHHERA's RME Table 6.1 (TTEMI 2002)	0.125	Value taken from AWHHERA's CTE Table 6-2 (TTEMI 2002) Native American Fraction Plant Ingestion; assumed to be one half of the RME value
Aquatic/ Terrestrial Plant Ingestion	F_t	Fraction of diet Site-derived	unitless	0.25	Value taken from AWHHERA's RME Table 7-1 (TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion	0.125	Value taken from AWHHERA's CTE Table 7-2 (TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion
	$IRP_{Aq/T}$	Ingestion Rate of Plant	(kg [DW]/kg/day)	4.75E-05	Value derived from AWHHERA's RME (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total RME intake of vegetables by NA estimated to be 9.5 g/kg-day (Table 9-20-9-22; summed 95% intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 5% for conservative RME exposure (Table 9-5; summed all vegetable-specific intakes for whole population, no specific NA receptor). Assumed both vegetables are 90% water (Table 9-37)	1.22E-05	Value derived from AWHHERA's CTE (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total CTE intake of vegetables by NA estimated to be 3.04g/kg-day (Table 9-20-9-22; summed mean intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 4% for CTE exposure (Table 9-5; summed all vegetable-specific intakes for whole population, no specific NA receptor). Assumed both vegetables are 90% water (Table 9-37).

Notes:
RME - reasonable maximum exposure
CTE - central tendency exposure
USEPA - United States Environmental Protection Agency
95%tile - 95th Percentile
Recommended values from USEPA (2011a) are 95th percentile values for RME and mean values for CTE, unless specified.

TABLE 4-2
Exposure Factors Input (Hypothetical Resident - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
General	ATc	Averaging time, cancer	days	25,550	Recommended value (USEPA 1989)	25,550	Recommended value (USEPA 1989)
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (USEPA 1989) - Total Exposure Duration in days	3,285	Recommended value (USEPA 1989) - Total Exposure Duration in days
	CF	Conversion Factor	kg/mg	1.0E-06		1.0E-06	
	PEF	Particulate Emission Factor	m^3/kg	6.5E+09	Calculated using parameters from Boise ID and a 0.5 acre site (USEPA 1996)	6.5E+09	Calculated using parameters from Boise ID and a 0.5 acre site (USEPA 1996)
	ED	Cumulative Exposure Duration	years	30	Summation of exposure duration of each life phase below	9	Summation of exposure duration of each life phase below
Adult (16+years of age)							
General	BW_a	Body Weight	kg	80	Recommended value for adults (USEPA 2014)	80	Recommended value for adults (USEPA 2014)
	$ADAF_a$	Age-Dependent Adjustment Factor	unitless	1	USEPA (2005c)	1	USEPA (2005c)
	ED_a	Exposure Duration	years	14	Recommended RME residential exposure is 30 years subtracting any years as a child or youth (USEPA 1989,1991b)	4	Recommended CTE residential exposure is 9 years subtracting any years as a child or youth (USEPA 1993b)
Source Material/Soil Exposure Pathways							
General	EFS_a	Exposure Frequency to Site Soil	days/yr	270	Recommended residential exposure frequency (USEPA 1989)	154	End of May through October each year
	ET_{oa}	Exposure time - Outdoor	hr/hr	0.151	Time-weighted rate for daily outdoor time for ages 16 to 30 years using mean values from Table 16-1, USEPA (2011a).	0.151	Time-weighted rate for daily outdoor time for ages 16 to 30 years using mean values from Table 16-1, USEPA (2011a).
	ET_{ia}	Exposure time - Indoor	hr/hr	0.849	Time-weighted rate for daily outdoor time for ages 16 to 30 years using mean values from Table 16-1, USEPA (2011a) subtracted from 1 to get indoor air time.	0.849	Time-weighted rate for daily outdoor time for ages 16 to 30 years using mean values from Table 16-1, USEPA (2011a) subtracted from 1 to get indoor air time.
Ingestion	IRS_a	Soil Ingestion Rate	mg/day	100	Recommended RME residential exposure for adults in USEPA (2014)	50	Recommended CTE residential exposure for adults in USEPA (1993b) and recommended rate for soil and outdoor settled dust USEPA (2011a)
Dermal	SAS_a	Exposure skin surface area per day	cm^2/day	6,032	Recommended RME value for residential adults (USEPA 2014)	6,032	Recommended CTE value for residential adults (USEPA 2014)
	AF_a	Adherence factor	mg/cm^2	0.07	Recommended value for residential adults (USEPA 2004)	0.07	Recommended value for residential adults (USEPA 2004)
Domestic Water Supply Exposure Pathways							
General	$EFDW_a$	Exposure Frequency	days/yr	270	Recommended residential exposure frequency (USEPA 1989)	154	End of May through October each year
Ingestion	$IRDW_a$	Domestic Water Supply Ingestion Rate	L/day	2.5	Daily drinking water ingestion rate for adults (USEPA 2014)	1.0	Time-weighted drinking water mean ingestion rate for ages 16 to 46 years per Table 3-1 of USEPA (2011a)
Dermal	$SADW_a$	Exposure skin surface area per day	cm^2/day	20,900	Recommended value for residential water surface area- adult (USEPA 2014)	20,900	Recommended value for residential water surface area- adult (USEPA 2014)
	$EVDW_a$	Event Frequency	event/day	1	Recommended value for residential adult showering/bathing (USEPA 2004)	1	Recommended value for residential adult showering/bathing (USEPA 2004)
	$teventDW_a$	Event duration	hr/event	0.71	Recommended value for residential adult water exposure time (USEPA 2014).	0.28	Recommended value for adult showering/bathing from Table 6-1, USEPA (2011a)

TABLE 4-2
Exposure Factors Input (Hypothetical Resident - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/year	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_a$	Ingestion Rate of Skeletal Muscle	g/kg/day	1.06	Time-weighted ingestion rate of game for ages 16-30 years using 95th percentile rate from Table 13-41, USEPA (2011); per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.349	Time-weighted ingestion rate of game for ages 16-30 years using mean rate from Table 13-41 USEPA (2011); Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRWGO_a$	Ingestion Rate of Offal or Organs	g/kg/day	0.002	No RME intake, same as CTE consumption per day	0.002	Table 11-13, USEPA (2011) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_{wg}	Fraction of diet Site-derived	unitless	1	Assumes all game meat is from Site	1	Assumes all game meat is from Site
Beef	IRM_a	Ingestion Rate of Skeletal Muscle	g/kg/day	2.24	Time-weighted ingestion rate of homegrown beef for ages 16-30 years using 95th percentile rate from Table 13-33, USEPA (2011); per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.777	Time-weighted ingestion rate of homegrown beef for ages 16-30 years using mean rate from Table 13-33, USEPA (2011); per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	IRO_a	Ingestion Rate of Offal or Organs	g/kg/day	0.006	No RME intake, doubled CTE consumption per day for an assumption of 1 lb (453.5924 g) of organ meat consumed during a year. Adjusted for receptor group body weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.002	Table 11-13, USEPA (2011) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_B	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site
Mutton	$IRMM_a$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.008	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the 95th%tile for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 16-30 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.002	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the mean for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 16-30 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRMO_a$	Ingestion Rate of Offal or Organs	g/kg/day	0.006	No RME intake, doubled CTE consumption per day for an assumption of 1 lb (453.5924 g) of organ meat consumed during a year. Adjusted for receptor group body weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.002	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_m	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site

TABLE 4-2
Exposure Factors Input (Hypothetical Resident - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Homegrown Produce	$IREAP_a$	Ingestion Rate of Exposed Aboveground Produce	g/kg/day	0.35	Time-weighted ingestion rate of exposed above ground vegetables for ages 16-30 years using 95th percentile rate from Table 13-60, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.11	Time-weighted ingestion rate of exposed above ground vegetables for ages 16-30 years using mean rate from Table 13-60, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content
	F_{eap}	Fraction of Exposed Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRPAP_a$	Ingestion Rate of Protected Aboveground Produce	g/kg/day	0.24	Time-weighted ingestion rate of protected above ground vegetables for ages 16-30 years using 95th percentile rate from Table 13-61, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.077	Time-weighted ingestion rate of protected above ground vegetables for ages 16-30 years using mean rate from Table 13-61, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content
	F_{pap}	Fraction of Protected Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRBP_a$	Ingestion Rate of Belowground Produce	g/kg/day	0.31	Time-weighted ingestion rate of below ground vegetables for ages 16-30 years using 95th percentile rate from Table 13-62, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.089	Time-weighted ingestion rate of below ground vegetables for ages 16-30 years using mean rate from Table 13-62, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content
	F_{bgp}	Fraction of Belowground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
Aquatic Plant Ingestion	F_t	Fraction of diet Site-derived	unitless	0.25	Value taken from AWHHERA's RME Table 7-1(TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion	0.125	Value taken from AWHHERA's CTE Table 7-2 (TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion
	$IRP_{Aq/T}$	Ingestion Rate of Plant	(kg [DW]/kg/day)	4.75E-05	Value taken from AWHHERA's RME (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total RME intake of vegetables by NA estimated to be 9.5 g/kg-day (Table 9-20-9-22; summed 95% intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 5% for conservative RME exposure (Table 9-5; summed all vegetable-specific intakes). Assumed both vegetables are 90% water (Table 9-37)	1.22E-05	Value taken from AWHHERA's CTE (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total CTE intake of vegetables by NA estimated to be 3.04g/kg-day (Table 9-20-9-22; summed mean intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 4% for CTE exposure (Table 9-5; summed all vegetable-specific intakes). Assumed both vegetables are 90% water (Table 9-37).

TABLE 4-2
Exposure Factors Input (Hypothetical Resident - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Youth (6 years up to 16 years of age)							
General	BW_{16}	Body Weight	kg	44.3	Time-weighted body weight for ages 6 to 16 years using recommended weight by age in Table 8-1, USEPA (2011a)	44.3	Time-weighted body weight for ages 6 to 16 years using recommended weight by age in Table 8-1, USEPA (2011a)
	$ADAF_{16}$	Age-Dependent Adjustment Factor	unitless	3	USEPA (2009a)	3	USEPA (2009a)
	ED_{16}	Exposure Duration	years	10	Years of exposure from 6 up to 16 years of age	2	Years of exposure from 6 up to 16 years of age
Source Material/Soil Exposure Pathways							
General	EFS_{16}	Exposure Frequency to Site Soil	days/yr	270	Recommended residential exposure frequency (USEPA 2014)	154	End of May through October each year
	ET_{o16}	Exposure time - Outdoor	hr/hr	0.081	Time-weighted rate for daily outdoor time for ages 6 to 16 years using mean values from Table 16-1, USEPA (2011a).	0.081	Time-weighted rate for daily outdoor time for ages 6 to 16 years using mean values from Table 16-1, USEPA (2011a).
	ET_{i16}	Exposure time - Indoor	hr/hr	0.919	Time-weighted rate for daily outdoor time for ages 6 to 16 years using mean values from Table 16-1, USEPA (2011a) subtracted from 1 to get indoor air time.	0.919	Time-weighted rate for daily outdoor time for ages 6 to 16 years using mean values from Table 16-1, USEPA (2011a) subtracted from 1 to get indoor air time.
Ingestion	IRS_{16}	Soil Ingestion Rate	mg/day	100	Recommended RME residential exposure for adults in USEPA (2014) and recommended daily ingestion rate of soil and dust (indoor and outdoor) in Table 5-1 (USEPA 2011a)	50	Recommended CTE residential exposure for adults in USEPA (1993b) and recommended daily ingestion rate of soil and outdoor settled dust Table 5-1 (USEPA 2011a)
Dermal	SAS_{16}	Exposure skin surface area per day	cm^2/day	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)
	AF_{16}	Adherence factor	mg/cm^2	0.07	Recommended value for residential adults (USEPA 2004)	0.07	Recommended value for residential adults (USEPA 2004)
Domestic Water Supply Exposure Pathways							
General	$EFDW_{16}$	Exposure Frequency	days/yr	270	Recommended residential exposure frequency (USEPA 2014)	154	End of May through October each year
Ingestion	$IRDW_{16}$	Domestic Water Supply Ingestion Rate	L/day	1.69	Time-weighted drinking water 95%tile ingestion rate for ages 6 to 16 years per Table 3-1 of USEPA (2011a)	0.574	Time-weighted drinking water mean ingestion rate for ages 6 to 16 years per Table 3-1 of USEPA (2011a)
Dermal	$SADW_{16}$	Exposure skin surface area per day	cm^2/day	13,350	Time-weighted surface area for ages 6 to 16 years using total surface area in Table 7–1, USEPA (2011a) *Mean value used due to inverse relationship between surface area and risk.	13,350	Time-weighted surface area for ages 6 to 16 years using total surface area in Table 7–1, USEPA (2011a)
	$EVDW_{16}$	Event Frequency	event/day	1	Recommended value for residential adult showering/bathing (USEPA 2004)	1	Recommended value for residential adult showering/bathing (USEPA 2004)
	$teventDW_{16}$	Event duration	hr/event	0.68	Time-weighted 95%tile length of shower for ages 6 to 16 years per in Table 16-1, USEPA (2011a)	0.30	Time-weighted mean length of shower for ages 6 to 16 years per in Table 16-1, USEPA (2011a)

TABLE 4-2
Exposure Factors Input (Hypothetical Resident - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/year	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_{16}$	Ingestion Rate of Skeletal Muscle	g/kg/day	1.17	Time-weighted ingestion rate of game for ages 6 to 16 years using 95th percentile rate from Table 13-41, USEPA (2011);Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.423	Time-weighted ingestion rate of game for ages 6-16 years using mean rate from Table 13-41, USEPA (2011a); perTable 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRWGO_{16}$	Ingestion Rate of Offal or Organs	g/kg/day	0.004	No RME intake, same as CTE consumption per day	0.004	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_{wg}	Fraction of diet Site-derived	unitless	1	Assumes all game meat is from Site	1	Assumes all game meat is from Site
Beef	IRM_a	Ingestion Rate of Skeletal Muscle	g/kg/day	3.532	Time-weighted ingestion rate of homegrown beef for ages 6 to 16 years using 95%tile rate from Table 13-33, USEPA (2011a); per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	1.167	Time-weighted ingestion rate of homegrown beef for ages 6-16 years using mean rate from Table 13-33, USEPA (2011a); per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	IRO_a	Ingestion Rate of Offal or Organs	g/kg/day	0.011	Assumption of 1 lb (453.5924 g) of organ meat consumed during a year, adjusted for receptor group body weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.004	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_B	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site
Mutton	$IRMM_a$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.028	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the 95th%tile for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 6-16 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.008	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the mean for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 6-16 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRMO_a$	Ingestion Rate of Offal or Organs	g/kg/day	0.011	No RME intake, doubled CTE consumption per day for an assumption of 1 lb (453.5924 g) of organ meat consumed during a year. Adjusted for receptor group body weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.004	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_m	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site

TABLE 4-2
Exposure Factors Input (Hypothetical Resident - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Homegrown Produce	$IREAP_{16}$	Ingestion Rate of Exposed Aboveground Produce	g/kg/day	0.463	Time-weighted ingestion rate of exposed above ground vegetables for ages 6-16 years using 95th percentile rate from Table 13-60, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.126	Time-weighted ingestion rate of exposed above ground vegetables for ages 6 to 16 years using mean rate from Table 13-60, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content
	F_{eap}	Fraction of Exposed Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRPAP_{16}$	Ingestion Rate of Protected Aboveground Produce	g/kg/day	0.28	Time-weighted ingestion rate of protected above ground vegetables for ages 6-16 years using 95th percentile rate from Table 13-61, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.097	Time-weighted ingestion rate of protected above ground vegetables for ages 6 to 16 years using mean rate from Table 13-61, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content
	F_{pap}	Fraction of Protected Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRBP_{16}$	Ingestion Rate of Belowground Produce	g/kg/day	0.47	Time-weighted ingestion rate of below ground vegetables for ages 6-16 years using 95th percentile rate from Table 13-62, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.117	Time-weighted ingestion rate of below ground vegetables for ages 6 to 16 years using mean rate from Table 13-62, USEPA (2011); per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content
	F_{bgp}	Fraction of Belowground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
Aquatic Plant Ingestion	F_t	Fraction of diet Site-derived	unitless	0.25	Value taken from AWHHERA's RME Table 7-1(TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion	0.125	Value taken from AWHHERA's CTE Table 7-2 (TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion
	$IRP_{Aq/T}$	Ingestion Rate of Plant	(kg [DW]/kg/day)	4.75E-05	Value taken from AWHHERA's RME (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total RME intake of vegetables by NA estimated to be 9.5 g/kg-day (Table 9-20-9-22; summed 95% intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 5% for conservative RME exposure (Table 9-5; summed all vegetable-specific intakes). Assumed both vegetables are 90% water (Table 9-37)	1.22E-05	Value taken from AWHHERA's CTE (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total CTE intake of vegetables by NA estimated to be 3.04g/kg-day (Table 9-20-9-22; summed mean intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 4% for CTE exposure (Table 9-5; summed all vegetable-specific intakes). Assumed both vegetables are 90% water (Table 9-37).
Older Child (2 years up to 6 years of age)							
General	BW_6	Body Weight	kg	17.4	Time-weighted body weight for ages 2 to 6 years using recommended weight by age in Table 8-1, USEPA (2011a)	17.4	Time-weighted body weight for ages 2 to 6 years using recommended weight by age in Table 8-1, USEPA (2011a)
	$ADAF_6$	Age-Dependent Adjustment Factor	unitless	3	USEPA (2005c)	3	USEPA (2005c)
	ED_6	Exposure Duration	years	4	Years of exposure from 2 up to 6 years of age	2	Years of exposure from 2 up to 6 years of age

TABLE 4-2
Exposure Factors Input (Hypothetical Resident - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Source Material/Soil Exposure Pathways							
General	EFS_6	Exposure Frequency to Site Soil	days/yr	270	Recommended residential exposure frequency (USEPA 1989)	154	End of May through October each year
	ET_{o6}	Exposure time - Outdoor	hr/hr	0.069	Time-weighted rate for daily outdoor time for ages 2 to 6 years using mean values from Table 16-1, USEPA (2011a).	0.069	Time-weighted rate for daily outdoor time for ages 2 to 6 years using mean values from Table 16-1, USEPA (2011a).
	ET_{i6}	Exposure time - Indoor	hr/hr	0.931	Time-weighted rate for daily outdoor time for ages 2-6 years using mean values from Table 16-1, USEPA (2011a) subtracted from 1 to get indoor air time.	0.931	Time-weighted rate for daily outdoor time for ages 2-6years using mean values from Table 16-1, USEPA (2011a) subtracted from 1 to get indoor air time.
Ingestion	IRS_6	Soil Ingestion Rate	mg/day	200	Recommended daily RME residential child exposure in USEPA (2014)	100	Recommended daily RME residential exposure in USEPA (1991a)
Dermal	SAS_6	Exposure skin surface area per day	cm^2/day	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)
	AF_6	Adherence factor	mg/cm^2	0.2	Recommended value for residential children (USEPA 2004)	0.04	Recommended CTE value for residential children (USEPA 2004)
Domestic Water Supply Exposure Pathways							
General	$EFDW_6$	Exposure Frequency	days/yr	270	Recommended residential exposure frequency (USEPA 2014)	154	End of May through October each year
Ingestion	$IRDW_6$	Domestic Water Supply Ingestion Rate	L/day	0.78	Recommended value for residential children for drinking water ingestion rate (USEPA 2014)	0.380	Time-weighted drinking water mean ingestion rate for ages 2 to 6 years per Table 3-1 of USEPA (2011a)
Dermal	$SADW_6$	Exposure skin surface area per day	cm^2/day	6,378	Recommended value for residential children water surface area (USEPA 2014)	6,378	Recommended value for residential children water surface area (USEPA 2014)
	$EVDW_5$	Event Frequency	event/day	1	Recommended value for residential children showering/bathing (USEPA 2004)	1	Recommended value for residential children showering/bathing (USEPA 2004)
	$teventDW_6$	Event duration	hr/event	0.54	Recommended value for residential children water exposure time (USEPA 2014)	0.40	Time-weighted mean length of bath for ages 2 to 6 years per in Table 16-1, USEPA (2011a)
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/year	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_6$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.015	AWHHERA (TTEMI 2002) for estimated skeletal muscle consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.006	AWHHERA (TTEMI 2002) for estimated skeletal muscle consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRWGO_6$	Ingestion Rate of Offal or Organs	g/kg/day	0.002	AWHHERA (TTEMI 2002) for estimated organ meat, sausage, and offal consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.0007	AWHHERA (TTEMI 2002) for estimated organ meat, sausage, and offal consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_{wg}	Fraction of diet Site-derived	unitless	0.11	AWHHERA (TTEMI 2002). Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.11	AWHHERA (TTEMI 2002). Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.

TABLE 4-2
Exposure Factors Input (Hypothetical Resident - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Beef	IRM_a	Ingestion Rate of Skeletal Muscle	g/kg/day	0.701	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the 95th%tile for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 2-6 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.27	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the mean for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 2-6 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	IRO_a	Ingestion Rate of Offal or Organs	g/kg/day	0.011	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	--	Assumes this age group does not consume significant amounts of organ meats
	F_B	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site
Mutton	$IRMM_a$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.014	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the 95th%tile for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 2-6 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.005	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the mean for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 2-6 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRMO_a$	Ingestion Rate of Offal or Organs	g/kg/day	0.011	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	-	Assumes this age group does not consume significant amounts of organ meats
	F_m	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site

TABLE 4-2
Exposure Factors Input (Hypothetical Resident - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Homegrown Produce	$IREAP_6$	Ingestion Rate of Exposed Aboveground Produce	g/kg/day	0.77	Time-weighted ingestion rate of exposed above ground vegetables for ages 2-6 years using 95%tile rate from Table 13-60, USEPA (2011a). Per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content.	0.22	Time-weighted ingestion rate of exposed above ground vegetables for ages 2 to 6 years using mean rate from Table 13-60, USEPA (2011a). Per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content.
	F_{eap}	Fraction of Exposed Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRPAP_6$	Ingestion Rate of Protected Aboveground Produce	g/kg/day	0.62	Time-weighted ingestion rate of protected above ground vegetables for ages 2-6 years using 95%tile rate from Table 13-61, USEPA (2011a); Per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content.	0.16	Time-weighted ingestion rate of protected above ground vegetables for ages 2 to 6 years using mean rate from Table 13-61, USEPA (2011a); Per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content.
	F_{pap}	Fraction of Protected Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRBP_6$	Ingestion Rate of Belowground Produce	g/kg/day	0.61	Time-weighted ingestion rate of below ground vegetables for ages 2-6 years using 95%tile rate from Table 13-62, USEPA (2011a); Per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content.	0.16	Time-weighted ingestion rate of below ground vegetables for ages 2 to 6 years using mean rate from Table 13-62, USEPA (2011a); Per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content.
	F_{bgp}	Fraction of Belowground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
Aquatic Plant Ingestion	F_t	Fraction of diet Site-derived	unitless	0.25	Value taken from AWHHERA's RME Table 7-1(TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion	0.125	Value taken from AWHHERA's CTE Table 7-2 (TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion
	$IRP_{Aq/T}$	Ingestion Rate of Plant	(kg [DW]/kg/day)	4.75E-05	Value taken from AWHHERA's RME (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total RME intake of vegetables by NA estimated to be 9.5 g/kg-day (Table 9-20-9-22; summed 95% intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 5% for conservative RME exposure (Table 9-5; summed all vegetable-specific intakes). Assumed both vegetables are 90% water (Table 9-37)	1.22E-05	Value taken from AWHHERA's CTE (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total CTE intake of vegetables by NA estimated to be 3.04g/kg-day (Table 9-20-9-22; summed mean intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 4% for CTE exposure (Table 9-5; summed all vegetable-specific intakes). Assumed both vegetables are 90% water (Table 9-37).

TABLE 4-2
Exposure Factors Input (Hypothetical Resident - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Young Child (0 years up to 2 years of age)							
General	BW_2	Body Weight	kg	9.6	Time-weighted body weight for ages 0 to 2 years using recommended weight by age in Table 8-1, USEPA (2011a)	9.6	Time-weighted body weight for ages 0 to 2 years using recommended weight by age in Table 8-1, USEPA (2011a)
	$ADAF_2$	Age-Dependent Adjustment Factor	unitless	10	USEPA (2005c)	10	USEPA (2005c)
	ED_2	Exposure Duration	years	2	Years of exposure from 0 up to 2 years of age	1	Years of exposure from 0 up to 2 years of age
Source Material/Soil Exposure Pathways							
General	EFS_2	Exposure Frequency to Site Soil	days/yr	270	Recommended residential exposure frequency (USEPA 2014)	154	End of May through October each year
	ET_{o2}	Exposure time - Outdoor	hr/hr	0.040	Time-weighted rate for daily outdoor time for ages 0 to 2 years using mean values from Table 16-1, USEPA (2011a).	0.040	Time-weighted rate for daily outdoor time for ages 0 to 2 years using mean values from Table 16-1, USEPA (2011a).
	ET_{i2}	Exposure time - Indoor	hr/hr	0.960	Time-weighted rate for daily outdoor time for ages 0-2 years using mean values from Table 16-1, USEPA (2011a) subtracted from 1 to get indoor air time.	0.960	Time-weighted rate for daily outdoor time for ages 0-2years using mean values from Table 16-1, USEPA (2011a) subtracted from 1 to get indoor air time.
Ingestion	IRS_2	Soil Ingestion Rate	mg/day	200	Recommended daily RME residential child exposure in USEPA (2014)	100	Recommended daily RME residential exposure in USEPA (1993b)
Dermal	SA_2	Exposure skin surface area per day	cm^2/day	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)	2,373	Recommended RME value for child residential scenario (no value for industrial) (USEPA 2014)
	AF_2	Adherence factor	mg/cm^2	0.2	Recommended value for residential children (USEPA 2004)	0.04	Recommended CTE value for residential children (USEPA 2004)
Domestic Water Supply Exposure Pathways							
General	$EFDW_2$	Exposure Frequency	days/yr	270	Recommended residential exposure frequency (USEPA 1989)	154	End of May through October each year
Ingestion	$IRDW_2$	Domestic Water Supply Ingestion Rate	L/day	0.78	Recommended value for residential children for drinking water ingestion rate (USEPA 2014)	0.298	Time-weighted drinking water mean ingestion rate for ages 0 to 2 years per Table 3-1 of USEPA (2011a)
Dermal	$SADW_2$	Exposure skin surface area per day	cm^2/day	4,630	Time-weighted surface area for ages 0 to 2 years using total surface area in Table 7–2, USEPA (2011a) *Mean value used due to inverse relationship between surface area and risk.	4,630	Time-weighted surface area for ages 0 to 2 years using total surface area in Table 7–2, USEPA (2011a)
	$EVDW_2$	Event Frequency	event/day	1	Recommended value for residential children showering/bathing (USEPA 2004)	1	Recommended value for residential children showering/bathing (USEPA 2004)
	$teventDW_2$	Event duration	hr/event	0.54	Recommended value for residential children water exposure time (USEPA 2014)	0.35	Time-weighted mean length of bath for ages 0 to 2 years per in Table 16-1, USEPA (2011a)
Food Product Ingestion Pathways							
General	EF	Exposure frequency	days/year	365	Food ingestion rates are yearly averages	365	Food ingestion rates are yearly averages
Wild Game	$IRWGM_2$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.015	AWHHERA (TTEMI 2002) for estimated skeletal muscle consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.006	AWHHERA (TTEMI 2002) for estimated skeletal muscle consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRWGO_2$	Ingestion Rate of Offal or Organs	g/kg/day	0.002	AWHHERA (TTEMI 2002) for estimated organ meat, sausage, and offal consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.0007	AWHHERA (TTEMI 2002) for estimated organ meat, sausage, and offal consumption for recreational hunters. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	F_{wg}	Fraction of diet Site-derived	unitless	0.11	AWHHERA (TTEMI 2002). Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.11	AWHHERA (TTEMI 2002). Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.

TABLE 4-2
Exposure Factors Input (Hypothetical Resident - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Beef	IRM_a	Ingestion Rate of Skeletal Muscle	g/kg/day	0.391	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the 95th%tile for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 0-2 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.145	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the mean for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 0-2 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	IRO_a	Ingestion Rate of Offal or Organs	g/kg/day	0.021	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	--	Assumes this age group does not consume significant amounts of organ meats
	F_B	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site
Mutton	$IRMM_a$	Ingestion Rate of Skeletal Muscle	g/kg/day	0.0098	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the 95th%tile for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 0-2 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	0.004	No homegrown veal/lamb ingestion rates were available in USEPA 2011a. USEPA (2011a) Table 11-7 provided ingestion rates by total population age ranges for Veal, Lamb and Game in g/day as well as total meat intake. The Ratio of Veal, Lamb and Game to total meat intake was applied to the mean for total homegrown meat intake per age range (Table 13-1). These intakes were then time-weighted for the age group of 0-2 years. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.
	$IRMO_a$	Ingestion Rate of Offal or Organs	g/kg/day	0.021	Table 11-13, USEPA (2011a) states the consumption of organ meats is less than 0.5 g/day but greater than zero. This rate assumes 0.5 g/day for the receptor group weight. Per Table 11-38, USEPA (2011) rates were adjusted for dry weight assuming 60.44% moisture content.	--	Assumes this age group does not consume significant amounts of organ meats
	F_m	Fraction of diet Site-derived	unitless	1	Assumes all homegrown meat is from Site	1	Assumes all homegrown meat is from Site

TABLE 4-2
Exposure Factors Input (Hypothetical Resident - Future)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference
Homegrown Produce	$IREAP_2$	Ingestion Rate of Exposed Aboveground Produce	g/kg/day	0.60	Time-weighted ingestion rate of exposed above ground vegetables for ages 1 to 2 years using 95%tile rate from Table 13-60, USEPA (2011a). Per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.17	Time-weighted ingestion rate of exposed above ground vegetables for ages 1 to 2 years using mean rate from Table 13-60, USEPA (2011a). Per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content
	Feap	Fraction of Exposed Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRPAP_2$	Ingestion Rate of Protected Aboveground Produce	g/kg/day	0.47	Time-weighted ingestion rate of protected above ground vegetables for ages 1 to 2 years using 95%tile rate from Table 13-61, USEPA (2011a); Per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.123	Time-weighted ingestion rate of protected above ground vegetables for ages 1 to 2 years using mean rate from Table 13-61, USEPA (2011a); Per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content
	Fpap	Fraction of Protected Aboveground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
	$IRBP_2$	Ingestion Rate of Belowground Produce	g/kg/day	0.52	Time-weighted ingestion rate of below ground vegetables for ages 1 to 2 years using 95%tile rate from Table 13-62, USEPA (2011a); Per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content	0.126	Time-weighted ingestion rate of below ground vegetables for ages 1 to 2 years using mean rate from Table 13-62, USEPA (2011a); Per Table 9-37, USEPA (2011) rates were adjusted for dry weight assuming 90.0% moisture content
	Fbgp	Fraction of Belowground Produce	unitless	1	Assumes all homegrown produce is derived from the Site	1	Assumes all homegrown produce is derived from the Site
Aquatic Plant Ingestion	F_t	Fraction of diet Site-derived	unitless	0.25	Value taken from AWHHERA's RME Table 7-1(TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion	0.125	Value taken from AWHHERA's CTE Table 7-2 (TTEMI 2002) Native American Terrestrial/Aquatic Fraction Plant Ingestion
	$IRP_{Aq/T}$	Ingestion Rate of Plant	(kg [DW]/kg/day)	4.75E-05	Value derived from AWHHERA's RME (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total RME intake of vegetables by NA estimated to be 9.5 g/kg-day (Table 9-20-9-22; summed 95% intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 5% for conservative RME exposure (Table 9-5; summed all vegetable-specific intakes). Assumed both vegetables are 90% water (Table 9-37)	1.22E-05	Value derived from AWHHERA's CTE (TTEMI 2002) Native American Terrestrial/Aquatic Plant Ingestion Rate, calculated from USEPA, 2011a using onion as a surrogate for wild onion and cabbage as a surrogate for watercress. Total CTE intake of vegetables by NA estimated to be 3.04g/kg-day (Table 9-20-9-22; summed mean intake rates). Onion and watercress combined percentage of total daily intake of vegetables=0.038 but rounded up to 4% for CTE exposure (Table 9-5; summed all vegetable-specific intakes). Assumed both vegetables are 90% water (Table 9-37).

Notes:
RME - reasonable maximum exposure
CTE - central tendency exposure
USEPA - United States Environmental Protection Agency
95%tile - 95th Percentile
Recommended values from USEPA (2011a) are 95th percentile values for RME and mean values for CTE, unless specified.

TABLE 4-2
Exposure Factors Input (References)

TTEMI 2002. TetraTech EM, Inc. Final Area Wide Human Health and Ecological Risk Assessment, Selenium Project, Southeast Idaho Phosphate Mining Resource Area. Prepared for Idaho Department of Environmental Quality, December.
USEPA 1989. Risk Assessment Guidance for Superfund. Volume I, Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1-89/002. U.S. EPA, Office of Emergency and Remedial Response
USEPA 1991a. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors". Office of Solid Waste and Emergency Response (OSWER) Directive 9285.6-03, March 25, 1991.
USEPA 1991b. Risk Assessment Guidance for Superfund Volume I, Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals). Interim. EPA/540/R-92/003. Office of Research and Development, Washington, D.C.
USEPA 1993b. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure, Draft. November
USEPA 1996. Soil Screening Guidance. USEPA OSWER, Washington D.C. EPA/540/R-96/018, July 1996.
USEPA 2000c. Soil Screening Guidance for Radionuclides: User's Guide. Office of Emergency and Remedial Response and Office of Radiation and Indoor Air. Washington, DC. OSWER No. 9355.4-16A http://www.epa.gov/superfund/health/contaminants/radiation/pdfs/ssuserguide.pdf
USEPA 2002c. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24, December 2002.
USEPA 2005c. Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. EPA/630/R-03/003F. March 2005
USEPA 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment. EPA/540/R/99/005, OSWER 9285.7-02EP, Final, July 2004.
USEPA 2009a. Risk Assessment Guidance for Superfund: Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). EPA-540-R-070-002, OSWER 9285.7-82, Final, January 2009.
USEPA 2011a. Exposure Factors Handbook: 2011 Edition. Office of Research and Development, EPA/600/R-090/052F, September 2011.
USEPA 2012d. Preliminary Remediation Goals for Radionuclides User's Guide. http://epa-prgs.ornl.gov/radionuclides/prg_guide.html Accessed May 2012. Includes associated Preliminary Remediation Goals for Radionuclides tables (dated August 2010).
USEPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. Office of Solid Waste and Emergency Response, OSWER Directive 9200.1-120, February 2014.

TABLE 4-3
Tier 1 Exposure Point Concentrations for All Receptors

Receptor	Exposure Area	Medium	Appendix H	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Iron	Lead	Manganese	Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Industrial Worker	Mined Area	Soil	H.2	1.3E+04	2.4E+00	1.8E+01	1.6E+02	1.0E+00	2.3E+01	3.6E+01	3.9E+02	5.1E+00	1.7E+04	7.6E+01	8.3E+02	2.1E+01	1.6E+02	5.6E+01	2.9E+00	1.1E+00	3.4E+01	4.1E+02	6.6E+02
		DWS	H.9	3.6E-02	5.5E-04	3.2E-03	3.2E-02	6.5E-04	2.0E-02	2.9E-04	1.0E-03	8.7E-04	6.7E-01	3.9E-03	2.5E-02	7.2E-03	2.3E-03	3.5E-02	1.8E-03	4.5E-05	3.8E-03	7.8E-04	2.1E-01
		Wild Game Muscle	H.15	7.1E-01	5.3E-05	1.6E-03	7.1E-03	1.0E-05	2.5E-02	5.2E-04	2.5E-02	1.3E-02	1.5E+01	3.1E-04	3.1E-01	3.0E-02	1.3E-03	2.1E-01	1.3E-04	3.1E-03	7.6E-05	1.2E-02	5.5E+00
		Wild Game Offal	H.15	7.1E-01	5.3E-05	1.6E-03	7.1E-03	1.0E-05	2.5E-02	7.8E-02	2.5E-02	1.3E-02	1.5E+01	3.1E-04	3.1E-01	3.0E-02	1.3E-03	1.4E+00	1.3E-04	3.1E-03	7.6E-05	1.2E-02	5.5E+00
Recreational Hunter	Site-wide	Soil	H.1	1.3E+04	2.1E+00	1.4E+01	1.5E+02	9.7E-01	1.8E+01	2.6E+01	2.9E+02	6.1E+00	1.6E+04	5.1E+01	9.6E+02	1.4E+01	1.3E+02	4.4E+01	1.9E+00	8.3E-01	2.3E+01	2.9E+02	5.8E+02
		Surface Water	H.5	3.6E+00	4.2E-04	1.0E-02	7.4E-02	2.3E-04	3.4E-02	4.2E-03	3.6E-02	9.5E-04	3.0E+00	1.4E-03	2.1E-01	2.1E-02	6.9E-02	7.4E-01	7.9E-04	7.6E-05	5.7E-03	4.5E-02	2.4E-01
		Wild Game Muscle	H.15	7.1E-01	5.3E-05	1.6E-03	7.1E-03	1.0E-05	2.5E-02	5.2E-04	2.5E-02	1.3E-02	1.5E+01	3.1E-04	3.1E-01	3.0E-02	1.3E-03	2.1E-01	1.3E-04	3.1E-03	7.6E-05	1.2E-02	5.5E+00
		Wild Game Offal	H.15	7.1E-01	5.3E-05	1.6E-03	7.1E-03	1.0E-05	2.5E-02	7.8E-02	2.5E-02	1.3E-02	1.5E+01	3.1E-04	3.1E-01	3.0E-02	1.3E-03	1.4E+00	1.3E-04	3.1E-03	7.6E-05	1.2E-02	5.5E+00
Current Seasonal Rancher	Non-Mined Area	Soil	H.3	1.4E+04	1.3E+00	8.3E+00	2.0E+02	9.2E-01	1.1E+01	1.1E+01	1.3E+02	7.7E+00	1.7E+04	1.8E+01	1.4E+03	7.4E+00	8.0E+01	3.6E+01	6.3E-01	4.9E-01	9.5E+00	9.8E+01	3.6E+02
		DWS	H.10	1.6E+01	2.5E-04	3.2E-03	1.2E-01	1.2E-03	3.2E-02	1.2E-03	2.5E-02	6.5E-03	1.6E+01	1.3E-02	4.3E-01	8.6E-03	1.5E-02	5.0E-01	5.3E-04	8.5E-05	3.6E-03	2.3E-02	1.5E-01
		Beef Muscle	H.17	1.7E+01	8.4E-04	1.8E-02	8.2E-02	2.0E-04	1.1E-01	2.4E-03	4.1E-01	2.5E-01	3.3E+02	4.4E-03	5.4E+00	6.0E-02	1.5E-02	2.7E-01	1.3E-03	1.3E-02	1.1E-03	1.5E-01	4.6E+01
		Beef Offal	H.17	1.7E+01	8.4E-04	1.8E-02	8.2E-02	2.0E-04	1.1E-01	3.7E-01	4.1E-01	2.5E-01	3.3E+02	4.4E-03	5.4E+00	6.0E-02	1.5E-02	1.5E+00	1.3E-03	1.3E-02	1.1E-03	1.5E-01	4.6E+01
		Mutton Muscle	H.17	1.7E+01	8.4E-04	1.8E-02	8.2E-02	2.0E-04	1.1E-01	2.4E-03	4.1E-01	2.5E-01	3.3E+02	4.4E-03	5.4E+00	6.0E-02	1.5E-02	2.7E-01	1.3E-03	1.3E-02	1.1E-03	1.5E-01	4.6E+01
		Mutton Offal	H.17	1.7E+01	8.4E-04	1.8E-02	8.2E-02	2.0E-04	1.1E-01	3.7E-01	4.1E-01	2.5E-01	3.3E+02	4.4E-03	5.4E+00	6.0E-02	1.5E-02	1.5E+00	1.3E-03	1.3E-02	1.1E-03	1.5E-01	4.6E+01
		Wild Game Muscle	H.15	7.1E-01	5.3E-05	1.6E-03	7.1E-03	1.0E-05	2.5E-02	5.2E-04	2.5E-02	1.3E-02	1.5E+01	3.1E-04	3.1E-01	3.0E-02	1.3E-03	2.1E-01	1.3E-04	3.1E-03	7.6E-05	1.2E-02	5.5E+00
		Wild Game Offal	H.15	7.1E-01	5.3E-05	1.6E-03	7.1E-03	1.0E-05	2.5E-02	7.8E-02	2.5E-02	1.3E-02	1.5E+01	3.1E-04	3.1E-01	3.0E-02	1.3E-03	1.4E+00	1.3E-04	3.1E-03	7.6E-05	1.2E-02	5.5E+00
Future Seasonal Rancher	Non-Mined Area and Mined Area BLM Land	Soil	H.4	1.4E+04	1.3E+00	8.5E+00	1.8E+02	9.0E-01	1.1E+01	1.2E+01	1.8E+02	7.5E+00	1.7E+04	1.8E+01	1.1E+03	8.1E+00	9.6E+01	3.9E+01	6.9E-01	5.7E-01	9.4E+00	1.2E+02	4.0E+02
		DWS [1]	H.8	1.3E+01	4.6E-04	5.6E-03	1.2E-01	7.9E-04	5.7E-02	2.8E-03	6.3E-02	4.3E-03	1.4E+01	9.3E-03	4.2E-01	1.2E-02	4.3E-02	3.4E-01	5.8E-04	1.3E-04	5.3E-03	4.3E-02	2.2E-01
		Beef Muscle	H.18	1.6E+01	8.3E-04	1.7E-02	7.7E-02	1.9E-04	1.1E-01	2.5E-03	5.1E-01	2.2E-01	3.0E+02	4.1E-03	4.5E+00	7.9E-02	1.7E-02	3.5E-01	1.3E-03	1.5E-02	1.0E-03	1.7E-01	4.6E+01
		Beef Offal	H.18	1.6E+01	8.3E-04	1.7E-02	7.7E-02	1.9E-04	1.1E-01	3.7E-01	5.1E-01	2.2E-01	3.0E+02	4.1E-03	4.5E+00	7.9E-02	1.7E-02	1.9E+00	1.3E-03	1.5E-02	1.0E-03	1.7E-01	4.6E+01
		Mutton Muscle	H.18	1.6E+01	8.3E-04	1.7E-02	7.7E-02	1.9E-04	1.1E-01	2.5E-03	5.1E-01	2.2E-01	3.0E+02	4.1E-03	4.5E+00	7.9E-02	1.7E-02	3.5E-01	1.3E-03	1.5E-02	1.0E-03	1.7E-01	4.6E+01
		Mutton Offal	H.18	1.6E+01	8.3E-04	1.7E-02	7.7E-02	1.9E-04	1.1E-01	3.7E-01	5.1E-01	2.2E-01	3.0E+02	4.1E-03	4.5E+00	7.9E-02	1.7E-02	1.9E+00	1.3E-03	1.5E-02	1.0E-03	1.7E-01	4.6E+01
		Wild Game Muscle	H.15	7.1E-01	5.3E-05	1.6E-03	7.1E-03	1.0E-05	2.5E-02	5.2E-04	2.5E-02	1.3E-02	1.5E+01	3.1E-04	3.1E-01	3.0E-02	1.3E-03	2.1E-01	1.3E-04	3.1E-03	7.6E-05	1.2E-02	5.5E+00
		Wild Game Offal	H.15	7.1E-01	5.3E-05	1.6E-03	7.1E-03	1.0E-05	2.5E-02	7.8E-02	2.5E-02	1.3E-02	1.5E+01	3.1E-04	3.1E-01	3.0E-02	1.3E-03	1.4E+00	1.3E-04	3.1E-03	7.6E-05	1.2E-02	5.5E+00
		Garden Produce - Cpae	H.21	2.1E+01	4.2E-02	5.4E-02	5.9E+00	2.3E-03	2.8E+01	1.5E+00	8.6E-01	7.7E-02	3.0E+01	2.5E-01	1.1E+02	8.7E-01	8.9E-01	7.6E-01	9.5E-02	4.9E-04	4.8E-02	4.4E-01	3.9E+01
		Garden Produce - Cpap	H.21	2.1E+01	4.2E-02	5.4E-02	5.9E+00	2.3E-03	2.8E+01	1.5E+00	8.6E-01	7.7E-02	3.0E+01	2.5E-01	1.1E+02	8.7E-01	8.9E-01	7.6E-01	9.5E-02	4.9E-04	4.8E-02	4.4E-01	3.9E+01
		Garden Produce - Cpb	H.21	9.1E+00	3.9E-02	6.8E-02	2.7E+00	1.3E-03	2.2E+01	7.7E-01	7.9E-01	5.2E-02	1.7E+01	1.6E-01	5.5E+01	4.9E-01	7.7E-01	8.6E-01	6.9E-02	2.3E-04	3.7E-02	6.6E-01	3.6E+02
Current Livestock Herder	Non-Mined Area	Soil	H.3	1.4E+04	1.3E+00	8.3E+00	2.0E+02	9.2E-01	1.1E+01	1.1E+01	1.3E+02	7.7E+00	1.7E+04	1.8E+01	1.4E+03	7.4E+00	8.0E+01	3.6E+01	6.3E-01	4.9E-01	9.5E+00	9.8E+01	3.6E+02
		Surface Water	H.6	1.1E+00	1.7E-04	8.1E-03	6.8E-02	7.3E-04	2.0E-02	5.7E-04	2.7E-03	7.7E-04	8.7E-01	1.2E-03	1.7E-01	5.6E-03	4.3E-03	3.9E-01	6.2E-04	3.0E-05	1.6E-03	3.3E-03	1.3E-02
Future Livestock Herder	Non-Mined Area and Mined Area BLM Land	Soil	H.4	1.4E+04	1.3E+00	8.5E+00	1.8E+02	9.0E-01	1.1E+01	1.2E+01	1.8E+02	7.5E+00	1.7E+04	1.8E+01	1.1E+03	8.1E+00	9.6E+01	3.9E+01	6.9E-01	5.7E-01	9.4E+00	1.2E+02	4.0E+02
		Surface Water	H.7	1.9E+00	2.1E-04	7.6E-03	6.6E-02	7.3E-04	2.3E-02	6.4E-04	4.5E-03	8.5E-04	1.3E+00	1.3E-03	1.3E-01	5.5E-03	5.5E-03	3.9E-01	6.0E-04	3.9E-05	2.2E-03	6.2E-03	2.4E-02
Recreational Trespasser	Site-wide	Soil	H.1	1.3E+04	2.1E+00	1.4E+01	1.5E+02	9.7E-01	1.8E+01	2.6E+01	2.9E+02	6.1E+00	1.6E+04	5.1E+01	9.6E+02	1.4E+01	1.3E+02	4.4E+01	1.9E+00	8.3E-01	2.3E+01	2.9E+02	5.8E+02
		Surface Water	H.5	3.6E+00	4.2E-04	1.0E-02	7.4E-02	2.3E-04	3.4E-02	4.2E-03	3.6E-02	9.5E-04	3.0E+00	1.4E-03	2.1E-01	2.1E-02	6.9E-02	7.4E-01	7.9E-04	7.6E-05	5.7E-03	4.5E-02	2.4E-01
Native American	Non-Mined Area and Mined Area BLM Land	Soil	H.4	1.4E+04	1.3E+00	8.5E+00	1.8E+02	9.0E-01	1.1E+01	1.2E+01	1.8E+02	7.5E+00	1.7E+04	1.8E+01	1.1E+03	8.1E+00	9.6E+01	3.9E+01	6.9E-01	5.7E-01	9.4E+00	1.2E+02	4.0E+02
		Surface Water	H.7	1.9E+00	2.1E-04	7.6E-03	6.6E-02	7.3E-04	2.3E-02	6.4E-04	4.5E-03	8.5E-04	1.3E+00	1.3E-03	1.3E-01	5.5E-03	5.5E-03	3.9E-01	6.0E-04	3.9E-05	2.2E-03	6.2E-03	2.4E-02
		Wild Game Muscle	H.15	7.1E-01	5.3E-05	1.6E-03	7.1E-03	1.0E-05	2.5E-02	5.2E-04	2.5E-02	1.3E-02	1.5E+01	3.1E-04	3.1E-01	3.0E-02	1.3E-03	2.1E-01	1.3E-04	3.1E-03	7.6E-05	1.2E-02	5.5E+00
		Wild Game Offal	H.15	7.1E-01	5.3E-05	1.6E-03	7.1E-03	1.0E-05	2.5E-02	7.8E-02	2.5E-02	1.3E-02	1.5E+01	3.1E-04	3.1E-01	3.0E-02	1.3E-03	1.4E+00	1.3E-04	3.1E-03	7.6E-05	1.2E-02	5.5E+00
		Culturally-significant Plant Ingestion	H.14-1	7.6E+01	1.7E-01	9.5E-02	6.9E+01	5.0E-03	3.9E+01	1.4E+00	5.7E-01	1.1E-01	1.3E+02	1.3E-01	9.7E+01	1.1E+00	1.1E+00	1.4E+01	1.3E-02	1.6E-02	1.3E-02	9.5E-01	5.5E+01
		Culturally-significant Tea Ingestion	H.19	2.9E-03	2.2E-05	3.4E-05	3.0E-02	3.7E-07	1.6E+00	5.1E-02	3.9E-05	7.0E-04	5.7E-03	6.6E-05	7.2E-01	2.2E-03	7.3E-04	2.4E-03	5.8E-05	3.0E-07	2.4E-06	5.2E-05	4.8E-01
Future Hypothetical Resident	Site-wide	Soil	H.1	1.3E+04	2.1E+00	1.4E+01	1.5E+02	9.7E-01	1.8E+01	2.6E+01	2.9E+02	6.1E+00	1.6E+04	5.1E+01	9.6E+02	1.4E+01	1.3E+02	4.4E+01	1.9E+00	8.3E-01	2.3E+01	2.9E+02	5.8E+02
		DWS	H.8	1.3E+01	4.6E-04	5.6E-03	1.2E-01	7.9E-04	5.7E-02	2.8E-03	6.3E-02	4.3E-03	1.4E+01	9.3E-03	4.2E-01	1.2E-02	4.3E-02	3.4E-01	5.8E-04	1.3E-04	5.3E-03	4.3E-02	2.2E-01
		Beef Muscle	H.16	1.2E+01	1.2E-03	2.2E-02	6.0E-02	1.8E-04	1.9E-01	5.7E-03	7.7E-01	1.4E-01	2.2E+02	8.0E-03	2.4E+00	2.5E-01	2.4E-02	1.6E+00	3.1E-03	3.5E-02	2.2E-03	3.6E-01	6.2E+01
		Beef Offal	H.16	1.2E+01	1.2E-03	2.2E-02	6.0E-02	1.8E-04	1.9E-01	8.6E-01	7.7E-01	1.4E-01	2.2E+02	8.0E-03	2.4E+00	2.5E-01	2.4E-02	9.0E+00	3.1E-03	3.5E-02	2.2E-03	3.6E-01	6.2E+01
		Mutton Muscle	H.16	1.2E+01	1.2E-03	2.2E-02	6.0E-02	1.8E-04	1.9E-01	5.7E-03	7.7E-01	1.4E-01	2.2E+02	8.0E-03	2.4E+00	2.5E-01	2.4E-02	1.6E+00	3.1E-03	3.5E-02	2.2E-03	3.6E-01	6.2E+01
		Mutton Offal	H.16	1.2E+01	1.2E-03	2.2E-02	6.0E-02	1.8E-04	1.9E-01	8.6E-01	7.7E-01	1.4E-01	2.2E+02	8.0E-03	2.4E+00	2.5E-01	2.4E-02	9.0E+00	3.1E-03	3.5E-02	2.2E-03	3.6E-01	6.2E+01
		Wild Game Muscle	H.15	7.1E-01	5.3E-05	1.6E-03	7.1E-03	1.0E-05	2.5E-02	5.2E-04	2.5E-02	1.3E-02	1.5E+01	3.1E-04	3.1E-01	3.0E-02	1.3E-03	2.1E-01	1.3E-04	3.1E-03	7.6E-05	1.2E-02	5.5E+00
		Wild Game Offal	H.15	7.1E-01	5.3E-05	1.6E-03	7.1E-03	1.0E-05	2.5E-02	7.8E-02	2.5E-02	1.3E-02	1.5E+01	3.1E-04	3.1E-01	3.0E-02	1.3E-03	1.4E+00	1.3E-04	3.1E-03	7.6E-05	1.2E-02	5.5E+00
		Garden Produce - Cpae	H.20	1.9E+01	6.6E-02	8.8E-02	4.9E+00	2.5E-03	4.5E+01	3.3E+00	1.4E+00	6.2E-02	2.7E+01	6.9E-01	9.6E+01	1.5E+00	1.2E+00	8.5E-01	2.6E-01	7.1E-04	1.2E-01	1.1E+00	5.7E+01
		Garden Produce - Cpap	H.20	1.9E+01	6.6E-02	8.8E-02	4.9E+00	2.5E-03	4.5E+01	3.3E+00	1.4E+00	6.2E-02	2.7E+01	6.9E-01	9.6E+01	1.5E+00	1.2E+00	8.5E-01	2.6E-01	7.1E-04	1.2E-01	1.1E+00	5.7E+01
		Garden Produce - Cpb	H.20	8.2E+00	6.2E-02	1.1E-01	2.3E+00	1.5E-03	3.6E+01	1.7E+00	1.3E+00	4.3E-02	1.6E+01	4.6E-01	4.8E+01	8.6E-01	1.0E+00	9.6E-01	1.9E-01	3.3E-04	9.1E-02	1.6E+00	5.2E+02
		Culturally-significant Plant Ingestion	H.14-3	3.0E+03	2.0E-01	2.1E+00	8.4E+01	2.5E-01	1.1E+01	2.1E+00	1.3E+01	1.6E+00	4.0E+03	5.9E+00	1.4E+02	1.4E+00	1.1E+01	4.3E+00	1.4E-01	9.7E-02	4.2E-01	8.4E+00	7.4E+01

Notes:

Refer to Appendix H for details about exposure point concentrations.

Cpae = Concentration in garden produce (above-ground/exposed)

Cpap = Concentration in garden produce (above-ground/protected)

Cpb = Concentration in garden produce (below-ground)

DW = Dry Weight

DWS = Domestic Water Supply

EPC = Exposure Point Concentration

All soil and tissue EPCs are in mg/kg DW. All water and tea EPCs are in mg/L.

1 - The exposure area for the Future Seasonal Rancher is Non-Mined Area and Mined Area BLM Land, but the Site-wide DWS dataset was used to represent that potential future exposure.

TABLE 4-4
Off-Site Fish Tissue Selenium Concentration Summary

Location Type	Stations	Date Range	Count	Overall Minimum (mg/kg)	Overall Maximum (mg/kg)	Maximum Detected Concentration (mg/kg)	Average (mg/kg)	Median (mg/kg)	25th percentile	75th percentile	Detect	Non-Detect
NON-SALMONIDS												
Trail Creek U/S of Camp G Creek	TC-5, TC-1	2009-2011	17	1.5	12.5	12.5	5.3	5.34	3.7	6	17	0
Camp G Creek Mouth	CGC-0	2009	10	2	10.4	10.4	6.4	6.1	4.7	8.1	10	0
Trail Creek D/S of Camp G Creek	TC	2000	8	2.2	10.5	10.5	5.7	6	4.3	6.2	8	0
Pedro Creek Mouth	PC-1	2009	6	20.3	36.4	36.4	27.6	26.5	22.6	32.4	6	0
Blackfoot River U/S of Trail Creek	ST022	2004	1	12	12	12	12	12	12	12	1	0
Blackfoot River D/S of Trail Creek	ST021, ST230	1999-2004	8	8.1	13	13	9.8	9.5	8.8	10.3	8	0
State Land Creek Mouth	SLC-0	2001-2009	4	15.2	19.8	19.8	17.7	18	16.3	19.4	4	0
Blackfoot River D/S of State Land Creek	MST020	2004	1	11	11	11	11	11	11	11	1	0
SALMONIDS												
Trail Creek U/S of Camp G Creek	TC-5, TC-1	2011	3	2.8	6.4	6.4	4.2	3.4	3.08	4.9	3	0
Blackfoot River D/S of Trail Creek	ST021, BFR-3, ST230	1999-2000	8	2.2	7.1	7.1	4.5	4.4	3.58	5.2	8	0

Notes:
mg/kg = milligrams per kilogram
U/S = Upstream; D/S = Downstream

TABLE 5-1
Toxicity and Chemical-Specific Factors for Human Health Chemicals of Potential Concern from Non-Radiological Effects

HH COPCs			Oral Pathway Toxicity Factors				Inhalation Pathway Toxicity Factors				Dermal Pathway Toxicity Factors		Oral/Dermal Pathway Toxicity Factor	Dermal Pathway Exposure Factors	
			Slope Factor [1]		Reference Dose [1]		Inhalation Unit Risk [1]		Reference Concentration [1]		Slope Factor [2]	Reference Dose [3]	Fraction of COI absorbed in gastrointestinal tract [1]	Permeability Coefficient [1]	Dermal Absorption Fraction [1] [a]
CASNo	Analyte [4]	Classification [5]	SFo	Source	RfDo	Source	IUR	Source	RfCi	Source	SFd	RfDd	GIABS	Kp	ABSd
			$(mg/kg\text{-}day)^{-1}$		(mg/kg-day)		$(ug/m^3)^{-1}$		(mg/m^3)		$(mg/kg\text{-}day)^{-1}$	(mg/kg-day)	unitless	cm/hr	unitless
7429-90-5	Aluminum	NE	na		1	P	na		0.005	P	na	1	1	0.001	0.01[a]
7440-36-0	Antimony	NE	na		0.0004	I	na		na		na	0.00006	0.15	0.001	0.01[a]
7440-38-2	Arsenic	A	1.5	I	0.0003	I	0.0043	I	0.000015	C	1.5	0.0003	1	0.001	0.03
7440-39-3	Barium	D	na		0.2	I	na		0.0005	H	na	0.014	0.07	0.001	0.01[a]
7440-41-7	Beryllium	B1	na		0.002	I	0.0024	I	0.00002	I	na	0.000014	0.007	0.001	0.01[a]
7440-42-8	Boron	NE	na		0.2	I	na		0.02	H	na	0.2	1	0.001	0.01[a]
7440-43-9	Cadmium	B1 (I)	na		0.001	I	0.0018	I	0.00001	A	na	0.000025	0.025	0.001	0.001
7440-47-3	Chromium, Total [b]	D	na		1.5		na		na		na	0.0195	0.013	0.001	0.01[a]
7440-48-4	Cobalt	C (I)	na		0.0003	P	0.009	P	0.000006	P	na	0.0003	1	0.0004	0.01[a]
7439-89-6	Iron	NE	na		0.7	P	na		na		na	0.7	1	0.001	0.01[a]
7439-96-5	Manganese	D	na		0.14	I	na		0.00005	I	na	0.14	1	0.001	0.01[a]
7439-98-7	Molybdenum	NE	na		0.005	I	na		na		na	0.005	1	0.001	0.01[a]
7440-02-0	Nickel	NE	na		0.02	I	0.00026	C	0.00009	A	na	0.0008	0.04	0.0002	0.01[a]
7782-49-2	Selenium	D	na		0.005	I	na		0.02	C	na	0.005	1	0.001	0.01[a]
7440-22-4	Silver	D	na		0.005	I	na		na		na	0.0002	0.04	0.0006	0.01[a]
7440-28-0	Thallium	D	na		0.00001	X	na		na		na	0.00001	1	0.001	0.01[a]
7440-61-1	Uranium[6]	NE	na		0.003 0.0006 0.0002	I O A	na		0.00004	A	na	0.003 0.0006 0.0002	1	0.001	0.01[a]
7440-62-2	Vanadium	NE	na		0.005	S	na		0.0001	A	na	0.00013	0.026	0.001	0.01[a]
7440-66-6	Zinc	D	na		0.3	I	na		na		na	0.3	1	0.0006	0.01[a]

TABLE 5-1
Toxicity and Chemical-Specific Factors for Human Health Chemicals of Potential Concern from Non-Radiological Effects

FOOTNOTES

Notes:

Source abbreviations: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; O = USEPA Office of Ground Water and Drinking Water; S = See User Guide Section 5; X = PPRTV Appendix

ATSDR = Agency for Toxic Substances and Disease Registry
cm/hr = centimeter per hour
COI = chemical of interest
HH COPC = human health chemical of potential concern
HI = hazard index
IRIS - Integrated Risk Information System
mg/kg-day = milligram per kilogram per day
mg/m3 = milligram per cubic meter
na = not available; n = no
MRL = minimal risk level
RfD = Reference Dose
USEPA = U.S. Environmental Protection Agency
USGS = U.S. Geological Survey
ug/m3 = micrograms per cubic meter

1. Toxicity Value source: U.S. Environmental Protection Agency (USEPA). 2016. Risk-Based Screening Table - Generic Tables; Regional Screening Level Tables (November 2015). Available at http://www.epa.gov/risk/risk-based-screening-table-generic-tables. (Website last updated December 21, 2015; accessed January 21, 2016).

a. For analytes lacking ABSd values in USEPA (2016), the value of 1% is used as conservative assumption of ABSd for inorganics, as recommended in USEPA (2015). USEPA, 2015. Mid-Atlantic Risk Assessment Technical Guidance Manual: Assessing Dermal Contact with Soil, December 1995. Previously available at http://www.epa.gov/reg3hwmd/risk/human/info/solabsg2.htm (website last updated June 19, 2015; and accessed July 15, 2015). Similar information also available at http://www.epa.gov/risk/assessing-dermal-exposure-soil (website last updated October 2015; accessed February 2016).

b. In cases where toxicity factors are not available for Total Chromium, information for Chromium III was used.

2. Dermal Slope Factor (SFd) is calculated using a route-to-route extrapolation of SFo/GIABS

3. Dermal Reference Dose (RfDd) is calculated using a route-to-route extrapolation of RfDo*GIABS

4. Analytes noted as the following in USEPA (2016): Aluminum, Antimony (metallic), Arsenic (inorganic), Barium, Beryllium (and compounds), Boron and Borates Only, Cadmium (Diet), Chromium (III, Insoluble salts), Cobalt, Iron, Manganese (Diet), Molybdenum, Nickel (Soluble Salts), Selenium, Thallium (Soluble Salts), Uranium (Soluble Salts) - CAS number listed as "NA" , Vanadium (and compounds), Zinc (and compounds).

c. Toxicity information is not compiled for lead; refer to the document for further discussion of this analyte.

5. Chemical Classification:
NE: This chemical has not undergone a complete evaluation and determination under US EPA's IRIS program for evidence of human carcinogenic potential. Was treated as a non-carcinogen for this analysis.
Group A: "Human Carcinogen" - There is enough evidence to conclude that it can cause cancer in humans.
Group B1: "Probable Human Carcinogen" - There is limited evidence that it can cause cancer in humans, but at present it is not conclusive.
Group B2: "Probable Human Carcinogen" - There is inadequate evidence that it can cause cancer in humans but at present it is far from conclusive.
Group C: "Possible Human Carcinogen" - There is limited evidence that it can cause cancer in animals in the absence of human data, but at present it is not conclusive.
Group D: "Not Classifiable as to Human Carcinogenicity" - There is no evidence at present that it causes cancer in humans.
Group E: "Evidence of Non-Carcinogenicity for Humans" - There is strong evidence that it does not cause cancer in humans.

6 = Uranium RfDs

RfD mg/kg-day	Source	Reference
0.003	1 - from IRIS (USEPA 2016)	U.S. Environmental Protection Agency (USEPA). 2016. Integrated Risk Information System (IRIS). Available at https://www.epa.gov/iris. (Website last updated June 27, 2016; accessed June 27, 2016).
0.0006	2 - Chronic RfD; for the uranium MCL developed by the Office of Ground Water and Drinking Water (USEPA/USGS 2000)	U.S. Environmental Protection Agency (USEPA) and U.S. Geological Survey (USGS). 2000. Radionuclides Notice of Data Availability Technical Support Document. Targeting and Analysis Branch, Standards and Risk Management Division, Office of Ground Water and Drinking Water, USEPA. Prepared by USEPA Office of Ground Water and Drinking Water in collaboration with USEPA Office of Indoor Air and Radiation and USGS. March. Available at https://www.epa.gov/sites/production/files/2015-09/documents/2009_04_16_radionuclides_regulation_radionuclides_rulemaking_techsupportdoc.pdf.
0.0002	3 - Intermediate-duration oral MRL from ATSDR (2013)	ATSDR. 2013. Toxicological Profile for Uranium. U.S. Department of Health and Human Services. Public Health Service. Atlanta, GA. February. Available at http://www.atsdr.cdc.gov/ToxProfiles/tp150.pdf.

TABLE 6-1
Overall Summary of Lifetime Non-Cancer Hazards and Cancer Risks for All Receptors – Non-Radionuclides

Receptor	Non-Cancer (HI)	Cancer (ELCR)
Industrial Worker (current and future)	5E-01	**3E-06**
Recreational Hunter (current and future)	5E-01	1E-06
Seasonal Rancher (current)	**1E+01**	**6E-05**
Seasonal Rancher (future)	**2E+01**	**4E-05**
Livestock Herder (current)	4E-01	**9E-06**
Livestock Herder (future)	4E-01	**9E-06**
Recreational Trespasser (current and future)	2E-01	1E-06
Native American (current and future)	3E-01	9E-07
Hypothetical Resident (future)	**3E+01**	**8E-05**

Notes:

Summarizes results of Tier 1 Reasonable Maximum Exposure (RME) analyses; refer to Appendices J through R for more information.

Hazard and risk estimates are rounded to 1 significant digit.

HI = hazard index

ELCR = excess lifetime cancer risk

Non-cancer hazards >1 are highlighted in gray.

Cancer risks >1E-05 are highlighted in gray.

Cancer risks >1E-06 are in bold font.

TABLE 6-2
Summary of Lifetime Non-Cancer Hazards and Cancer Risks for All Receptors - by HH COPC (Non-Radionuclides)

HH COPC	Industrial Worker		Recreational Hunter		Seasonal Rancher - Current		Seasonal Rancher - Future		Livestock Herder - Current		Livestock Herder - Future		Recreational Trespasser		Native American		Hypothetical Resident	
	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer
Aluminum	2E-03	na	2E-03	na	3E-01	na	3E-01	na	1E-02	na	1E-02	na	3E-03	na	5E-03	na	5E-01	na
Antimony	2E-03	na	7E-04	na	2E-02	na	2E-01	na	5E-03	na	5E-03	na	2E-03	na	6E-03	na	3E-01	na
Arsenic	2E-02	**3E-06**	1E-02	1E-06	3E-01	**6E-05**	7E-01	**4E-05**	5E-02	**9E-06**	5E-02	**9E-06**	2E-02	1E-06	2E-02	9E-07	1E+00	**8E-05**
Barium	3E-04	na	2E-04	na	1E-02	na	4E-02	na	3E-03	na	3E-03	na	4E-04	na	5E-03	na	5E-02	na
Beryllium	6E-04	6E-12	2E-04	5E-12	2E-02	5E-11	2E-02	5E-11	9E-03	5E-11	9E-03	5E-11	1E-03	3E-12	1E-03	8E-12	3E-02	2E-11
Boron	2E-04	na	2E-04	na	4E-03	na	2E-01	na	2E-04	na	2E-04	na	6E-05	na	6E-03	na	3E-01	na
Cadmium	5E-03	2E-10	3E-03	1E-10	4E-02	4E-10	**2E+00**	5E-10	1E-02	4E-10	1E-02	5E-10	7E-03	7E-11	5E-02	8E-11	**4E+00**	4E-10
Chromium	1E-04	na	7E-05	na	2E-03	na	4E-03	na	9E-04	na	1E-03	na	3E-04	na	1E-04	na	6E-03	na
Cobalt	5E-02	1E-10	5E-02	1E-10	**2E+00**	2E-09	**2E+00**	2E-09	2E-02	2E-09	2E-02	2E-09	4E-03	8E-11	1E-02	2E-10	**2E+00**	4E-10
Iron	2E-02	na	2E-02	na	1E+00	na	1E+00	na	2E-02	na	2E-02	na	4E-03	na	9E-03	na	**2E+00**	na
Manganese	3E-03	na	3E-03	na	1E-01	na	9E-01	na	9E-03	na	8E-03	na	1E-03	na	1E-02	na	8E-01	na
Molybdenum	8E-03	na	7E-03	na	6E-02	na	3E-01	na	2E-03	na	2E-03	na	2E-03	na	4E-03	na	5E-01	na
Nickel	2E-03	1E-10	1E-03	7E-11	2E-02	5E-10	1E-01	6E-10	2E-02	5E-10	2E-02	6E-10	5E-03	5E-11	3E-03	9E-11	2E-01	2E-10
Selenium	5E-02	na	7E-02	na	**2E+00**	na	**2E+00**	na	1E-01	na	1E-01	na	5E-02	na	8E-02	na	**3E+00**	na
Silver	4E-04	na	1E-04	na	3E-03	na	2E-02	na	6E-04	na	7E-04	na	3E-04	na	2E-04	na	6E-02	na
Thallium	3E-01	na	3E-01	na	**3E+00**	na	**4E+00**	na	4E-02	na	4E-02	na	1E-02	na	5E-02	na	**9E+00**	na
Uranium	2E-03	na	8E-04	na	2E-02	na	6E-02	na	3E-03	na	3E-03	na	2E-03	na	1E-03	na	1E-01	na
Vanadium	2E-02	na	1E-02	na	2E-01	na	5E-01	na	1E-01	na	1E-01	na	5E-02	na	2E-02	na	1E+00	na
Zinc	2E-02	na	2E-02	na	4E-01	na	1E+00	na	8E-04	na	1E-03	na	5E-04	na	4E-03	na	1E+00	na
TOTAL	HI	ELCR	HI	ELCR	HI	ELCR	HI	ELCR	HI	ELCR	HI	ELCR	HI	ELCR	HI	ELCR	HI	ELCR
	5E-01	**3E-06**	5E-01	1E-06	**1E+01**	**6E-05**	**2E+01**	**4E-05**	4E-01	**9E-06**	4E-01	**9E-06**	2E-01	1E-06	3E-01	9E-07	**3E+01**	**8E-05**

Notes:

Summarizes results of Tier 1 Reasonable Maximum Exposure (RME) analyses; refer to Appendices J through R for more information.

Hazard and risk estimates are rounded to 1 significant digit.

HH COPC = human health chemical of potential concern

HI = hazard index

ELCR = excess lifetime cancer risk

Non-cancer hazards >1 are highlighted in gray.

Cancer risks >1E-05 are highlighted in gray.

Cancer risks >1E-06 are in bold font.

na = not applicable

TABLE 6-3
Summary of Lifetime Non-Cancer Hazards and Cancer Risks for all Receptors - with Contributing Pathway Information (Non-Radionuclides)

Receptor	Lifestage[1]	Exposure Area	Non-Cancer (HI)	HH COPCs with HQ > 1	Contributing Pathways[2]	Cancer (ELCR)	HH COPCs with ELCR > 1E-5	Contributing Pathways[2]
Industrial Worker (Current and Future)	Adult	Mined Area	<1	--	--	**3E-06**	None	--
Recreational Hunter (Current and Future)	Lifetime	Site-wide	<1	--	--	1E-06	None	--
Seasonal Rancher (Current)	Adult	Non-Mined Area	**1E+01**	Cobalt, Selenium, Thallium	DWS (Selenium), Livestock (Cobalt, Thallium)	**6E-05**	Arsenic	The order of risk driving media for arsenic are: DWS, livestock, and soil.
Seasonal Rancher (Future)	Lifetime	Non-Mined Area and Mined Area BLM Land	**2E+01**	Cadmium, Cobalt, Selenium, Thallium	DWS (Selenium), Livestock (Cobalt and Thallium), Garden Produce (Cadmium)	**4E-05**	Arsenic	The order of risk driving media for arsenic are: DWS, garden produce, and livestock.
Livestock Herder (Current)	Adult	Non-Mined Area	<1	--	--	**9E-06**	None	--
Livestock Herder (Future)	Adult	Non-Mined Area and Mined Area BLM Land	<1	--	--	**9E-06**	None	--
Recreational Trespasser (Current and Future)	Lifetime	Site-wide	<1	--	--	1E-06	None	--
Native American (Current and Future)	Lifetime	Non-Mined Area and Mined Area BLM Land	<1	--	--	9E-07	None	--
Hypothetical Resident (Future)	Lifetime	Site-wide	**3E+01**	Cadmium, Cobalt, Iron, Selenium, Thallium	DWS (Selenium, Iron[3]), Livestock (Cobalt, Iron[3], Thallium), Garden Produce (Cadmium)	**8E-05**	Arsenic	The order of risk driving media for arsenic are: DWS, garden produce, livestock, culturally-significant plants, and soil.

Notes:
Summarizes results of Tier 1 Reasonable Maximum Exposure (RME) analyses; refer to Appendices J through R for more information.
Hazard and risk estimates are rounded to 1 significant digit.
BLM = Bureau of Land Management
DWS = Domestic water supply
ELCR = excess lifetime cancer risk
HH COPC = human health chemical of potential concern
HI = hazard index
HQ = hazard quotient
Non-cancer hazards >1 are highlighted in gray.
Cancer risks >1E-05 are highlighted in gray.
Cancer risks >1E-06 are in bold font.
1 - Potential hazards/risks to other life stages are presented in Appendix J through R. Adult hazards/risks are presented when the scenario only consisted of an adult receptor; lifetime hazards/risks are presented when the scenario contained adult, youth, and/or child life stages.
2 - Ingestion pathways are listed; dermal exposure and inhalation are insignificant when compared to ingestion pathways.
3 - HQs for exposure pathways for iron are at/below 1, but when summed, the HQ for total ingestion pathway is slightly greater than 1. DWS and Livestock are two individual pathways contributing to that hazard.

TABLE 6-4
Overall Summary of Lifetime Cancer Risks for All Receptors – Radionuclides

Receptor	Cancer (ELCR)
Industrial Worker (current and future)	**8E-06**
Recreational Hunter (current and future)	**4E-06**
Recreational Trespasser (current and future)	**4E-06**
Seasonal Rancher (current)	**3E-04**
Seasonal Rancher (future)	**5E-04**
Livestock Herder (current)	**2E-05**
Livestock Herder (future)	**2E-05**
Native American (current and future)	**3E-06**
Hypothetical Resident (future)	**2E-03**
Hypothetical Future Resident exposed to “Background”	**1E-02**

Notes:

Summarizes results of Tier 1 Reasonable Maximum Exposure (RME) analyses; refer to Appendix S for more information.

Risk estimates are rounded to 1 significant digit.

ELCR = excess lifetime cancer risk

Cancer risks >1E-05 are highlighted in gray.

Cancer risks >1E-06 are in bold font.

TABLE 6-5
Summary of Radionuclide EPCs and Lifetime Cancer Risks for Select Receptors

Receptor [1]	Soil and Water Radionuclide EPCs [2]	Pathway-Specific Cancer Risk	Overall Cancer Risk (ELCR)
Current Seasonal Rancher	Soil: 9.5 mg/kg (3.1 pCi/g)	1E-05 (mostly related to soil ingestion)	**3E-04**
	DWS: 3.6E-03 mg/L (1.2 pCi/L)	3E-04 (>99% of pathway risk from ingestion pathway)	
Future Seasonal Rancher	Soil: 9.4 mg/kg (3.1 pCi/g)	7E-05 (mostly produce ingestion; increased risk for this scenario when compared to Current Seasonal Rancher is mostly due to including produce in this scenario)	**5E-04**
	DWS: 5.3E-03 mg/L (1.8 pCi/L)	4E-04 (>99% of pathway risk from ingestion pathway)	
Current Livestock Herder	Soil: 9.5 mg/kg (3.1 pCi/g)	1E-05 (mostly related to soil ingestion and external exposure)	**2E-05**
	Surface water: 1.6E-03 mg/L (5E-01 pCi/L)	5E-06 (mostly related to ingestion)	
Future Livestock Herder	Soil: 9.4 mg/kg (3.1 pCi/g)	1E-05 (mostly related to soil ingestion and external exposure)	**2E-05**
	Surface water: 2.2E-03 mg/L (7E-01 pCi/L)	7E-06 (mostly related to ingestion)	
Hypothetical Future Resident	Soil: 23 mg/kg (7.4 pCi/g)	3E-04 (>99% from homegrown produce ingestion pathway)	**2E-03**
	DWS: 5.3E-03 mg/L (1.8 pCi/L)	2E-03 (>99% of pathway risk from ingestion pathway)	
Hypothetical Future Resident Background	Background Soil [3] – 1.5 mg/kg (4.9E-01 pCi/g)	1E-04 (86% from homegrown produce ingestion pathway)	**1E-02**
	Public Water Supply (MCL) [4] – 0.03 mg/L (1E+01 pCi/L)	1E-02 (>99% from ingestion pathway)	

Notes:

Summarizes results of Tier 1 Reasonable Maximum Exposure (RME) analyses; refer to Appendix S for more information.

1 - Receptors with overall lifetime ELCR less than 1E-05 are not presented on this table; refer to Table 6-4 and Appendix S for more information.

Risk estimates are rounded to 1 significant digit.

DWS = Domestic water supply

ELCR = excess lifetime cancer risk

MCL = maximum contaminant level

Overall cancer risks >1E-05 are highlighted in gray.

2 - Radionuclide EPCs are based on uranium and uranium decay products (see Appendix S-1). Soil and water EPCs are presented; EPCs for other pathways are listed in Appendix S-1.

3 - Site-specific surface soil 95UCL background value calculations presented in Appendix T.

4 - Concentration equivalent to the Federal uranium MCL of 0.03 mg/L (USEPA 2015).

U.S. Environmental Protection Agency (USEPA). 2015. National Primary Drinking Water Standards and National Secondary Drinking Water. Office of Water, EPA 816-F-03-016. Available at http://water.epa.gov/drink/contaminants/index.cfm.

TABLE 6-6
Summary of Lifetime Non-Cancer Hazards for All Receptors - Using Alternative Uranium RfDs

HH COPC	Industrial Worker			Recreational Hunter			Seasonal Rancher - Current			Seasonal Rancher - Future			Livestock Herder - Current		
	Using IRIS RfD[1]	Using USEPA RfD[2]	Using ATSDR RfD[3]	Using IRIS RfD[1]	Using USEPA RfD[2]	Using ATSDR RfD[3]	Using IRIS RfD[1]	Using USEPA RfD[2]	Using ATSDR RfD[3]	Using IRIS RfD[1]	Using USEPA RfD[2]	Using ATSDR RfD[3]	Using IRIS RfD[1]	Using USEPA RfD[2]	Using ATSDR RfD[3]
Uranium	2E-03	1E-02	3E-02	8E-04	4E-03	1E-02	2E-02	9E-02	3E-01	6E-02	3E-01	8E-01	3E-03	1E-02	4E-02
TOTAL for all HH COPCs	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI
	5E-01	6E-01	6E-01	5E-01	6E-01	6E-01	**1E+01**	**1E+01**	**1E+01**	**2E+01**	**2E+01**	**2E+01**	4E-01	4E-01	4E-01

HH COPC	Livestock Herder - Future			Recreational Trespasser			Native American			Hypothetical Resident		
	Using IRIS RfD[1]	Using USEPA RfD[2]	Using ATSDR RfD[3]	Using IRIS RfD[1]	Using USEPA RfD[2]	Using ATSDR RfD[3]	Using IRIS RfD[1]	Using USEPA RfD[2]	Using ATSDR RfD[3]	Using IRIS RfD[1]	Using USEPA RfD[2]	Using ATSDR RfD[3]
Uranium	3E-03	1E-02	4E-02	2E-03	8E-03	2E-02	1E-03	5E-03	1E-02	1E-01	6E-01	**2E+00**
TOTAL for all HH COPCs	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI
	4E-01	5E-01	5E-01	2E-01	2E-01	2E-01	3E-01	3E-01	3E-01	**3E+01**	**3E+01**	**3E+01**

Notes:
Summarizes results of Tier 1 Reasonable Maximum Exposure (RME) analyses; refer to Appendices J through R for more information.
Hazard estimates are rounded to 1 significant digit.
Non-cancer hazards >1 are highlighted in gray.

ATSDR = Agency for Toxic Substances and Disease Registry
HH COPC = human health chemical of potential concern
HI = hazard index
IRIS - Integrated Risk Information System
mg/kg-day = milligram per kilogram per day
MRL = minimal risk level
RfD = Reference Dose
RME = Reasonable Maximum Exposure
USEPA = U.S. Environmental Protection Agency
USGS = U.S. Geological Survey

Uranium RfDs

RfD mg/kg-day	Source
0.003	1 - from IRIS (USEPA 2016)
0.0006	2 - Chronic RfD; for the uranium MCL developed by the Office of Ground Water and Drinking Water (USEPA/USGS 2000)
0.0002	3 - Intermediate-duration oral MRL from ATSDR (2013)

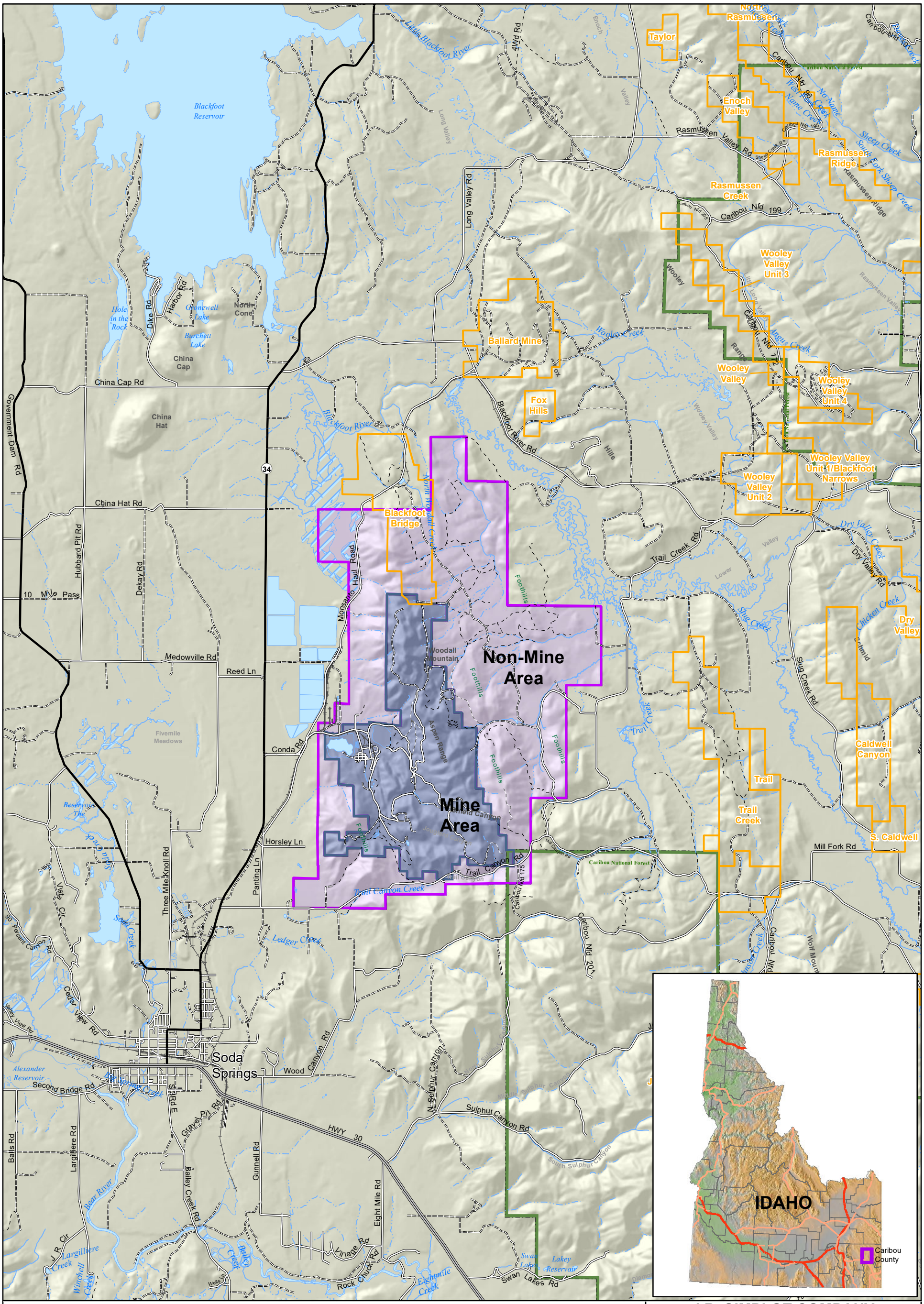
References:

ATSDR. 2013. Toxicological Profile for Uranium. U.S. Department of Health and Human Services. Public Health Service. Atlanta, GA. February. Available at http://www.atsdr.cdc.gov/ToxProfiles/tp150.pdf.

U.S. Environmental Protection Agency (USEPA). 2016. Integrated Risk Information System (IRIS). Available at https://www.epa.gov/iris. (Website last updated June 27, 2016; accessed June 27, 2016).

U.S. Environmental Protection Agency (USEPA) and U.S. Geological Survey (USGS). 2000. Radionuclides Notice of Data Availability Technical Support Document. Targeting and Analysis Branch, Standards and Risk Management Division, Office of Ground Water and Drinking Water, USEPA. Prepared by USEPA Office of Ground Water and Drinking Water in collaboration with USEPA Office of Indoor Air and Radiation and USGS. March. Available at https://www.epa.gov/sites/production/files/2015-09/documents/2009_04_16_radionuclides_regulation_radionuclides_rulemaking_techsupportdoc.pdf.

FIGURES



J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

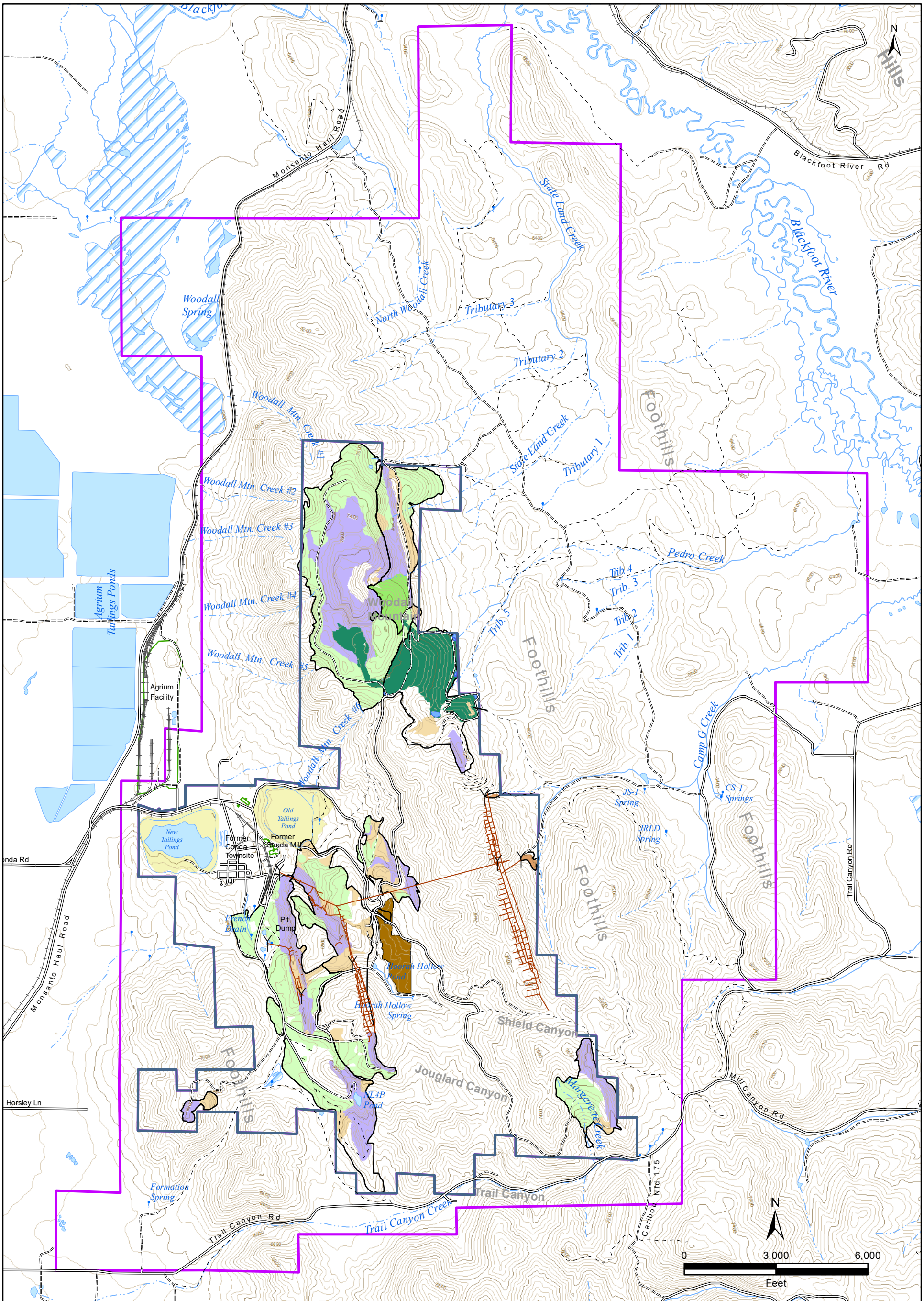
FIGURE 1-1

CONDA/WOODALL MOUNTAIN PHOSPHATE MINE LOCATION

DATE: DEC 2016
BY: CRL
FOR: RCR

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_1-01_VicinityMap.mxd



Legend

- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream
- Spring/Seep
- Lake/Pond
- Reservoir
- Swamp/Marsh
- Underground Workings
- Adit Portal
- Mined Area
- Non-Mined Area
- Mine Panels
- Dinwoody Formation Borrow Area
- NTCRA/FSPS sedimentation basins

Residual Mining Materials (RMM)

- Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
- Reclaimed Overburden Disposal Area
- Reclaimed Pit
- Disturbed Pit
- Disturbed Tailings
- Disturbed Overburden Disposal Area
- Waste Rock Piles

Note: O.B. = Overburden

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

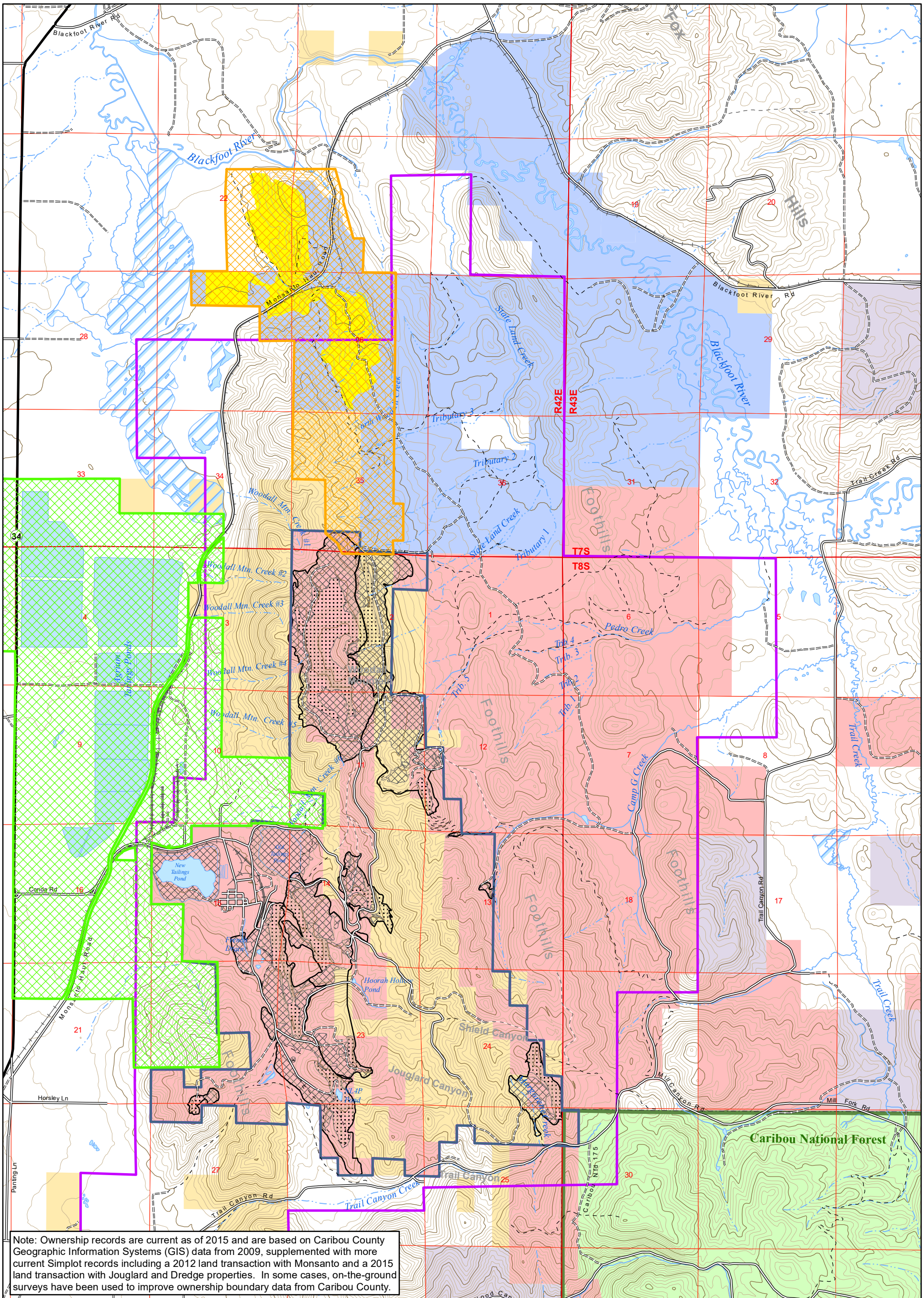
FIGURE 1-2

CONDA/WOODALL MOUNTAIN MINE FEATURES

DATE: DEC 2016
BY: EEB
FOR: RCR

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_1-02_CondaMineFeatures.mxd



Note: Ownership records are current as of 2015 and are based on Caribou County Geographic Information Systems (GIS) data from 2009, supplemented with more current Simplot records including a 2012 land transaction with Monsanto and a 2015 land transaction with Jouglard and Dredge properties. In some cases, on-the-ground surveys have been used to improve ownership boundary data from Caribou County.

Legend

- Major Road
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh

Land Ownership

- BLM
- J.R. Simplot Co.
- State of Idaho
- USDA Forest Service
- Monsanto
- Monsanto Active Mine

Current and Potential Future Natural Resource Use

- Agrium Boundary
- Blackfoot Bridge Project Boundary
- Residual Mining Material
- Open Pits

- Mined Area
- Non-Mined Area

N

0 2,500 5,000
Feet

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

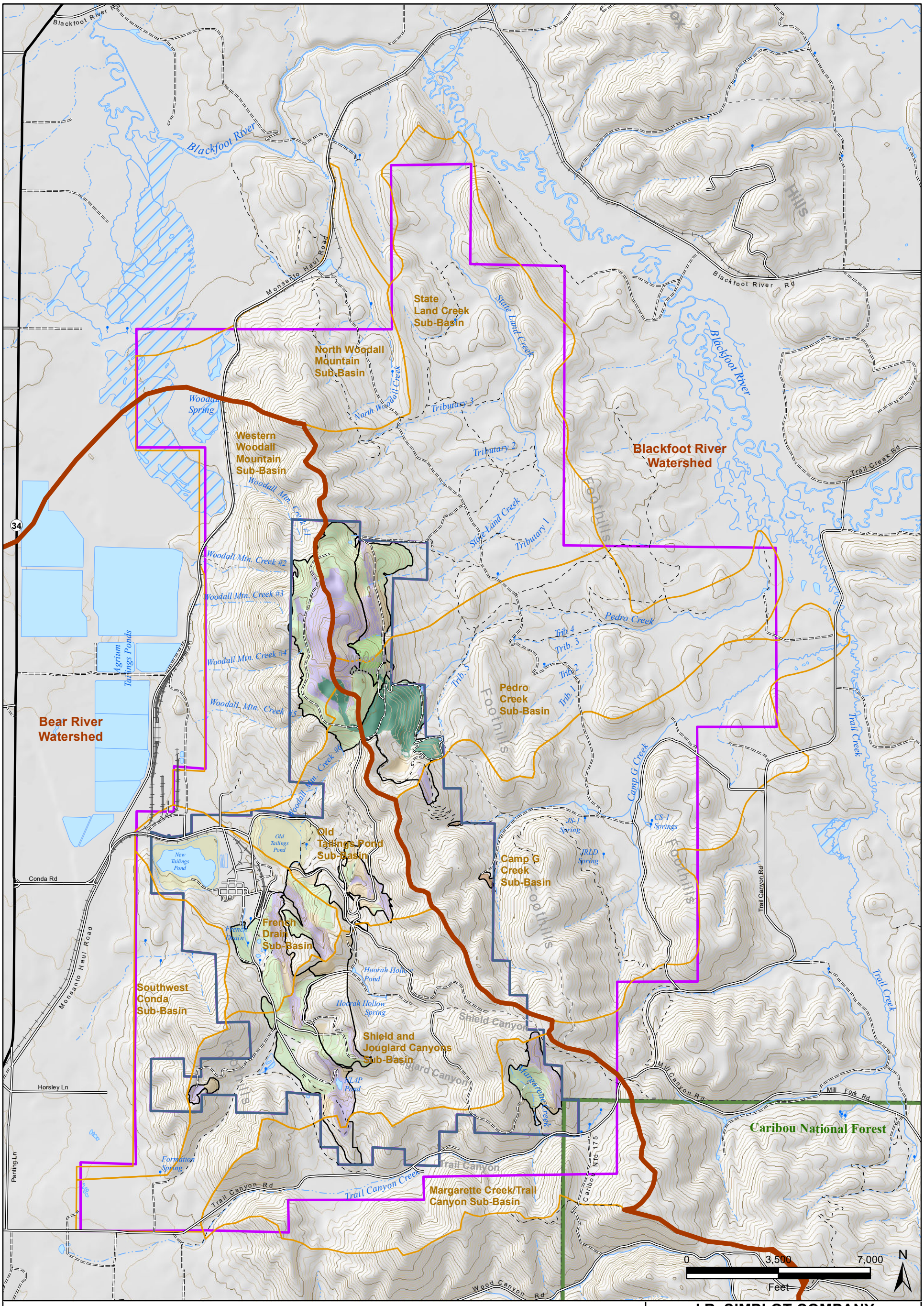
FIGURE 2-1

LAND OWNERSHIP AND LAND USE

DATE: DEC 2016
BY: EEB
FOR: RCR

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_2-01_LandOwnership.mxd



Legend

- Major Road
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh
- Mined Area
- Non-Mined Area
- Sub-Basins
- Major Watershed Boundary

Residual Mining Materials (RMM)

- Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
- Reclaimed Overburden Disposal Area
- Reclaimed Pit
- Disturbed Pit
- Disturbed Tailings
- Disturbed Overburden Disposal Area
- Waste Rock Piles

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

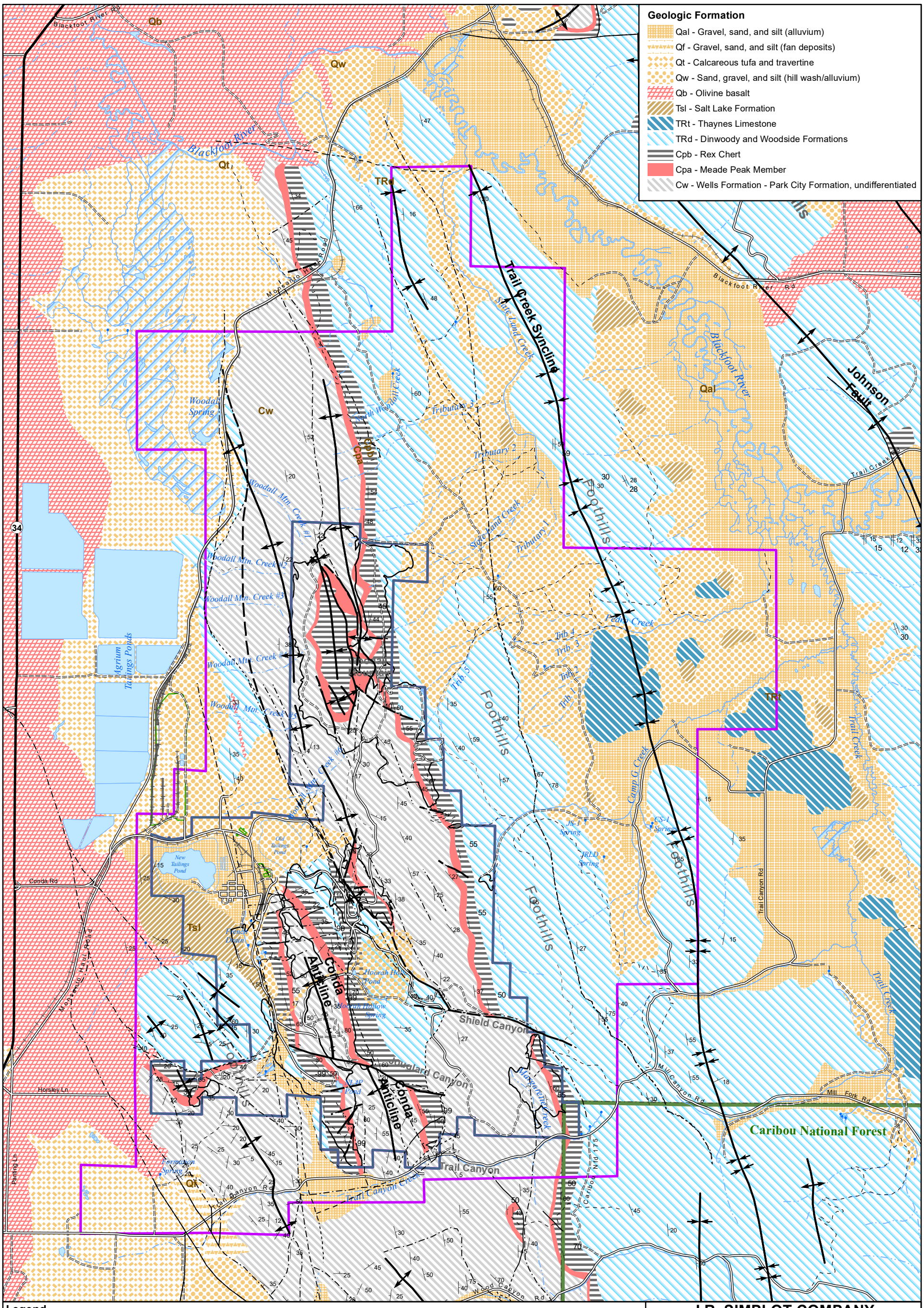
FIGURE 2-2

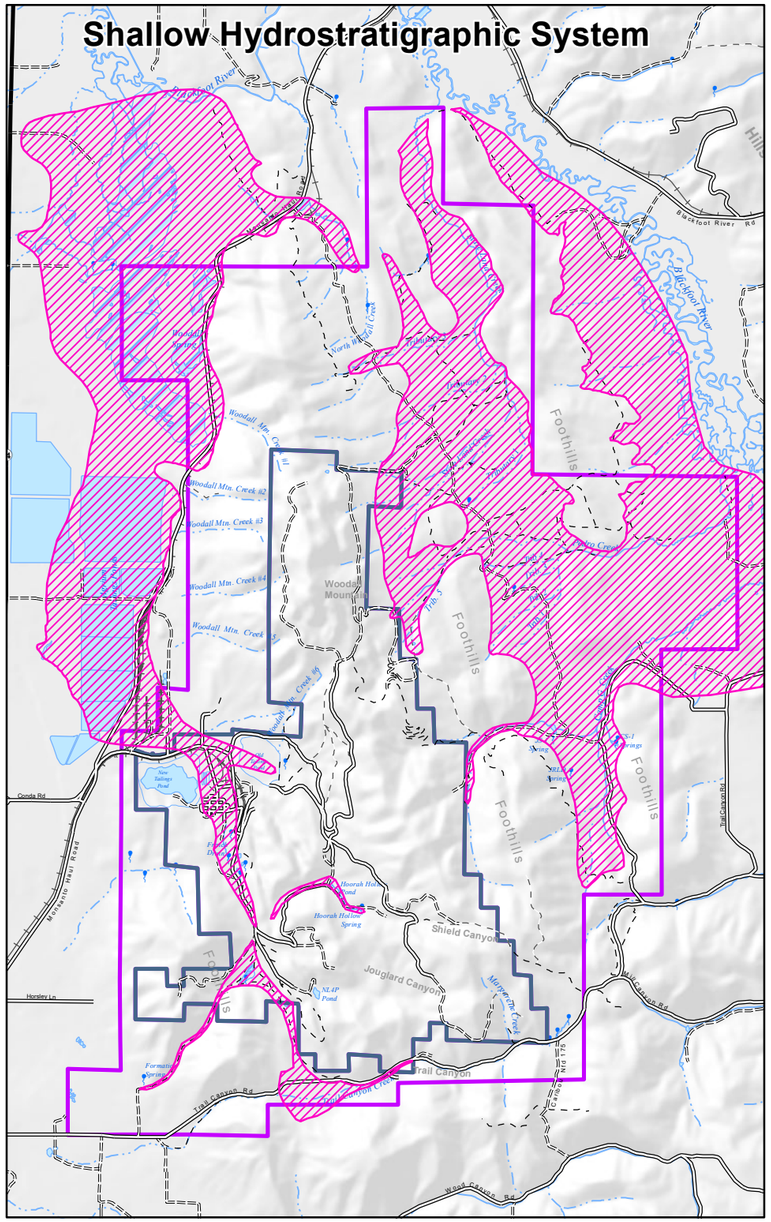
SURFACE WATER DRAINAGES AND SUB-BASIN BOUNDARIES

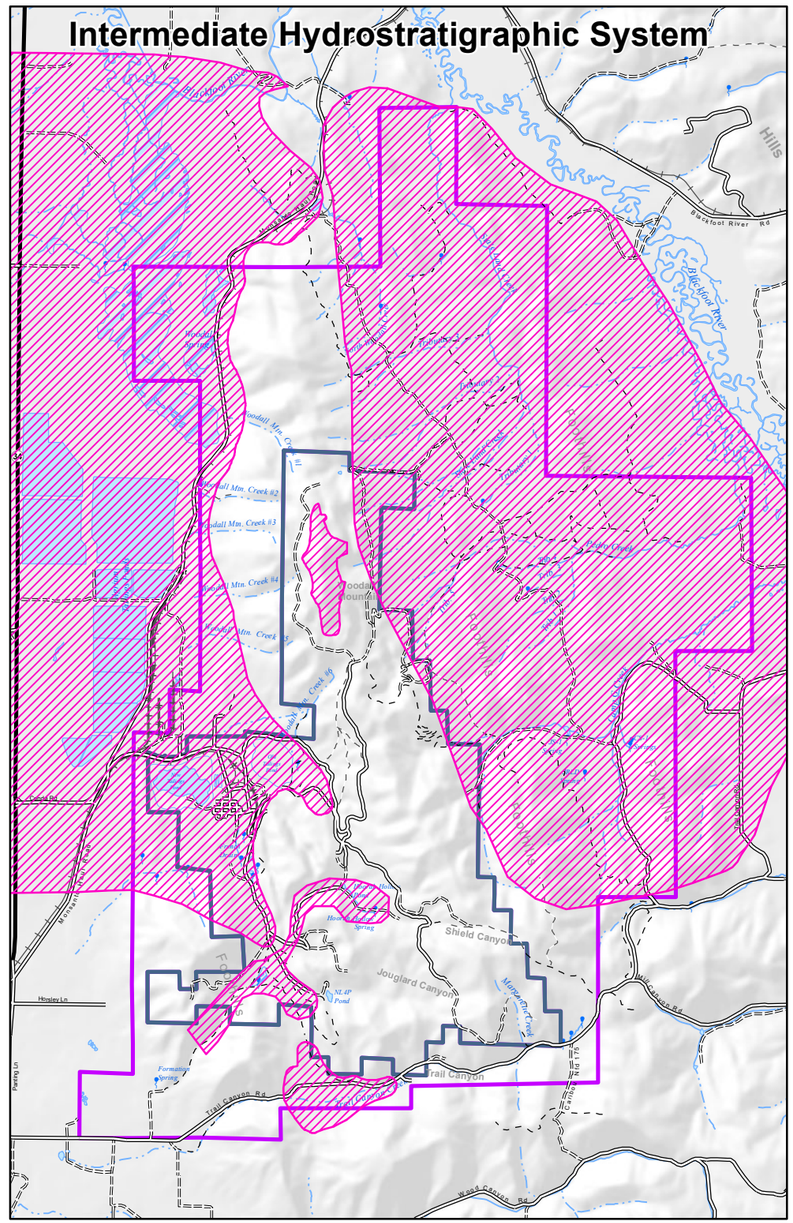
DATE: DEC 2016
BY: EEB
FOR: RCR

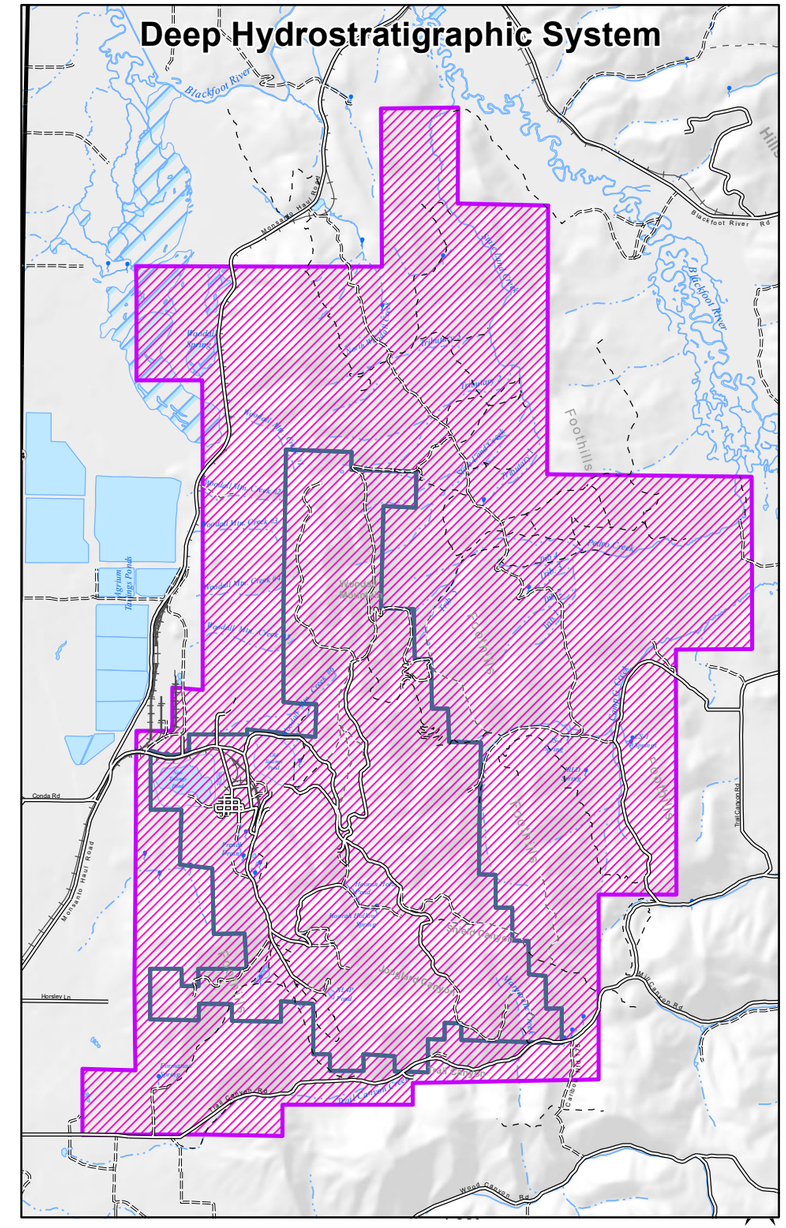
FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_2-02_SW_Drainages.mxd


Geologic Formation
Qal - Gravel, sand, and silt (alluvium)
Qf - Gravel, sand, and silt (fan deposits)
Qt - Calcareous tufa and travertine
Qw - Sand, gravel, and silt (hill wash/alluvium)
Qb - Olivine basalt
Tsl - Salt Lake Formation
TRt - Thaynes Limestone
TRd - Dinwoody and Woodside Formations
Cpb - Rex Chert
Cpa - Meade Peak Member
Cw - Wells Formation - Park City Formation, undifferentiated
Trail Creek Syncline
Johnson Fault
Foothills
Conda Anticline
Caribou National Forest
Blackfoot River
Trail Canyon
Shield Canyon
Woodall Mtn. Creek
Trail Creek
Mosaic Tailings Ponds
Conda Rd
Horsley Ln
Mosaic Haul Road
Blackfoot River Rd
Trail Canyon Rd
Mill Canyon Rd
Mill Fork Rd
Wood Canyon Rd
Caribou Nfd 175
Trail Canyon Creek
Pedro Creek
Camp G Creek
Slate Land Creek
Tributary 1
Tributary 2
Tributary 3
Woodall Spring
Old Tailings Pond
New Tailings Pond
French Drain
Hoorah Hollow Pond
Hoorah Hollow Spring
Formation Spring
JS-1 Spring
JRLD Spring
CS-1 Spring
Legend
Major Road
Minor Road
Unimproved Road
Trail (4WD)
Trail (Other than 4WD)
Railroad
Intermittent Stream
Perennial Stream
Lake/Pond
Reservoir
Swamp/Marsh
Mined Area
Non-Mined Area
Mine Panels
Strike/Dip
Strike/Dip Overturned
Fault, Buried
Fault, Confirmed
Fault, Inferred
Anticline
Overturned Anticline
Syncline
N
0
2,500
5,000
Feet
Note: Geology compiled from USGS 1927 geologic maps of the Henry, James, and Slug Creek quadrangle and the 1969 Soda Springs quadrangle, and updated using Conda-specific information obtained from mining exploration and RI-related borings.
J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT
FIGURE 2-3
SURFACE GEOLOGY MAP
DATE: DEC 2016
BY: EEB
FOR: RCR
FORMATION ENVIRONMENTAL
S:\GIS\arcpro\2010139\plt\RIA_2015\SSHRA\Fig_2-03_SurfaceGeology.mxd







Legend

- Major Road
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Spring/Seep
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh
- Mined Area
- Non-Mined Area
- Hydrostratigraphic System Extent

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

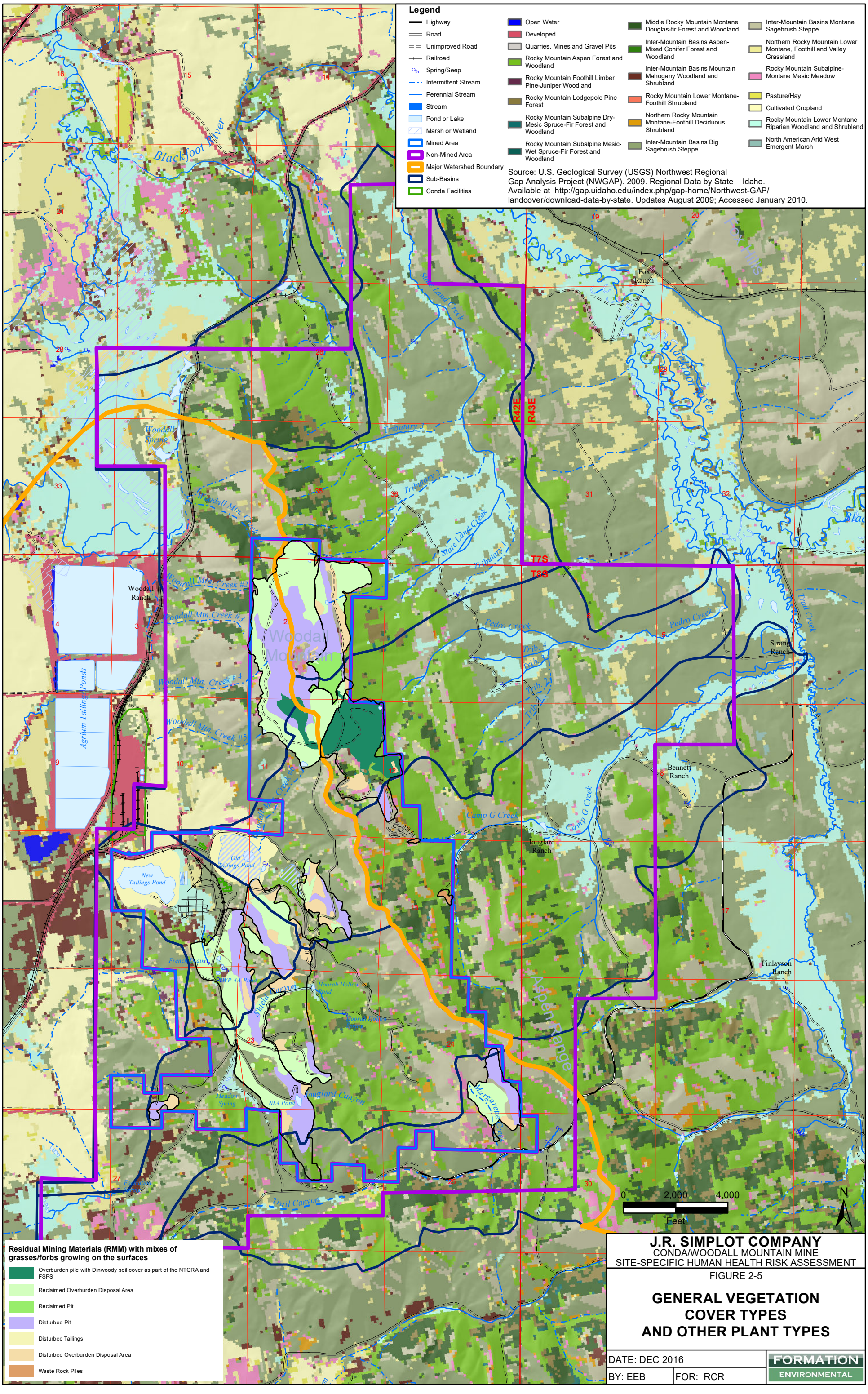
FIGURE 2-4

GENERAL BOUNDARIES OF THE HYDROSTRATIGRAPHIC SYSTEMS

DATE: DEC 2016
BY: EEB
FOR: RCR

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_2-04_HydroStratSys.mxd


Legend
Highway
Road
Unimproved Road
Railroad
Spring/Seep
Intermittent Stream
Perennial Stream
Stream
Pond or Lake
Marsh or Wetland
Mined Area
Non-Mined Area
Major Watershed Boundary
Sub-Basins
Conda Facilities
Open Water
Developed
Quarries, Mines and Gravel Pits
Rocky Mountain Aspen Forest and Woodland
Rocky Mountain Foothill Limber Pine-Juniper Woodland
Rocky Mountain Lodgepole Pine Forest
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland
Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland
Middle Rocky Mountain Montane Douglas-fir Forest and Woodland
Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland
Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland
Rocky Mountain Lower Montane-Foothill Shrubland
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland
Inter-Mountain Basins Big Sagebrush Steppe
Inter-Mountain Basins Montane Sagebrush Steppe
Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland
Rocky Mountain Subalpine-Montane Mesic Meadow
Pasture/Hay
Cultivated Cropland
Rocky Mountain Lower Montane Riparian Woodland and Shrubland
North American Arid West Emergent Marsh
Source: U.S. Geological Survey (USGS) Northwest Regional Gap Analysis Project (NWGAP). 2009. Regional Data by State – Idaho. Available at http://gap.uidaho.edu/index.php/gap-home/Northwest-GAP/landcover/download-data-by-state. Updates August 2009; Accessed January 2010.
Blackfoot River
Woodall Spring
Woodall Mtn. Creek
Woodall Mtn. Creek #2
Woodall Mtn. Creek #3
Woodall Mtn. Creek #4
Woodall Mtn. Creek #5
Woodall Mtn. Creek #6
Woodall Ranch
Agrium Tailings Ponds
Woodall Mountain
State Land Creek
Tributary 3
Tributary 2
Tributary 1
Pedro Creek
Trib. 4
Trib. 3
Trib. 2
Trib. 1
Fox Ranch
Fox Hills
Strong Ranch
Trail Creek
Bennett Ranch
Camp G Creek
Jouglard Ranch
Old Tailings Pond
New Tailings Pond
French Drainage
PWP-4A-Pond
Shield Canyon
Hoorah Hollow Pond
Hoorah Hollow Spring
Meadow Spring
NL4 Pond
Jouglard Canyon
Margaret Lake
Aspen Range
Finlayson Ranch
Trail Canyon
R42E
R43E
T7S
T8S
0 2,000 4,000
Feet
N
Residual Mining Materials (RMM) with mixes of grasses/forbs growing on the surfaces
Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
Reclaimed Overburden Disposal Area
Reclaimed Pit
Disturbed Pit
Disturbed Tailings
Disturbed Overburden Disposal Area
Waste Rock Piles
J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT
FIGURE 2-5
GENERAL VEGETATION COVER TYPES AND OTHER PLANT TYPES
DATE: DEC 2016
BY: EEB
FOR: RCR
FORMATION ENVIRONMENTAL
S:\GIS\arcprj2\0101\39\plt\RIA_2015\SSHHRA\fig_2-05_VegCoverTypes.mxd

Sources:
Bureau of Land Management (BLM). 2012. Range Pastures of Idaho (RANGE_NOC_GrazingPastures_PUB_100K_POLY.shp). Spatial Data Set. BLM, Idaho State Office, Boise, ID. Available at http://cloud.insideidaho.org/data/blm. Dated Jan 2012; accessed Nov 2015.

U.S. Forest Service (USFS). 2008. Range allotments shapefile - in Geographic Information System (GIS) coverages provided by Caribou National Forest, via e-mail. April 2008.

Woodall Ranch 04386

Woodall Spring 04338

Woodall Mountain 04554

Conda Mine 10020

Trail Canyon-1 04226

Trail Canyon-2 04289

North Sulphur 20220

Caribou National Forest

Legend

- Major Road
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh
- Mined Area
- Non-Mined Area
- Mine Panel Boundary

USFS Grazing Allotments

- North Sulphur

BLM Grazing Allotments

- Conda Mine
- North Sulphur And Trail
- Trail Canyon-1
- Trail Canyon-2
- Woodall Mountain
- Woodall Ranch
- Woodall Spring

N

0 2,500 5,000
Feet

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

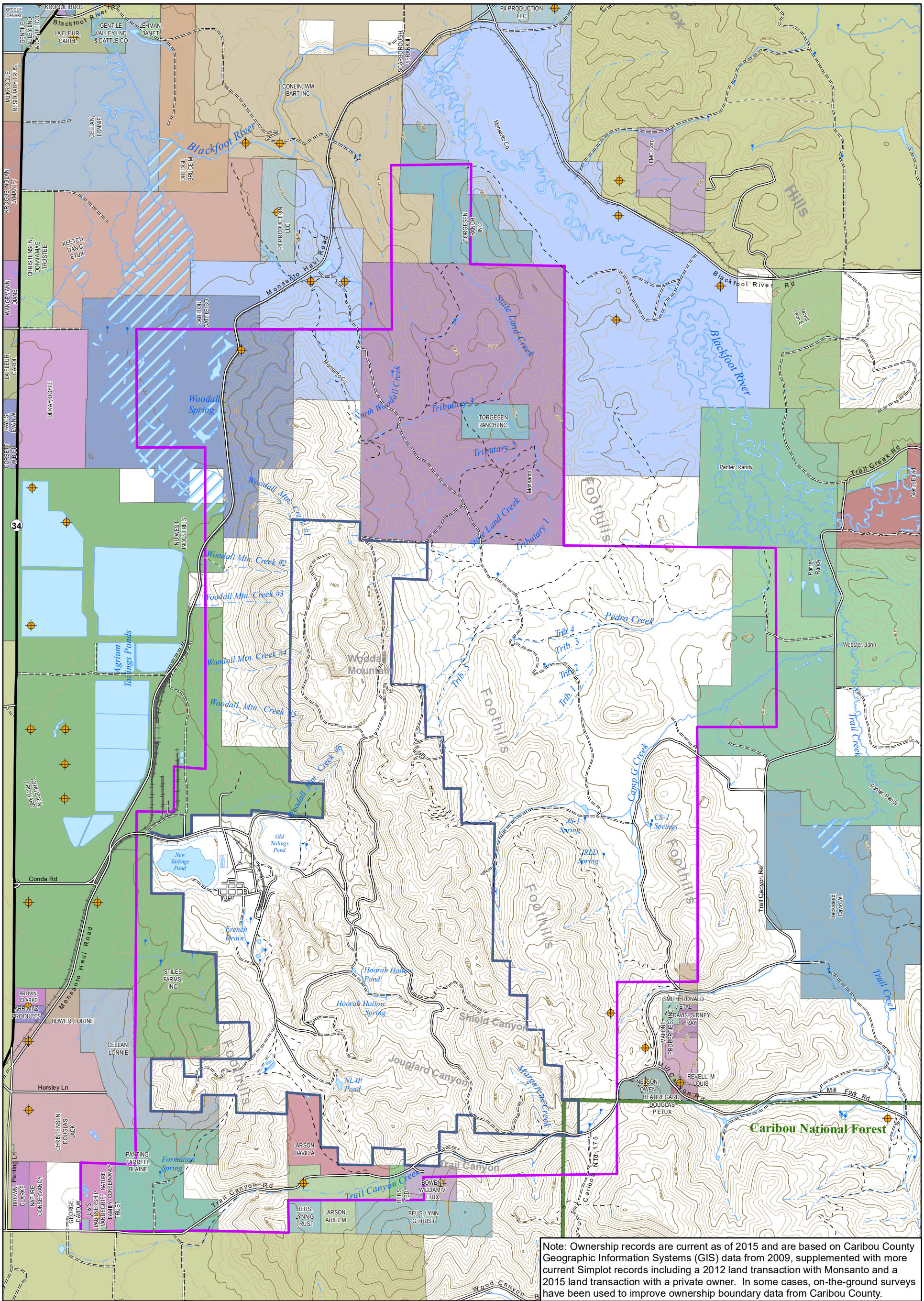
FIGURE 2-6

GRAZING ALLOTMENTS

DATE: DEC 2016
BY: EEB FOR: RCR

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_2-06_GrazingAllotments.mxd



Note: Ownership records are current as of 2015 and are based on Caribou County Geographic Information Systems (GIS) data from 2009, supplemented with more current Simplot records including a 2012 land transaction with Monsanto and a 2015 land transaction with a private owner. In some cases, on-the-ground surveys have been used to improve ownership boundary data from Caribou County.

Legend

- Major Road
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh
- Mined Area
- Non-Mined Area
- Domestic Well Location

N

0 2,500 5,000
Feet

J.R. SIMPLOT COMPANY

CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

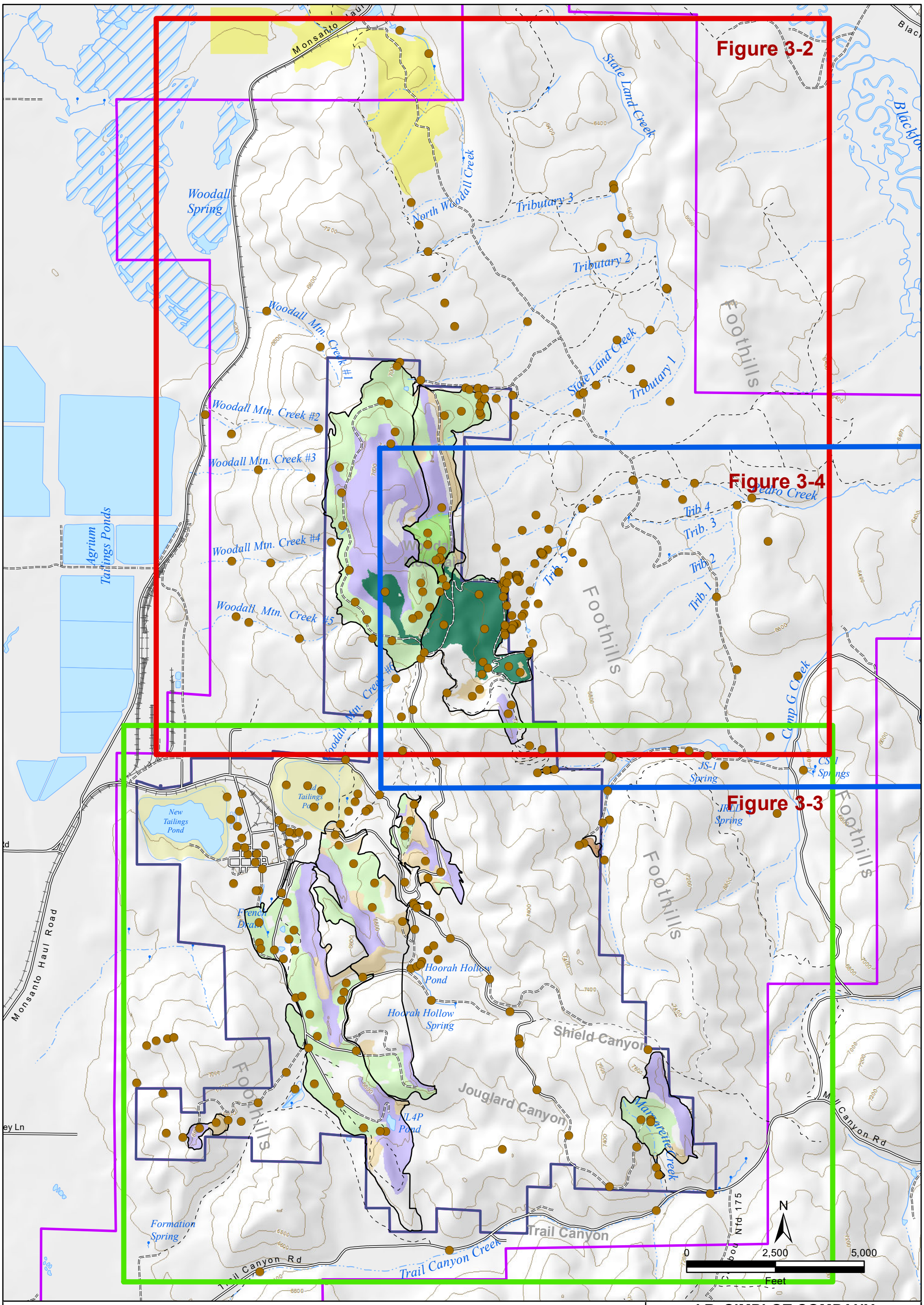
FIGURE 2-7

PRIVATE LAND AND DOMESTIC WELLS SURROUNDING CONDA MINE

DATE: DEC 2016
BY: CRL
FOR: KSR

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_2-7_DomesticWells.mxd



Legend

- Mine Panels
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Surface Soil Sampling Location
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh
- Monsanto Active Mine

Residual Mining Materials (RMM)

- Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
- Reclaimed Overburden Disposal Area
- Reclaimed Pit
- Disturbed Pit
- Disturbed Tailings
- Disturbed Overburden Disposal Area
- Waste Rock Piles

- Mined Area
- Non-Mined Area
- Figure 3-2 - North
- Figure 3-4 - East
- Figure 3-3 - South

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

FIGURE 3-1

SURFACE SOIL SAMPLING LOCATIONS

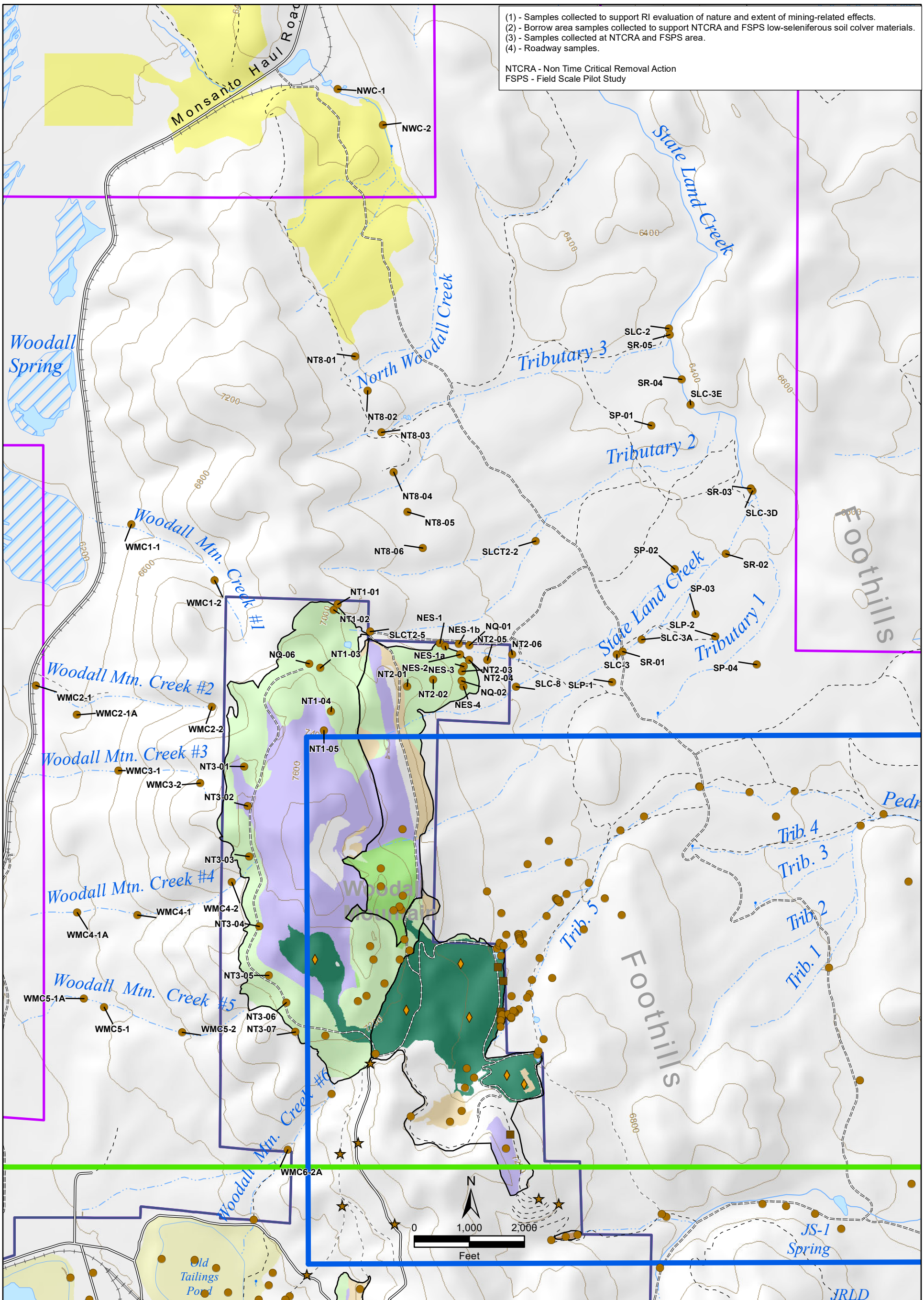
DATE: DEC 2016
BY: AKC
FOR: RPS

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_3-01_SL_Locs.mxd

(1) - Samples collected to support RI evaluation of nature and extent of mining-related effects.
(2) - Borrow area samples collected to support NTCRA and FSPS low-seleniferous soil colver materials.
(3) - Samples collected at NTCRA and FSPS area.
(4) - Roadway samples.

NTCRA - Non Time Critical Removal Action
FSPS - Field Scale Pilot Study



Legend

- Nature & Extent Soil Sampling Location
- Soil Cover Sampling Location (2)
- FSPS/NTCRA Soil Sampling Location
- Road Soil Sampling Location (4)
- Mine Panels
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh
- Monsanto Active Mine

Residual Mining Materials (RMM)

- Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
- Reclaimed Overburden Disposal Area
- Reclaimed Pit
- Disturbed Pit
- Disturbed Tailings
- Disturbed Overburden Disposal Area
- Waste Rock Piles

- Mined
- Non-Mined
- Figure 3-2 - North
- Figure 3-4 - East
- Figure 3-3 - South

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

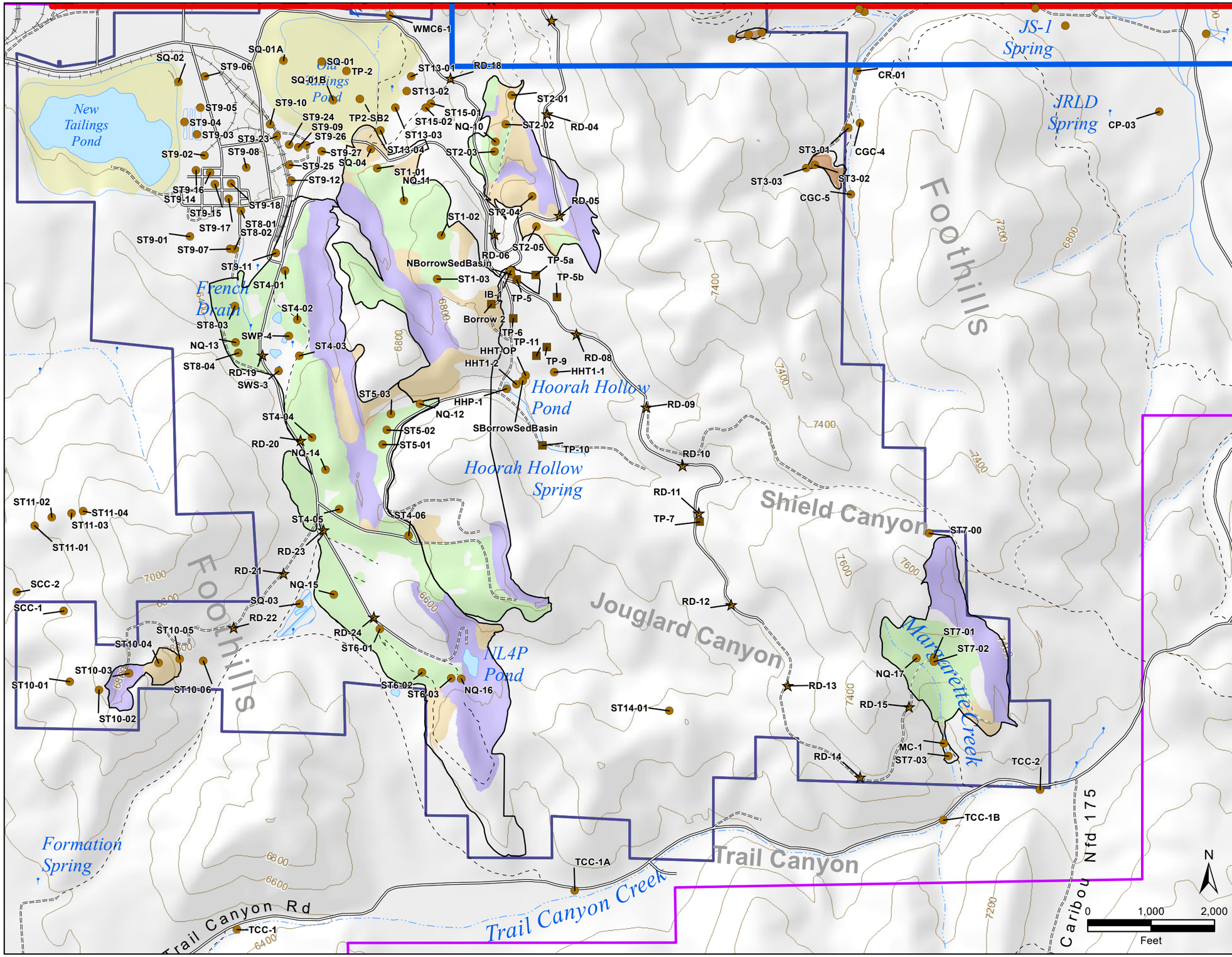
FIGURE 3-2

SURFACE SOIL SAMPLING LOCATIONS IN NORTH PORTION OF SITE

DATE: DEC 2016
BY: AKC
FOR: RPS

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\01\139\plt\RIA_2015\SSHHRA\Fig_3-02_SL_Locs_N.mxd



Legend

- Nature & Extent Soil Sampling Location (1)
- Soil Cover Sampling Location (2)
- FSPS/NTCRA Soil Sampling Location (3)
- Road Soil Sampling Location (4)
- Mine Panels
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh
- Monsanto Active Mine

Residual Mining Materials (RMM)

- Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
- Reclaimed Overburden Disposal Area
- Reclaimed Pit
- Disturbed Pit
- Disturbed Tailings
- Disturbed Overburden Disposal Area
- Waste Rock Piles
- Mined Area
- Non-Mined Area
- Figure 3-2 - North
- Figure 3-4 - East
- Figure 3-3 - South

(1) - Samples collected to support RI evaluation of nature and extent of mining-related effects.
(2) - Borrow area samples collected to support NTCRA and FSPS low-seleniferous soil colver materials.
(3) - Samples collected at NTCRA and FSPS area.
(4) - Roadway samples.

NTCRA - Non Time Critical Removal Action
FSPS - Field Scale Pilot Study

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

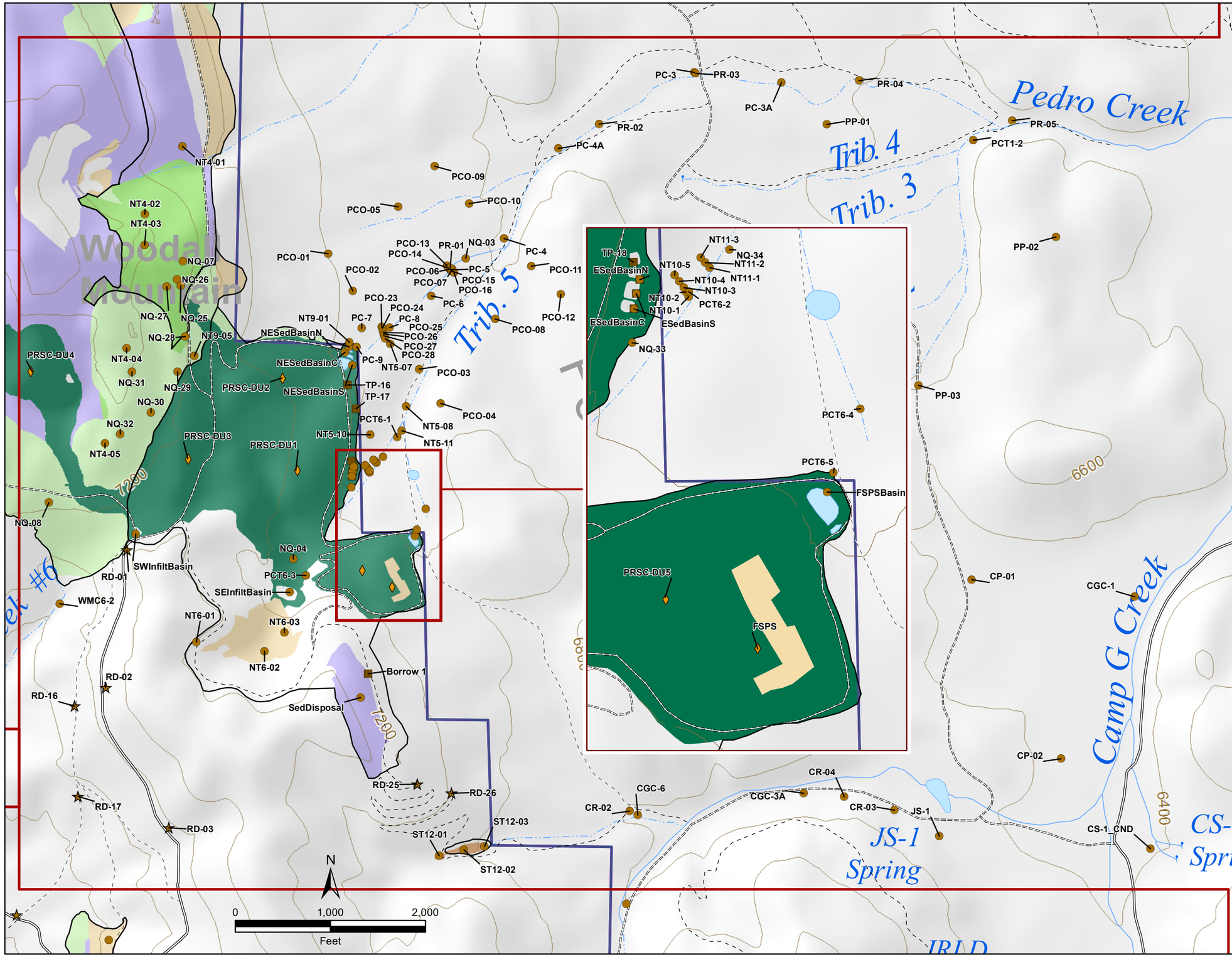
FIGURE 3-3

SURFACE SOIL SAMPLING LOCATIONS IN SOUTH PORTION OF SITE

DATE: DEC 2016
BY: AKC
FOR: RPS

FORMATION ENVIRONMENTAL

S:\GIS\arcpy\2010139\pit\RA_2015\SSHHRA\Fig_3-03_SL_Locs_S.mxd



Legend

- Nature & Extent Soil Sampling Location (1)
- Soil Cover Sampling Location (2)
- FSPS/NTCRA Soil Sampling Location (3)
- Road Soil Sampling Location (4)
- Mine Panels
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Monsanto Active Mine

Residual Mining Materials (RMM)

- Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
- Reclaimed Overburden Disposal Area
- Reclaimed Pit
- Disturbed Pit
- Disturbed Tailings
- Disturbed Overburden Disposal Area
- Waste Rock Piles
- Mined Area
- Non-Mined Area

(1) - Samples collected to support RI evaluation of nature and extent of mining-related effects.
(2) - Borrow area samples collected to support NTCRA and FSPS low-seleniferous soil colver materials.
(3) - Samples collected at NTCRA and FSPS area.
(4) - Roadway samples.

NTCRA - Non Time Critical Removal Action
FSPS - Field Scale Pilot Study

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

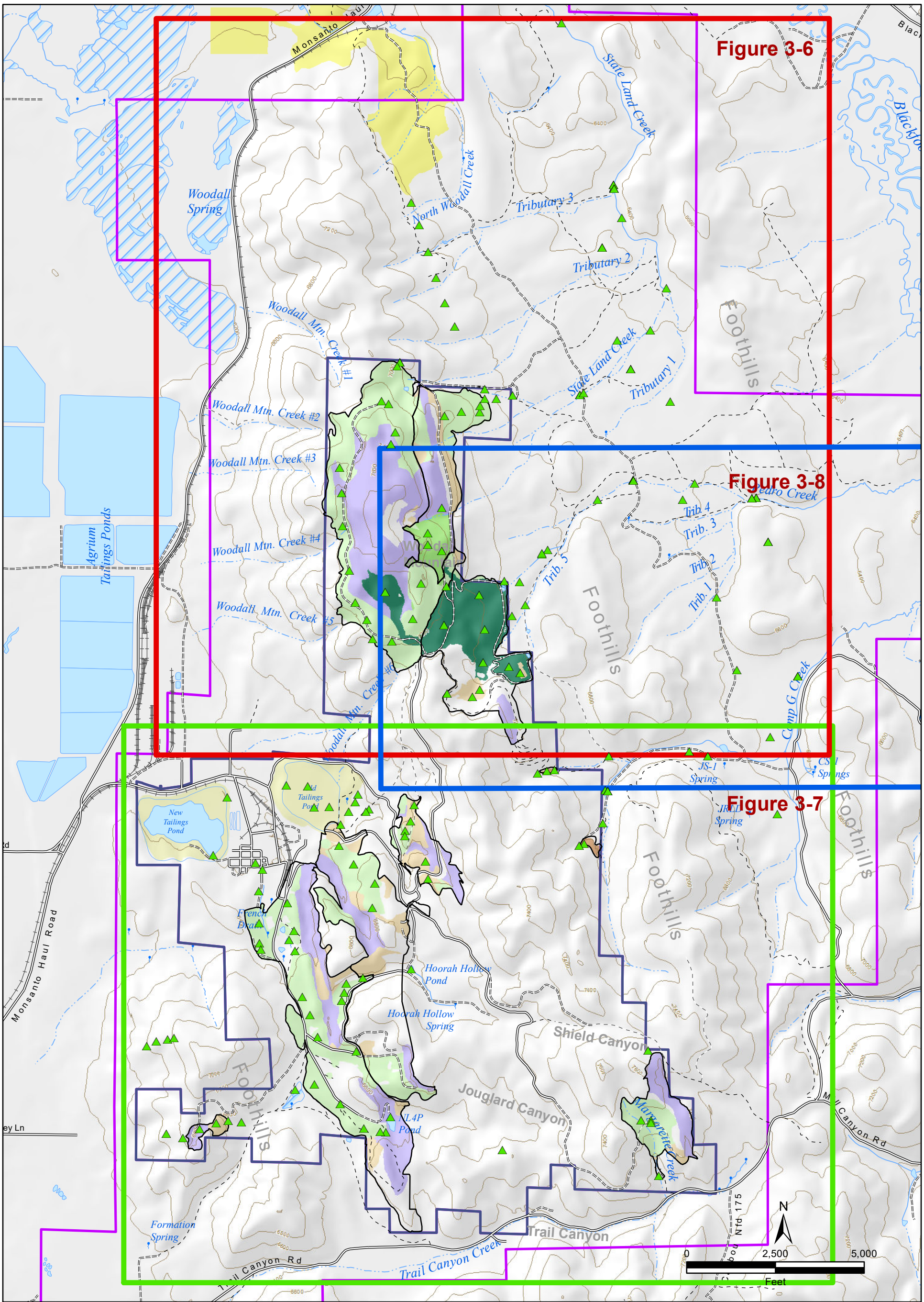
FIGURE 3-4

SURFACE SOIL SAMPLING LOCATIONS IN EAST PORTION OF SITE

DATE: DEC 2016
BY: AKC
FOR: RPS

FORMATION ENVIRONMENTAL

S:\GIS\arcpj2\010139\pltRIA_2015\SSHHRA\Fig_3-04_SL_Locs_Pedro.mxd



Legend

- Vegetation Sampling Location
- Mine Panels
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad

Note: Location labels are shown on figures 3-6 through 3-8

- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh
- Monsanto Active Mine Areas

Residual Mining Materials (RMM)

- Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
- Reclaimed Overburden Disposal Area
- Reclaimed Pit
- Disturbed Pit
- Disturbed Tailings
- Disturbed Overburden Disposal Area
- Waste Rock Piles

- Mined Area
- Non-Mined Area
- Figure 3-6 - North
- Figure 3-7 - South
- Figure 3-8 - East

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

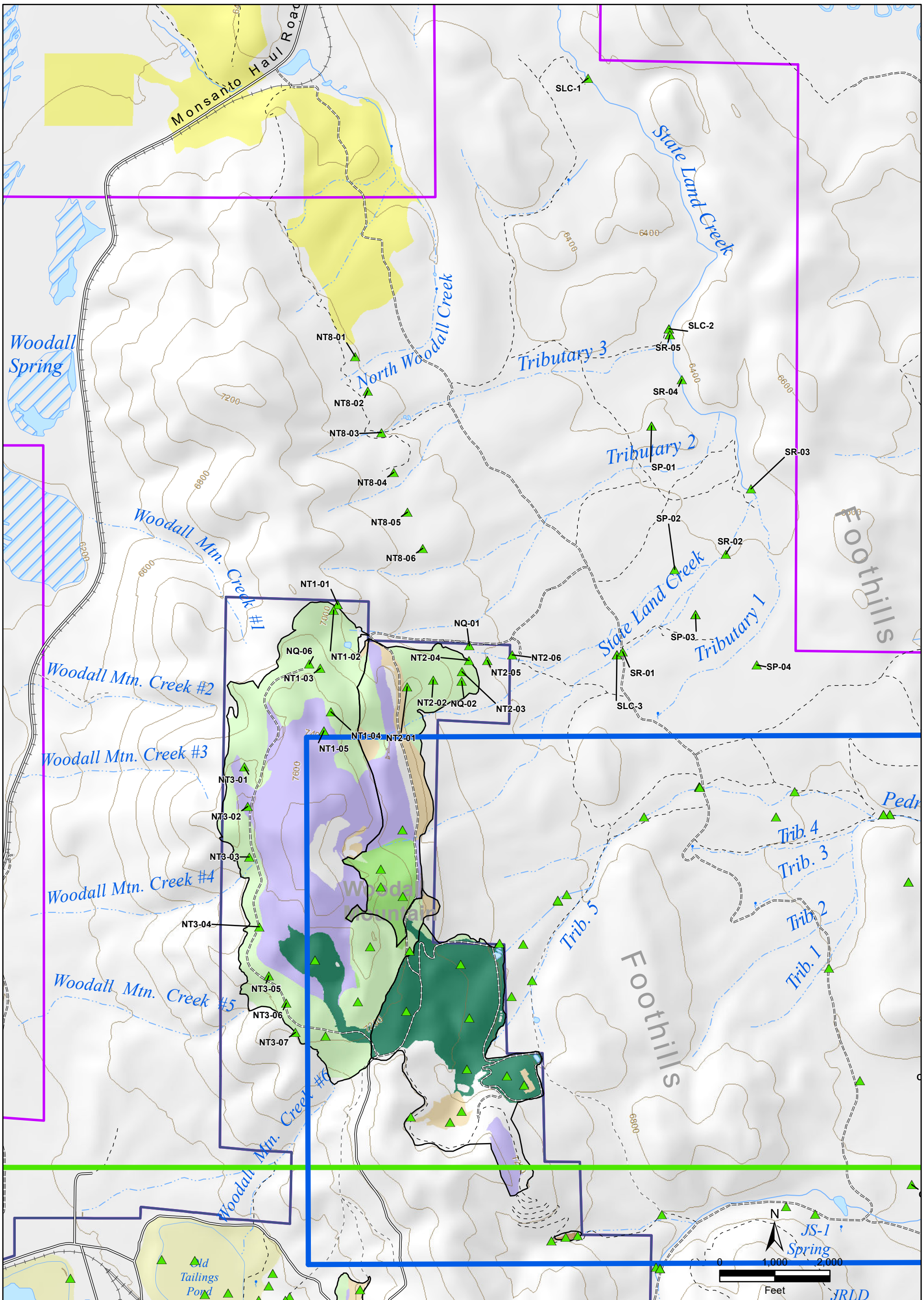
FIGURE 3-5

VEGETATION SAMPLING LOCATIONS

DATE: DEC 2016
BY: AKC
FOR: RPS

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_3-05_VG_Locs.mxd



Legend

- Vegetation Sampling Location
- Mine Panels
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh
- Monsanto Active Mine

Residual Mining Materials (RMM)

- Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
- Reclaimed Overburden Disposal Area
- Reclaimed Pit
- Disturbed Pit
- Disturbed Tailings
- Disturbed Overburden Disposal Area
- Waste Rock Piles

- Mined Area
- Non-Mined
- Figure 3-6 - North
- Figure 3-7 - South
- Figure 3-8 - East

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

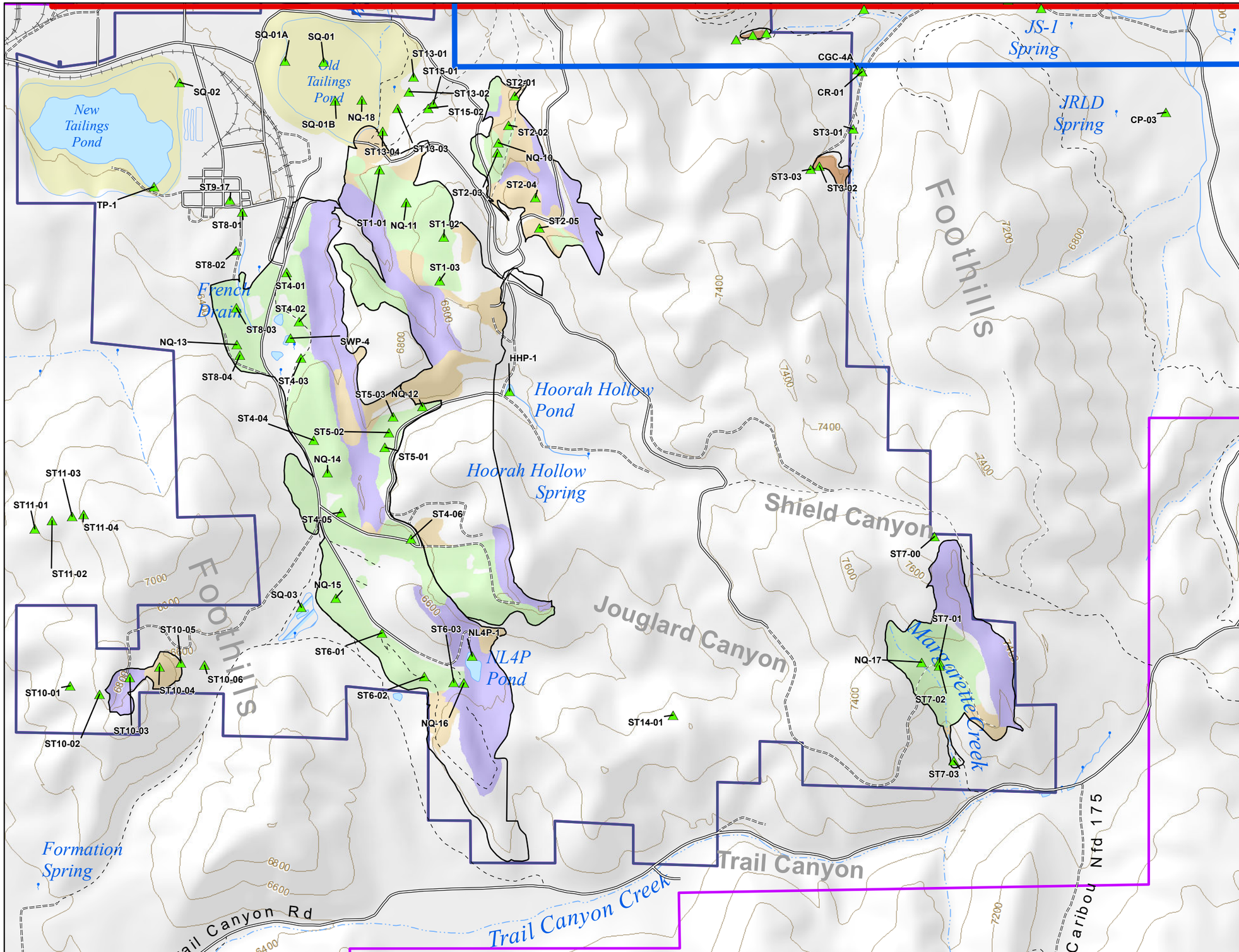
FIGURE 3-6

VEGETATION SAMPLING LOCATIONS IN NORTH PORTION OF SITE

DATE: DEC 2016
BY: AKC
FOR: RPS

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_3-06_VG_Locs_N.mxd



Legend

- Vegetation Sampling Location
- Mine Panels
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh
- Monsanto Active Mine

Residual Mining Materials (RMM)

- Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
- Reclaimed Overburden Disposal Area
- Reclaimed Pit
- Disturbed Pit
- Disturbed Tailings
- Disturbed Overburden Disposal Area
- Waste Rock Piles
- Mined Area
- Non-Mined Area
- Figure 3-6 - North
- Figure 3-7 - South
- Figure 3-8 - East

0 1,500 3,000 Feet

N

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

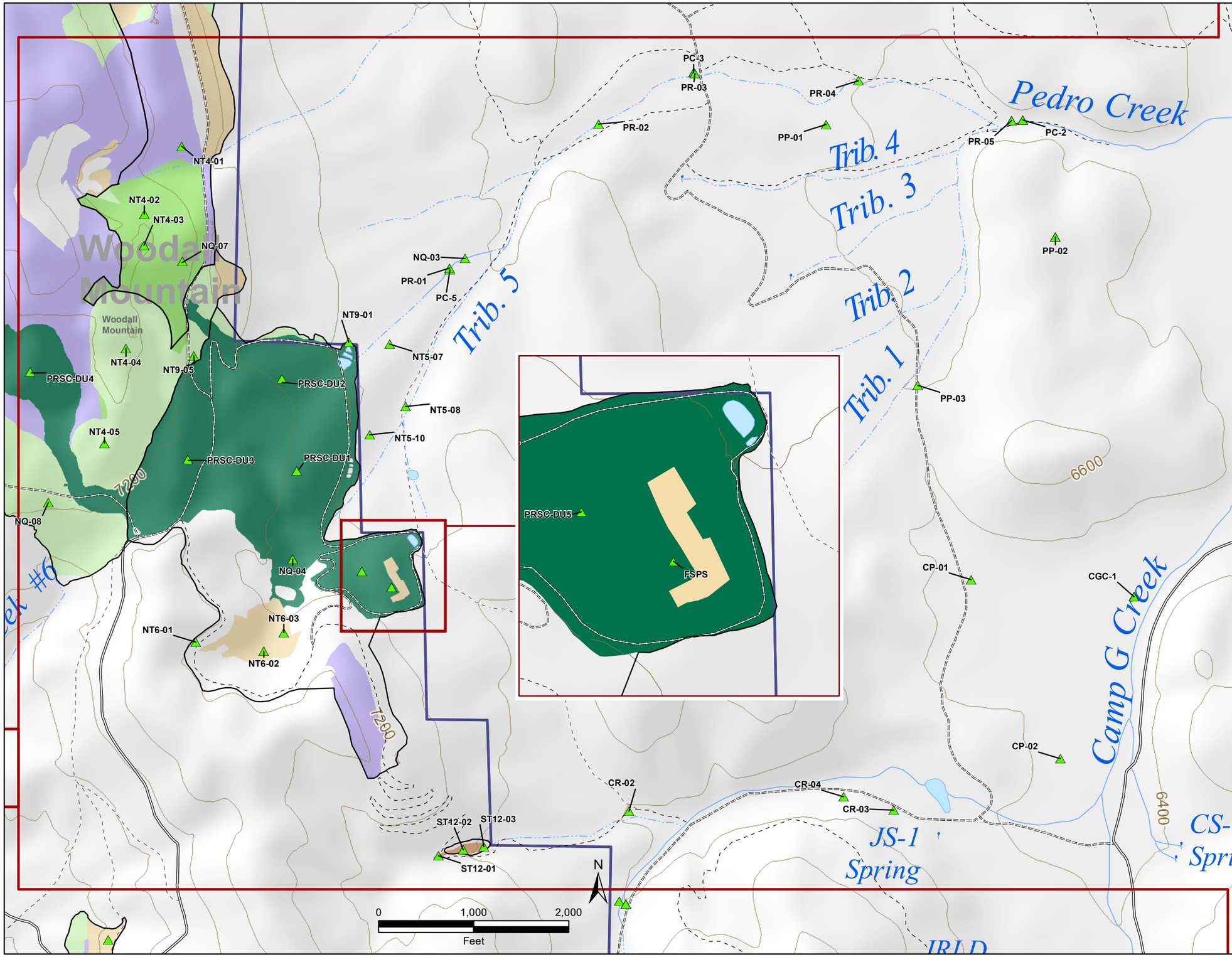
FIGURE 3-7

VEGETATION SAMPLING LOCATIONS IN SOUTH PORTION OF SITE

DATE: DEC 2016
BY: AKC FOR: RPS

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_3-07_VG_Locs_S.mxd



Legend

- Vegetation Sampling Location
- Mine Panels
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream
- Lake/Pond

Residual Mining Materials (RMM)

- Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
- Reclaimed Overburden Disposal Area
- Reclaimed Pit
- Disturbed Pit
- Disturbed Tailings
- Disturbed Overburden Disposal Area
- Waste Rock Piles
- Mined Area
- Non-Mined Area

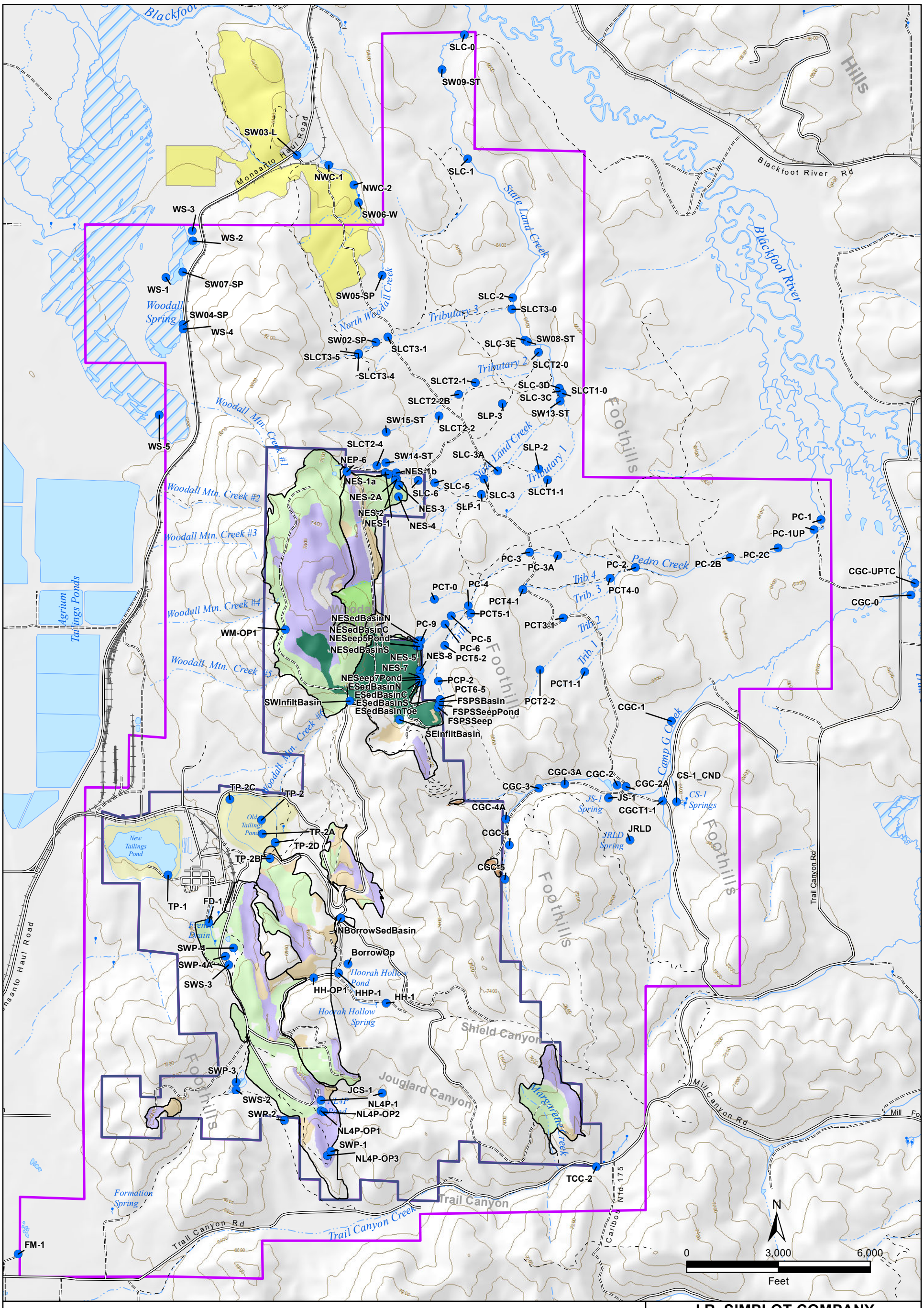
J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

FIGURE 3-8

VEGETATION SAMPLING LOCATIONS IN EAST PORTION OF SITE

DATE: DEC 2016
BY: AKC
FOR: RPS
FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_3-08_VG_Locs_Pedro.mxd



Legend

- Surface Water Sampling Location
- Mine Panels
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh
- Monsanto Active Mine

Residual Mining Materials (RMM)

- Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
- Reclaimed Overburden Disposal Area
- Reclaimed Pit
- Disturbed Pit
- Disturbed Tailings
- Disturbed Overburden Disposal Area
- Waste Rock Piles

- Mined Area
- Non-Mined Area

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

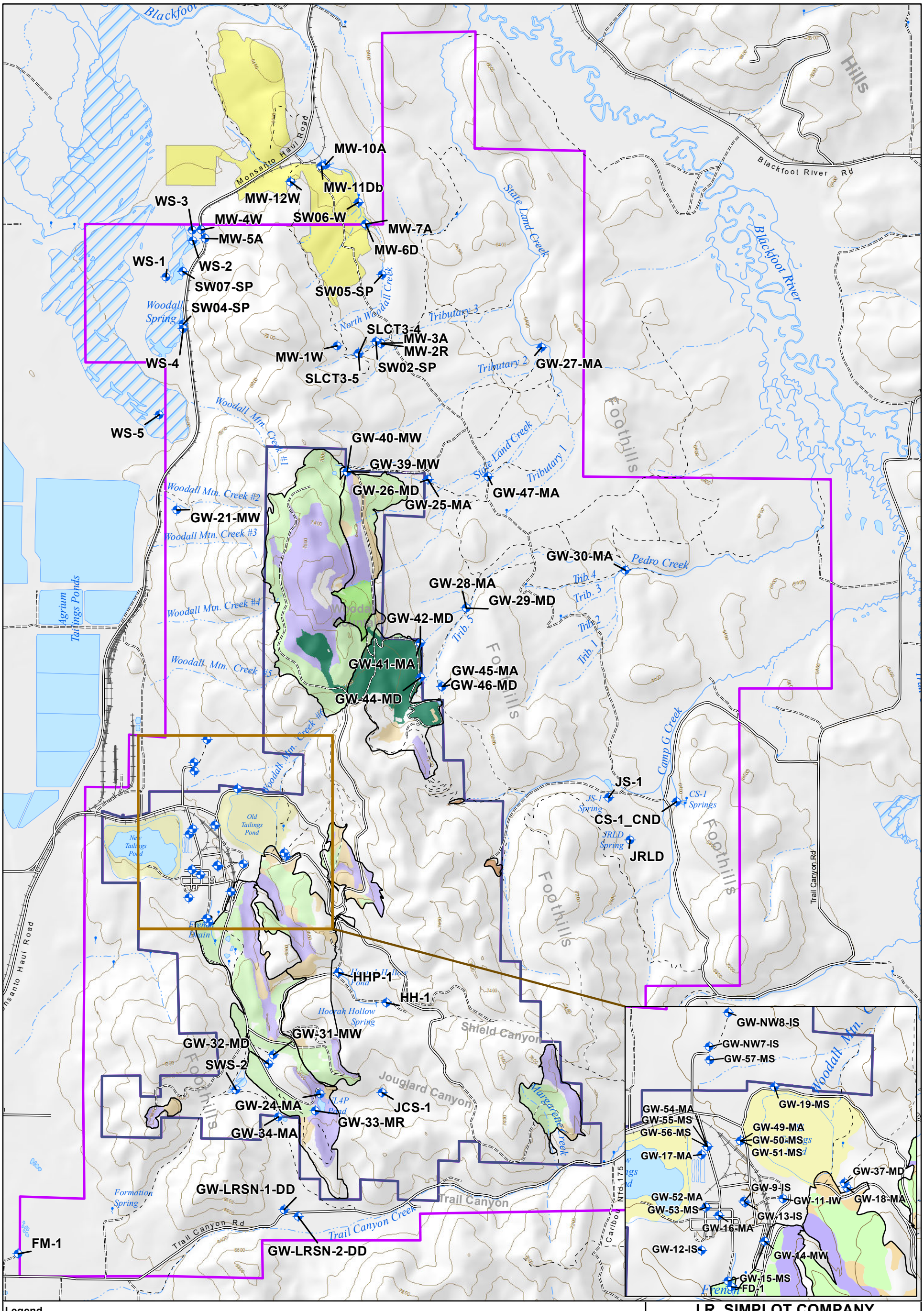
FIGURE 3-9

SURFACE WATER SAMPLING LOCATIONS

DATE: DEC 2016
BY: AKC
FOR: RPS

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_3-9_SW_Locs.mxd



Legend

- Domestic Water Supply Sampling Location
- Mine Panels
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh

Residual Mining Materials (RMM)

- Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
- Reclaimed Overburden Disposal Area
- Reclaimed Pit
- Disturbed Pit
- Disturbed Tailings
- Disturbed Overburden Disposal Area
- Waste Rock Piles

- Mined Area
- Non-Mined Area
- Monsanto Active Mine

N

0 2,500 5,000
Feet

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

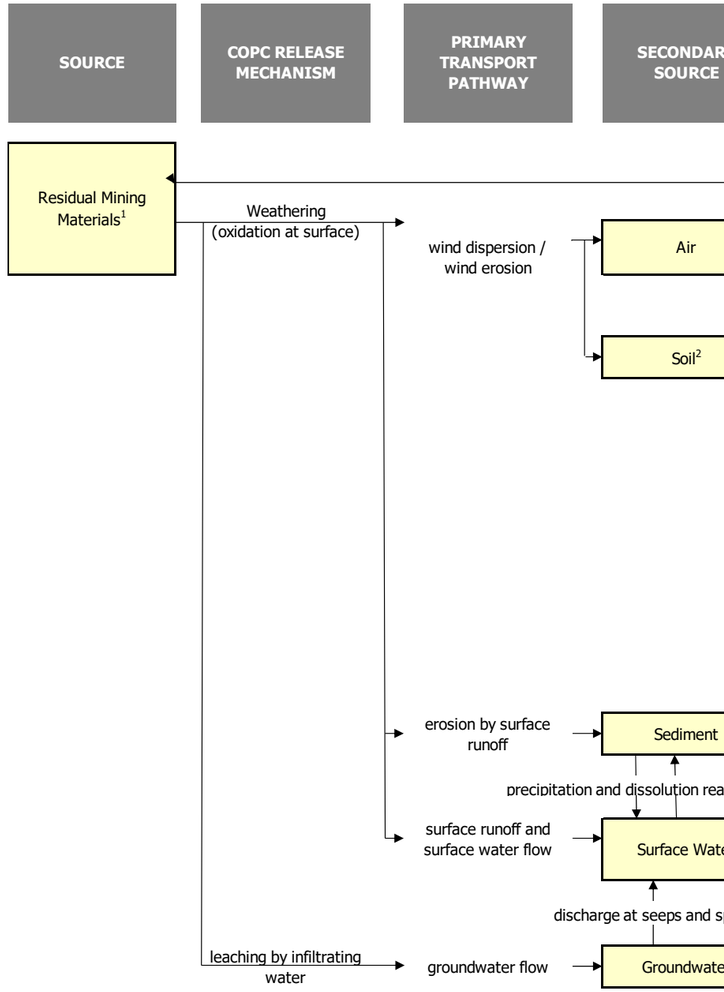
FIGURE 3-10

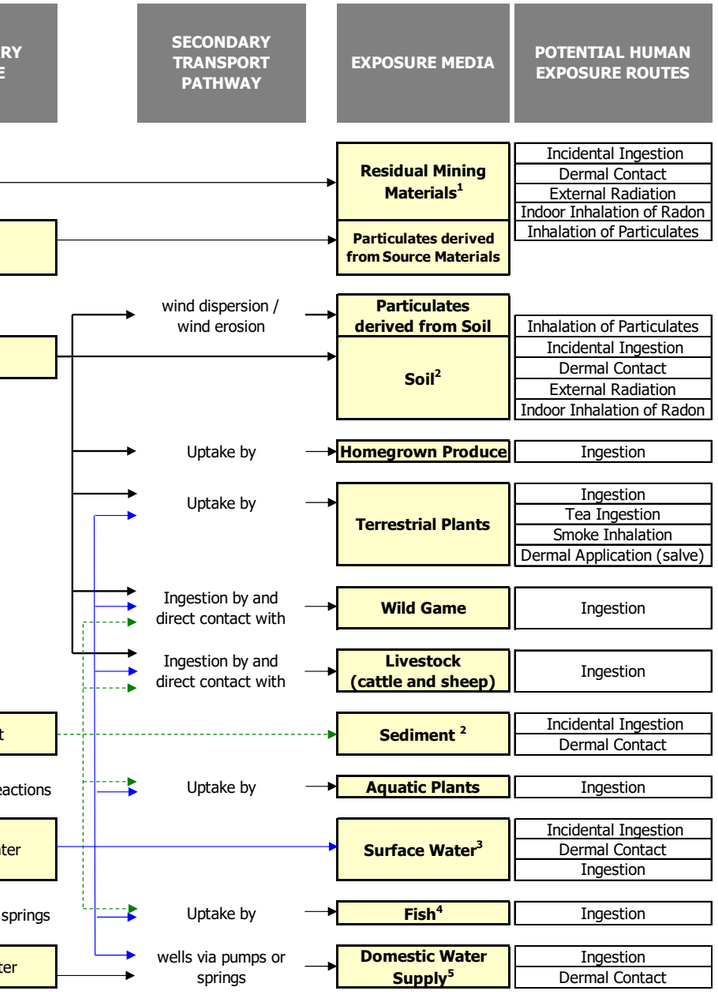
DOMESTIC WATER SUPPLY SAMPLING LOCATIONS

DATE: DEC 2016
BY: AKC
FOR: RPS

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHRA\Fig_3-10_DomWatSupply.mxd





EXPOSURE MEDIA	POTENTIAL HUMAN EXPOSURE ROUTES	Industrial Worker C/F	Recreational Hunter C/F	Seasonal Rancher C	Seasonal Rancher F	Off-Site Recreational Fisher[4] C/F	Recreating Trespasser C/F	Native American C/F	Livestock herder C/F	Hypothetical Resident F
Residual Mining Materials[1]	Incidental Ingestion	●	●	●	●		●	●	●	●
	Dermal Contact	●	●	●	●		●	●	●	●
	External Radiation	●	●	●	●		●	●	●	●
	Indoor Inhalation of Radon									●
Particulates derived from Source Materials	Inhalation of Particulates	●	●	●	●		●	●	●	●
Particulates derived from Soil	Inhalation of Particulates	●	●	●	●		●	●	●	●
Soil[2]	Incidental Ingestion	●	●	●	●		●	●	●	●
	Dermal Contact	●	●	●	●		●	●	●	●
	External Radiation	●	●	●	●		●	●	●	●
	Indoor Inhalation of Radon									●
Homegrown Produce	Ingestion				●					●
Terrestrial Plants	Ingestion							●		
	Tea Ingestion							●		
	Smoke Inhalation							⊙		
	Dermal Application (salve)							⊙		
Wild Game	Ingestion	●	●	●	●			●		●
Livestock (cattle and sheep)	Ingestion			●	●					●
Sediment[2]	Incidental Ingestion	⊙	⊙	⊙	⊙	⊗	⊙	⊙	⊙	⊙
	Dermal Contact	⊙	⊙	⊙	⊙	⊗	⊙	⊙	⊙	⊙
Aquatic Plants	Ingestion							●		●
Surface Water[3]	Incidental Ingestion	⊙	⊙	⊙	⊙	⊗	⊙	⊙	⊙	⊙
	Dermal Contact	⊙	●	⊙	⊙	⊗	●	●	●	⊙
	Ingestion	⊙	●	⊙	⊙	⊗	●	●	●	⊙
Fish[4]	Ingestion					⊗				
Domestic Water Supply[5]	Ingestion	●		●	●					●
	Dermal Contact	●		●	●					●

Notes:

[1] The Residual Mining Materials are generated during mining and include: waste rock, overburden piles, tailings, etc.

[2] Surface soils are soils (including samples from residual mining material) and non-aquatic sediment. Aquatic sediment exposure is considered potentially complete but insignificant and so is not listed on this table.

[3] Surface water is defined as streams, ponds, seeps, and springs.

[4] No edible size salmonid fish were observed within Site surface waters; therefore, exposure to this media is incomplete at the Site. Exposure to Off-Site Recreational Fisher receptors from consumable fish caught off-site in the Blackfoot River or Trail Creek were evaluated qualitatively/semi-quantitatively.

[5] Domestic Water Supply (DWS) is defined as water from 1) groundwater wells from all formations (except for two wells from Meade Peak formation), and 2) all springs.

Different line weights, colors, and styles are only used to allow ease of reading

Internal radiation is possible whenever ingestion is a complete pathway

C - Current or existing receptor population

F - Future receptor population

● Complete Significant Pathway

⊙ Complete Insignificant Pathway

Incomplete Pathway

⊗ No complete pathways for direct exposure to Site media; exposure to off-Site Blackfoot River/Trail Creek media will be evaluated qualitatively/semi-quantitatively

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

FIGURE 4-1

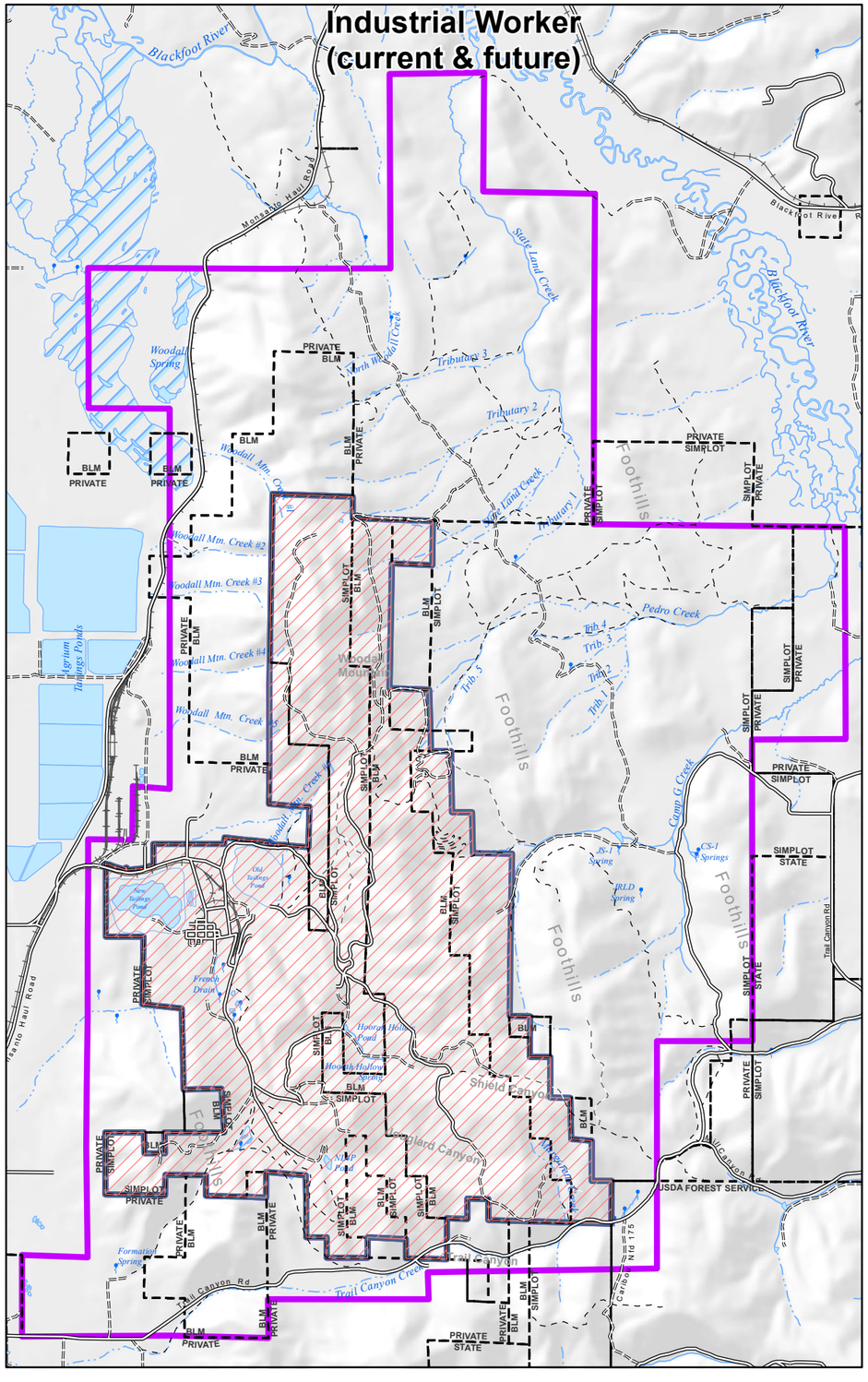
Conceptual Site Model for Human Receptors

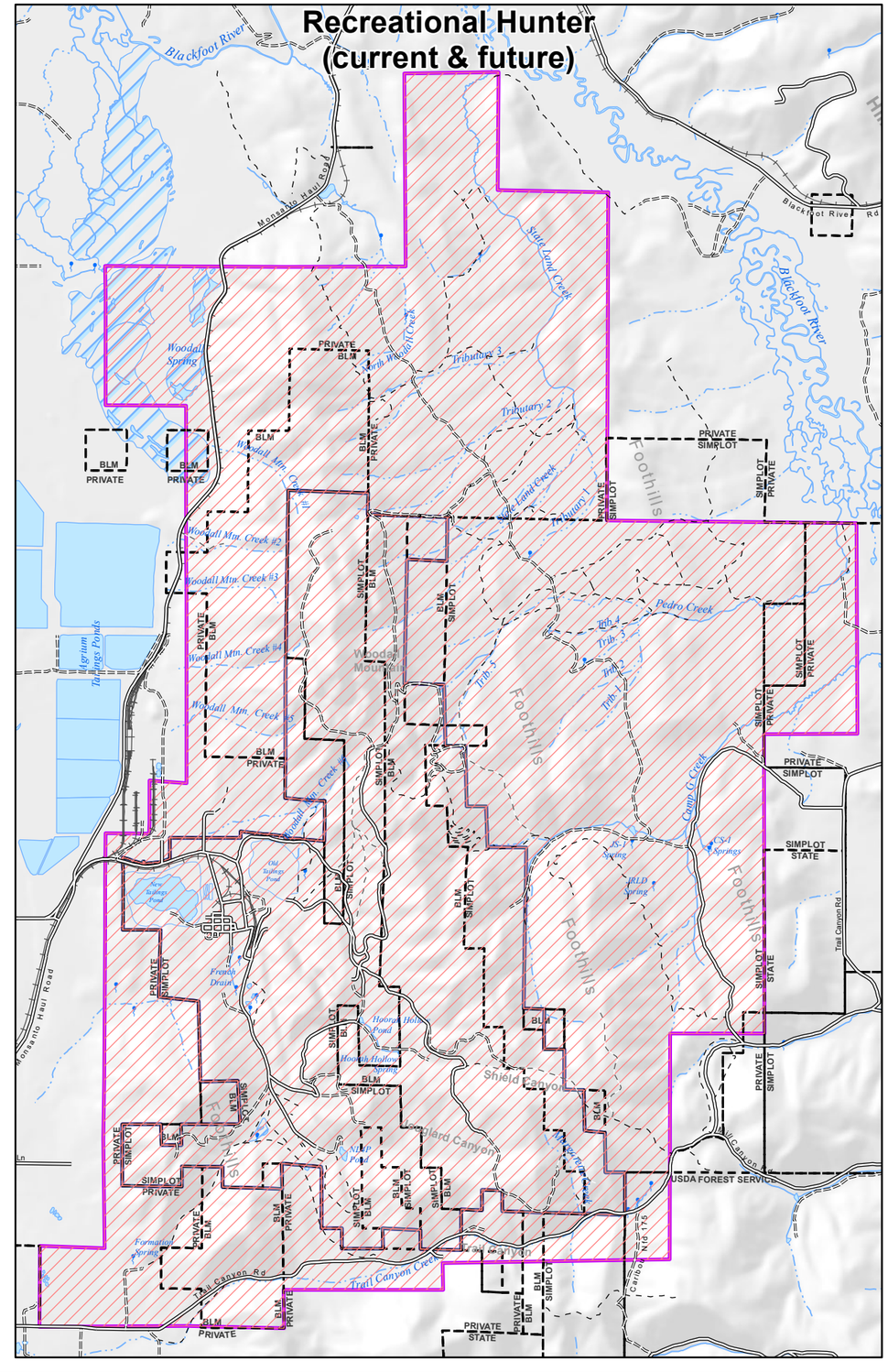
DATE: DEC 2016

BY: RCR | FOR: RPS

FORMATION ENVIRONMENTAL

S:\Jobs\0442-001-900-Simplot-Conda\RIFS_RiskAssessRpts\HHRA\FnlReport\Figures\Fig_4-1_HHRA_CSM.xlsx





Legend

- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Exposure Area
- Surface Ownership 2015
- Mined Area
- Non-Mined Area
- Spring/Seep
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh

Note: It was assumed that wild game were exposed over the entire Site, although the receptor may harvest from in the exposure unit.

0 4,500 9,000
Feet

N

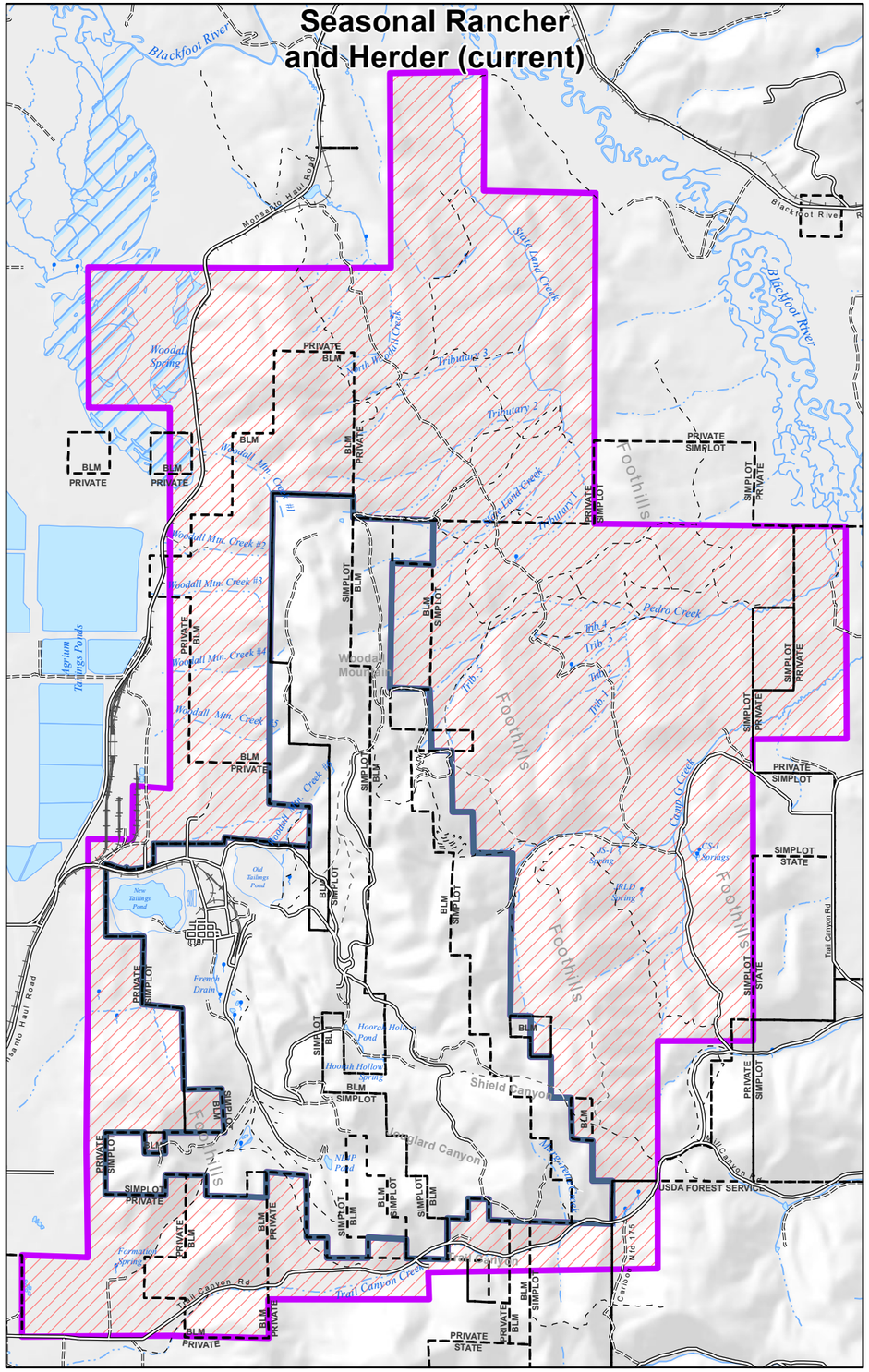
J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

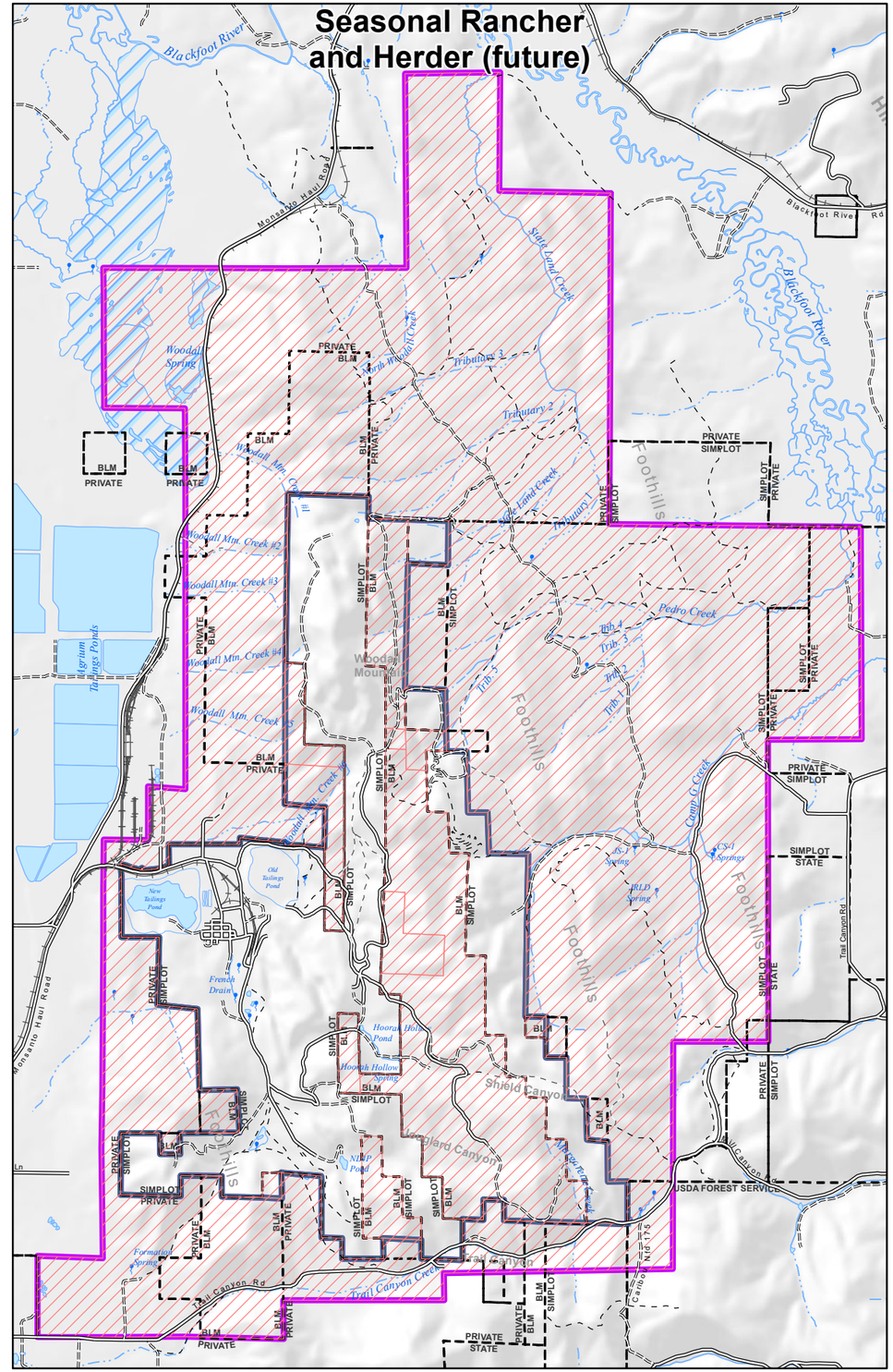
FIGURE 4-2

EXPOSURE AREAS FOR INDUSTRIAL WORKER AND RECREATIONAL HUNTER

DATE: DEC 2016
BY: EEB FOR: RCR
FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_4-02_SideBySide.mxd





Legend

- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Surface Ownership 2015
- Mined Area
- Non-Mined Area
- Exposure Area
- Spring/Seep
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh

0 4,500 9,000
Feet

N

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

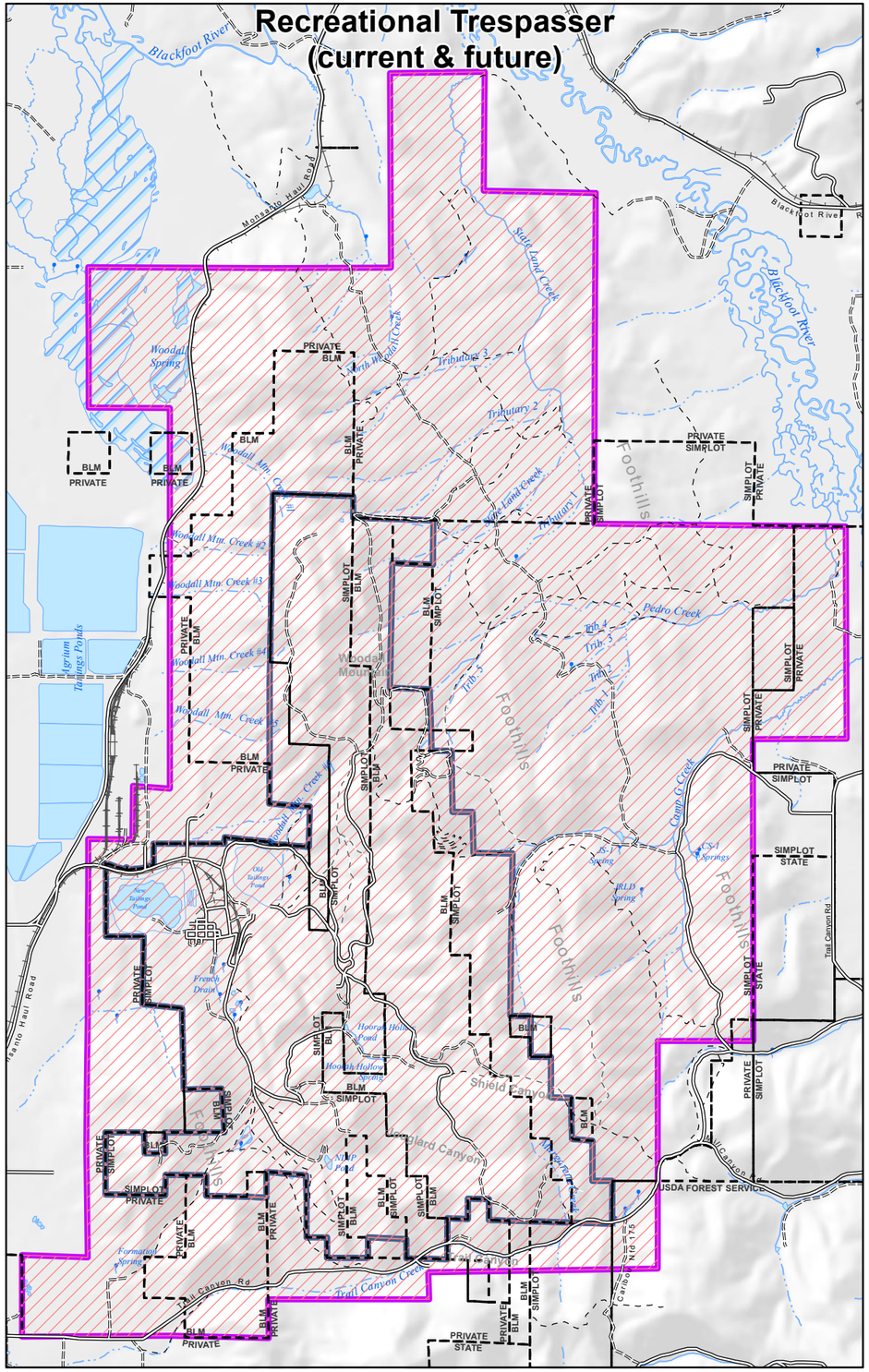
FIGURE 4-3

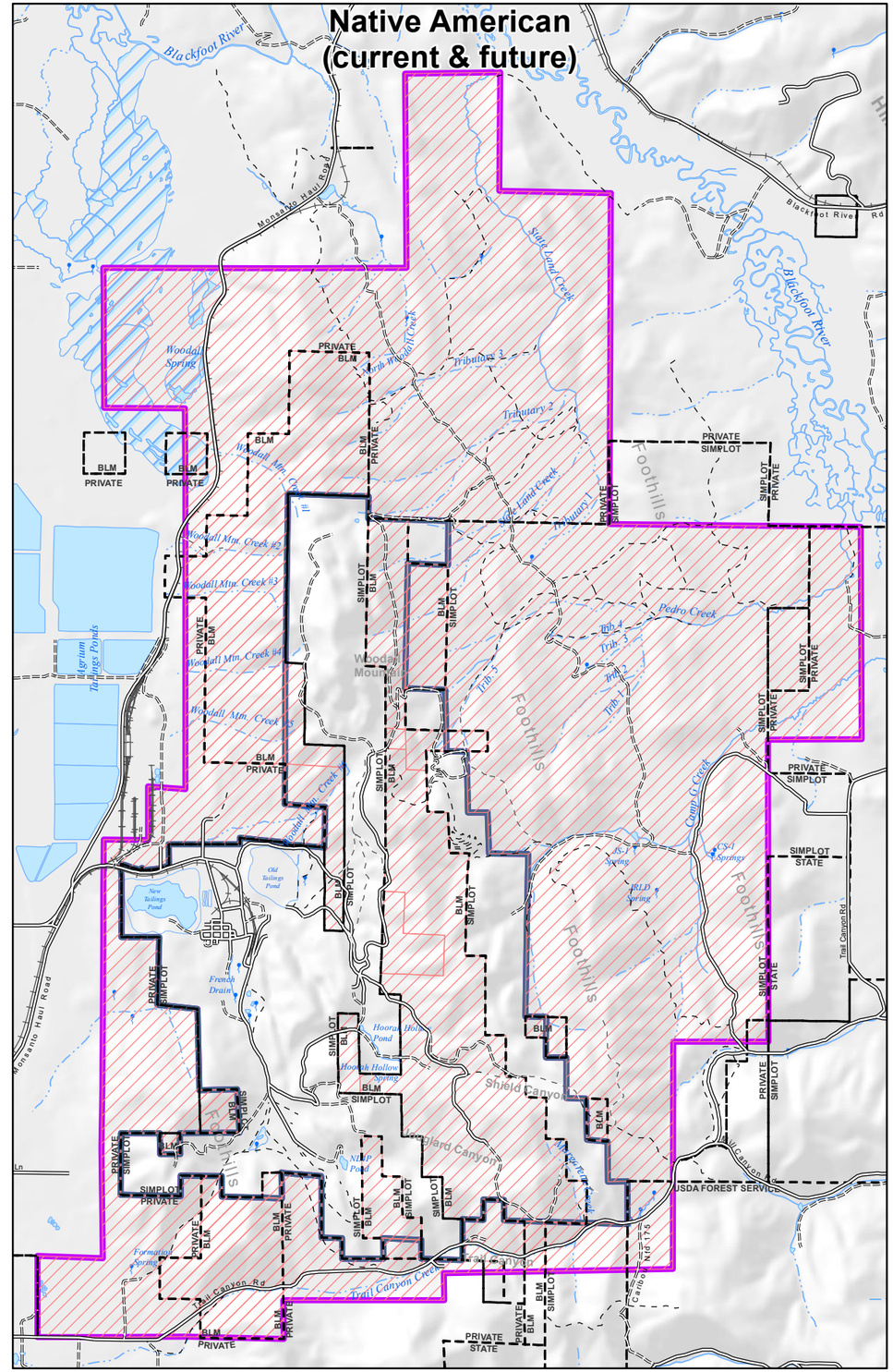
EXPOSURE AREAS FOR SEASONAL RANCHER AND HERDER

DATE: DEC 2016
BY: EEB
FOR: RCR

FORMATION ENVIRONMENTAL

S:\GIS\arcpj2\010139\plt\RIA_2015\SSHHRA\Fig_4-03_Seasonal.mxd





Legend

- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Surface Ownership 2015
- Exposure Area
- Mined Area
- Non-Mined Area
- Spring/Seep
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh

0 4,500 9,000
Feet

N

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

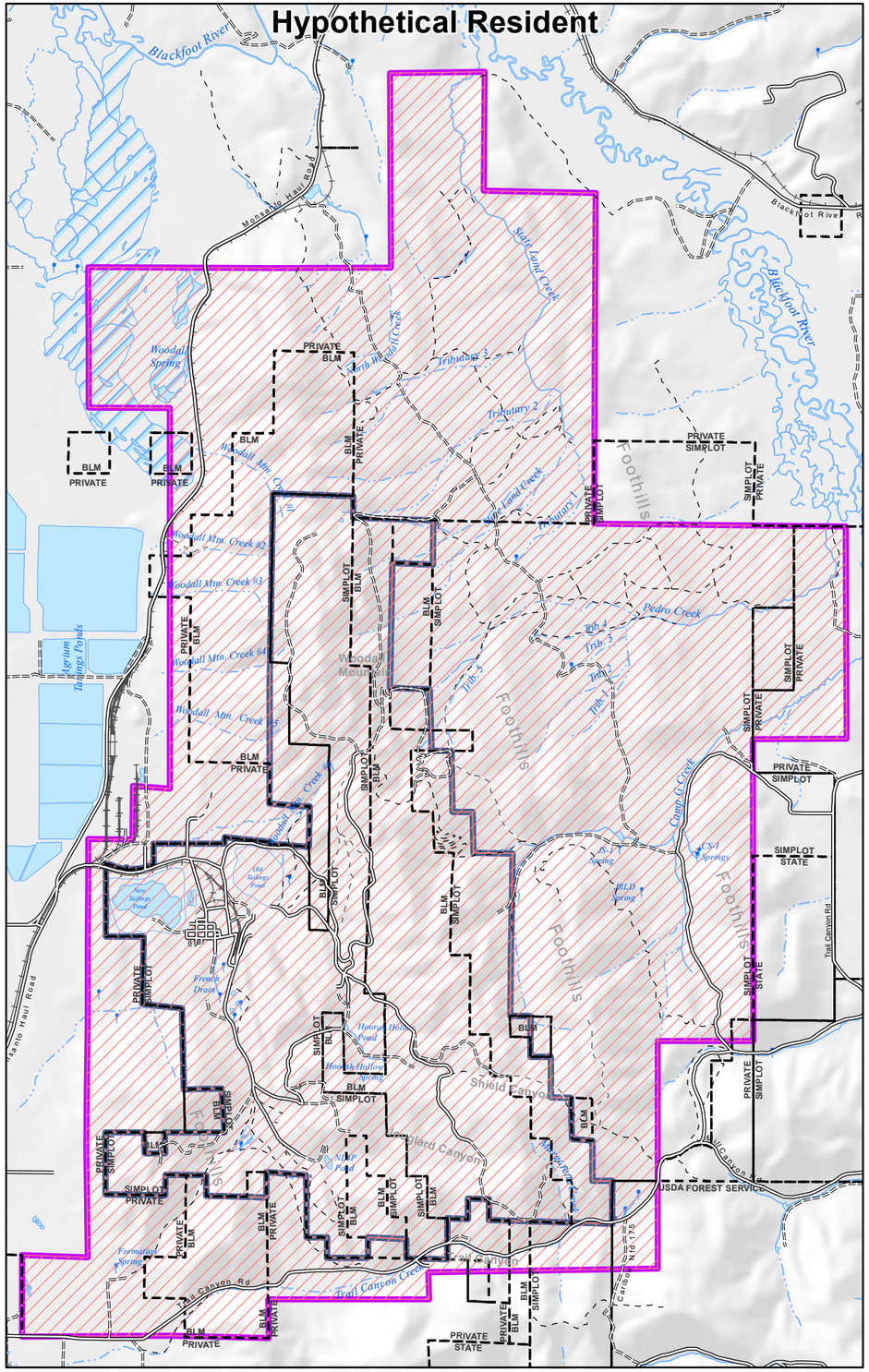
FIGURE 4-4

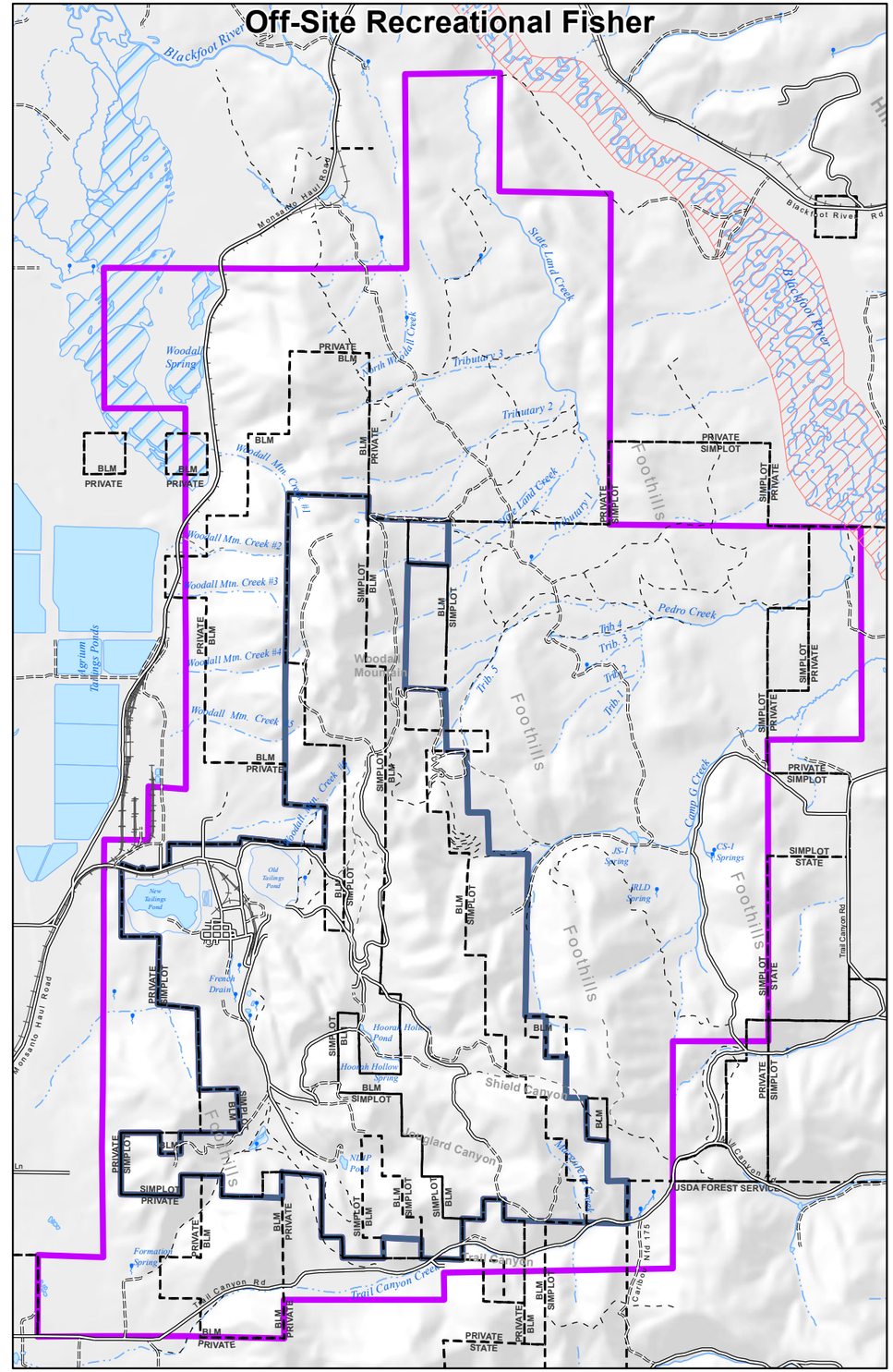
EXPOSURE AREAS FOR RECREATIONAL TRESPASSER AND NATIVE AMERICAN

DATE: DEC 2016
BY: EEB
FOR: RCR

FORMATION ENVIRONMENTAL

S:\GIS\arcpj2\010139\plt\RIA_2015\SSHHRA\Fig_4-04_RecNative.mxd





Legend

- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Surface Ownership 2015
- Exposure Area
- Mined Area
- Non-Mined Area
- Spring/Seep
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh

0 4,500 9,000
Feet

N

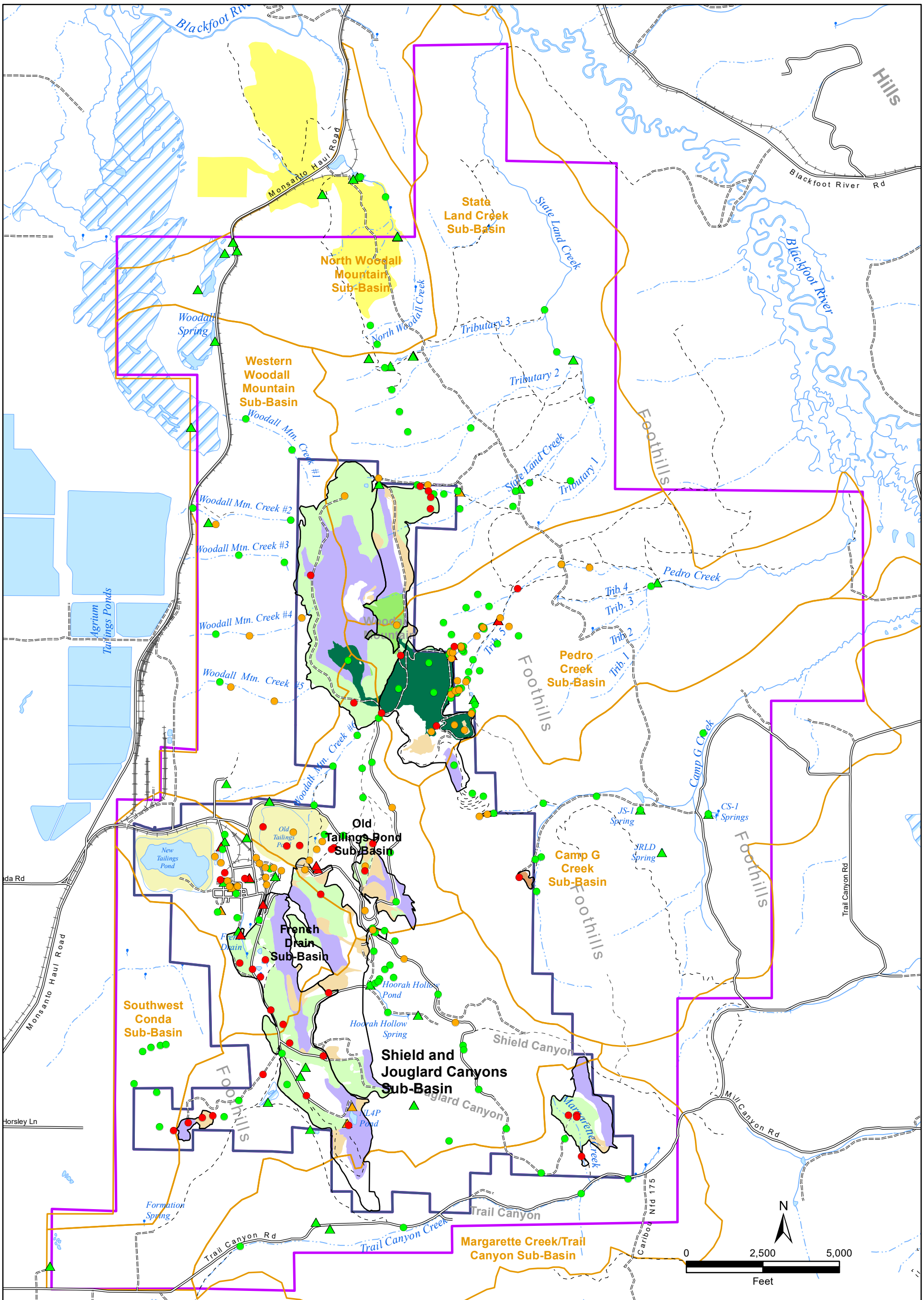
J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

FIGURE 4-5
EXPOSURE AREAS FOR HYPOTHETICAL RESIDENT AND OFF-SITE RECREATIONAL FISHER

DATE: DEC 2016
BY: EEB
FOR: RCR

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_4-05_ResRec.mxd



Legend

- Mine Panels
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream

Residual Mining Materials (RMM)

- Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
- Reclaimed Overburden Disposal Area
- Reclaimed Pit
- Disturbed Pit
- Disturbed Tailings
- Disturbed Overburden Disposal Area
- Waste Rock Piles

- Monsanto Active Mine
- Mined Area
- Non-Mined Area
- Sub-Basins

Surface Soil Arsenic Conc. (mg/kg)

- <= 9.4 mg/kg (Site-specific bkg value)
- 9.4 mg/kg - 18.8 mg/kg
- > 18.8 mg/kg

Domestic Water Supply Arsenic Conc. (mg/L)

- <= 0.01 mg/L (MCL)
- 0.01 mg/L - 0.02 mg/L
- > 0.02 mg/L

MCL = Maximum contaminant level

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

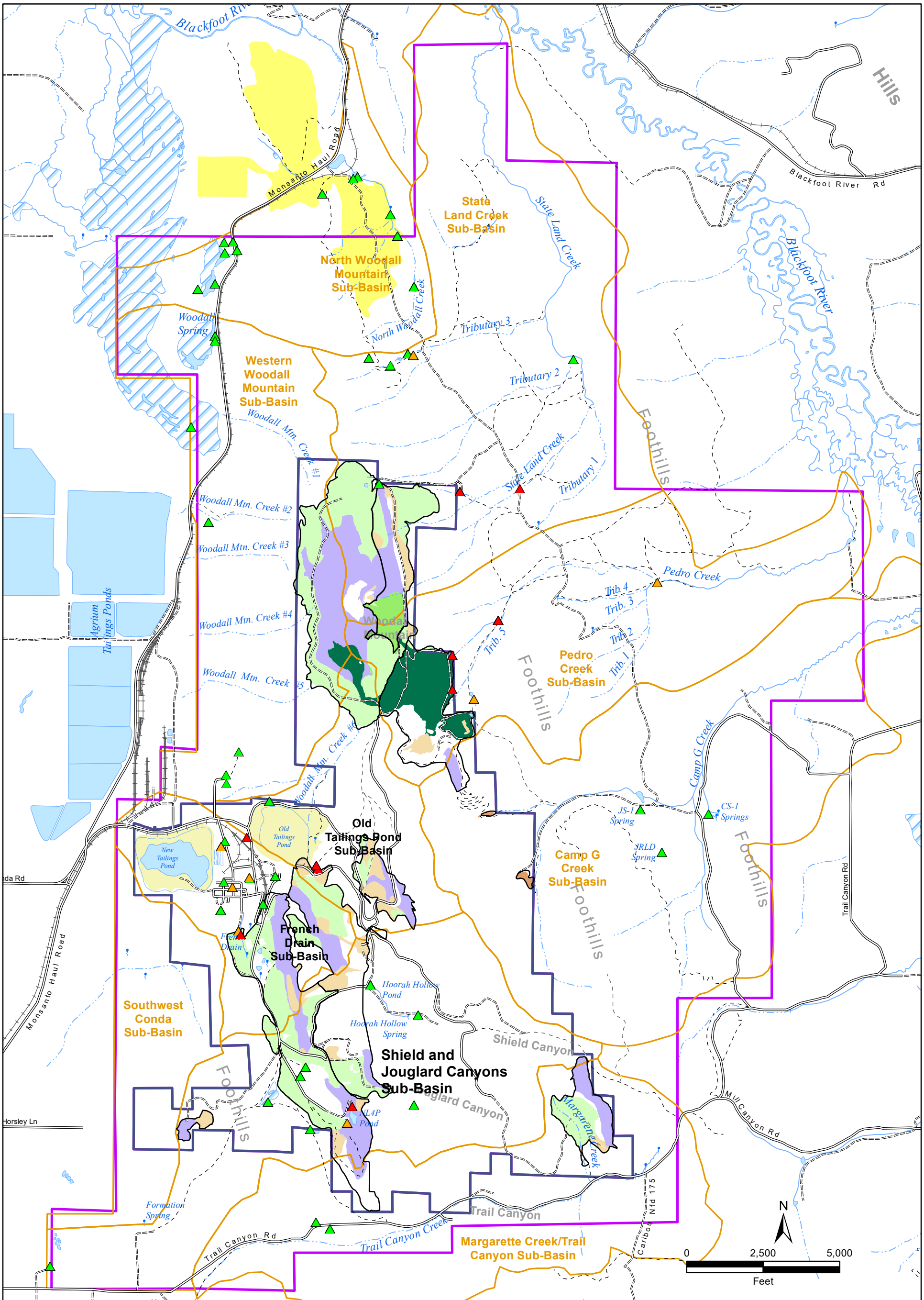
FIGURE 6-1

ARSENIC CONCENTRATIONS IN DOMESTIC WATER SUPPLY AND SURFACE SOIL SAMPLING LOCATIONS

DATE: DEC 2016
BY: RCR
FOR: RPS

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_6-01_As_SLDWS.mxd



Legend

Domestic Water Supply Selenium Conc. (mg/L)
- <= 0.05 mg/L (MCL)
- 0.05 mg/L - 0.5 mg/L
- > 0.5 mg/L

- Mine Panels
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream
- Lake/Pond
- Reservoir
- Swamp/Marsh
- Monsanto Active Mine

Residual Mining Materials (RMM)
- Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
- Reclaimed Overburden Disposal Area
- Reclaimed Pit
- Disturbed Pit
- Disturbed Tailings
- Disturbed Overburden Disposal Area
- Waste Rock Piles

- Mined Area
- Non-Mined Area
- Sub-Basins

MCL = Maximum contaminant level

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

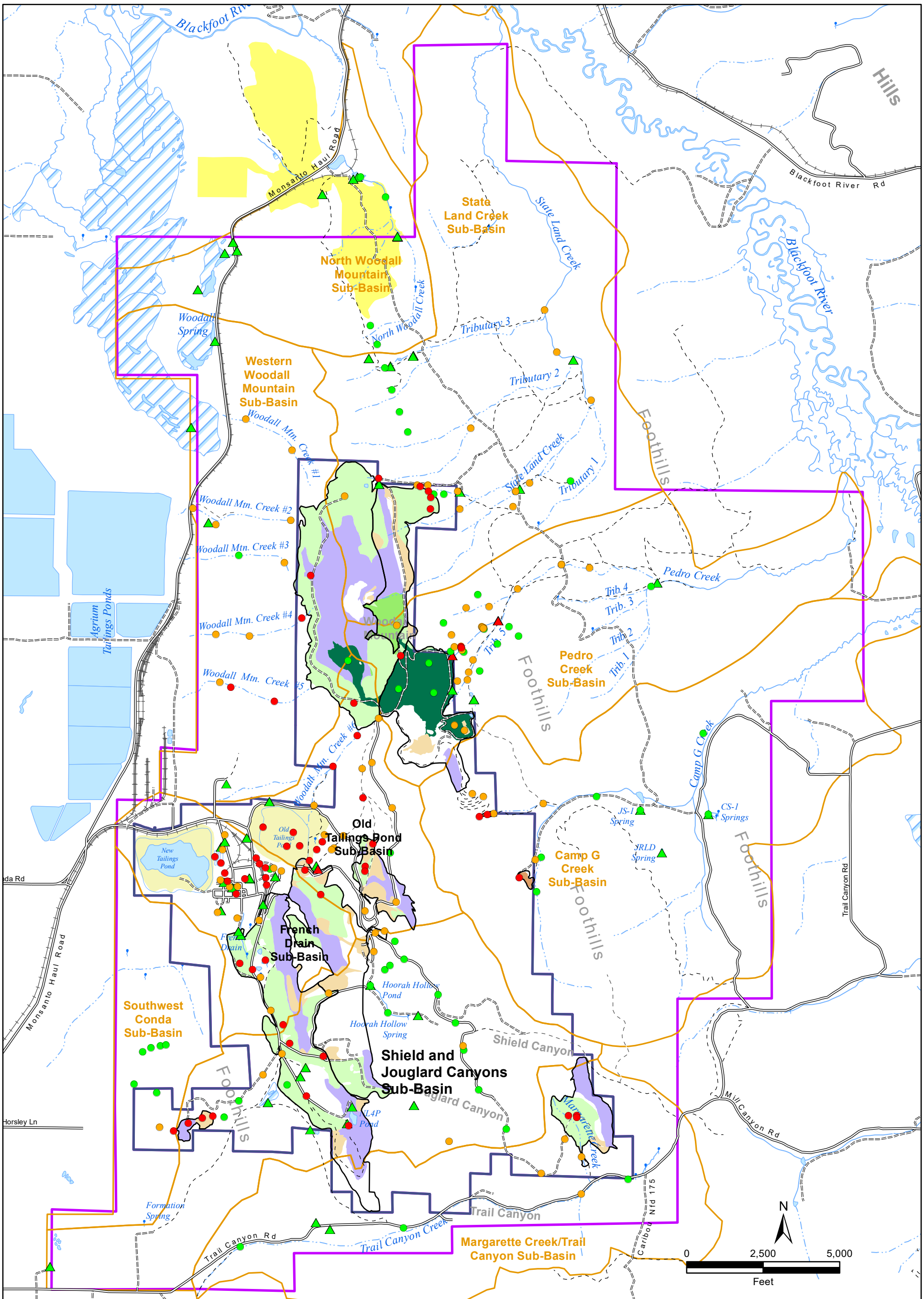
FIGURE 6-2

SELENIUM CONCENTRATIONS IN DOMESTIC WATER SUPPLY SAMPLING LOCATIONS

DATE: DEC 2016
BY: RCR
FOR: RPS

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_6-02_Se_DWS.mxd



Legend

- Mine Panels
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Railroad
- Intermittent Stream
- Perennial Stream

Residual Mining Materials (RMM)

- Overburden pile with Dinwoody soil cover as part of the NTCRA and FSPS
- Reclaimed Overburden Disposal Area
- Reclaimed Pit
- Disturbed Pit
- Disturbed Tailings
- Disturbed Overburden Disposal Area
- Waste Rock Piles

- Monsanto Active Mine
- Mined Area
- Non-Mined Area
- Sub-Basins

Surface Soil Uranium Conc. (mg/kg)

- <= 2.0 mg/kg (Site specific bkg value)
- 2.0 mg/kg - 20 mg/kg
- > 20 mg/kg

Domestic Water Supply Uranium Conc. (mg/L)

- <= 0.03 mg/L (MCL)
- > 0.03 mg/L

MCL = Maximum contaminant level

J.R. SIMPLOT COMPANY
CONDA/WOODALL MOUNTAIN MINE
SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT

FIGURE 6-3

URANIUM CONCENTRATIONS IN DOMESTIC WATER SUPPLY AND SURFACE SOIL SAMPLING LOCATIONS

DATE: DEC 2016
BY: AKC
FOR: RPS

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010139\plt\RIA_2015\SSHHRA\Fig_6-03_U_SLDWS.mxd