IDAHO MINING ASSOCIATION
SELENIUM COMMITTEE

Final – Summer 2001 Area-Wide Investigation Data Summary

Southeast Idaho Phosphate Resource Area
Selenium Project

July 2002

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ACRONYMS

AOC	Administrative Order on Consent
APCL	Applied Physics and Chemistry Laboratory
EDL	estimated detection limit
EPA	Environmental Protection Agency
ERA	ecological risk assessment
IDA	Idaho Department of Agriculture
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDHW	Idaho Department of Health and Welfare
IDL	instrument detection limit or
IDL	Idaho Department of Lands
IMA	Idaho Mining Association
MDL	method detection limit
MOU	Memorandum of Understanding
MW	Montgomery Watson
MWH	Montgomery Watson Harza
RSD	relative standard deviation
SAP	Sampling and Analysis Plan
SeAWAC	Selenium Area-Wide Advisory Committee
SeWG	Selenium Working Group
TtEMI	TetraTech EM Inc.
U of I	University of Idaho Analytical Sciences Laboratory
USBIA	United States Bureau of Indian Affairs
USBLM	United States Bureau of Land Management
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

1.0 INTRODUCTION

This report contains small mammal, vegetation, terrestrial invertebrate and surface soil data collected in August-September 2001 by the Idaho Mining Association (IMA) Selenium Committee as part of the Summer 2001 Area-Wide Investigation.

1.1 REPORT ORGANIZATION

The contents of this report are as follows:

- Section 1.0. Introduction – This section describes the purpose of the report, identifies the scope and objectives of the Summer 2001 Area-Wide Investigation, and presents a brief background discussion of the Selenium Project.

- Section 2.0. Field and Laboratory Methodologies – This section describes procedures and methodologies used for data collection, laboratory analysis, and data evaluation.

- Section 3.0. Sampling Results – This section presents sampling and analysis results for data collected in Summer 2001.

- Section 4.0. References – This section lists the references cited.

Supporting documentation is included in the appendices.

1.2 SUMMER 2001 AREA-WIDE INVESTIGATION OBJECTIVES AND SCOPE

Pursuant to the Interagency Memorandum of Understanding (MOU), the Idaho Department of Environmental Quality (IDEQ) developed a scope of work for the Area-Wide Investigation which was incorporated as part of an Administrative Order on Consent (AOC). The AOC was negotiated between federal, tribal, and state agencies and the IMA Selenium Committee companies. For the Summer 2001 Area-Wide Investigation, Montgomery Watson Harza (MWH), on behalf of the IMA Selenium Committee, implemented a scope of work and sampling design developed by IDEQ to fill data gaps and to provide data to calculate bio-transfer coefficients. These data gaps are presented in the Draft Data Gap Technical Memorandum (TtEMI, 2001a). For this sampling event, MWH was tasked with sampling small mammals, vegetation, terrestrial invertebrates, and surface soil.

1.2.1 Small Mammals

The following objectives for small mammal sampling were taken directly from "Technical Note: Small Mammal Sampling" (TtEMI, 2001b). The entire document can be found in Appendix A.

> For carnivorous upper trophic level terrestrial species, small mammals from the downstream riparian areas and waste rock disposal areas are likely to represent an

important exposure pathway from contaminated soil to higher trophic levels. However, limited information is available concerning the contaminant concentrations in small mammals within the Selenium Project study area. The data contained in the TRC report for the Maybe Canyon Mine indicates a significant uptake of inorganic contaminants into the small mammal population and subsequent exposure to higher trophic levels.

The movement of chemicals from soil into lower-trophic levels, such as invertebrates and plants and subsequently to small mammals, is one of the largest uncertainties in the ecological risk assessment (ERA). Upper trophic level avian and mammalian carnivores feed on small mammals. Evaluation of these upper-trophic-level receptors is dependent on modeled concentrations in their food sources. Therefore, small mammals will be collected to reduce the uncertainties. The analytical data from this sampling effort will be used to develop biotransfer factors and modeled doses for use in the ERA.

1.2.2 Terrestrial Invertebrates

The following objectives for waste rock dump soil sampling were taken directly from "Technical Note: Terrestrial Invertebrate Sampling" (TtEMI, 2001c). The entire document can be found in Appendix A.

For terrestrial species, plant tissue and terrestrial invertebrates from the downstream riparian areas and waste rock disposal areas are likely to represent the most significant transfer mechanisms from contaminated soil to higher trophic levels. However, limited information is available concerning the contaminant concentrations in terrestrial invertebrates within the Selenium Project study area. The data contained in the TRC report for the Maybe Canyon Mine indicates a significant uptake of inorganic contaminants into the terrestrial invertebrate population and subsequent exposure to higher trophic levels.

The movement of chemicals from soil into lower-trophic levels, such as invertebrates, is one of the largest uncertainties in the ecological risk assessment (ERA). Omnivorous and insectivorous avian and mammalian species feed on terrestrial invertebrates. Evaluation of these upper-trophic-level receptors is dependent on modeled concentrations in their food sources. Therefore, terrestrial invertebrates will be collected to reduce the uncertainties. The analytical data from this sampling effort will be used to develop biotransfer factors for use in the ecological risk assessments.

1.3 PROJECT BACKGROUND

Phosphate mining has been an ongoing activity within the Southeast Idaho Resource Area (Resource Area) since Conda Mine started operations in 1919. Today four companies operate phosphate mines in the region, and the ore derived from these mines is locally processed into fertilizer and elemental phosphorous, two important products in the world economy. Phosphate mining and ore processing form an important economic foundation for southeast Idaho.

In late 1996, six horses pastured downstream of a closed, reclaimed phosphate mine were diagnosed with alkalai disease, a form of chronic selenosis. This event prompted concern by

mine operators, the public, local, state, and federal agencies about potential selenium impacts to the environment. To address these concerns, the IMA formed the IMA Selenium Committee in early spring 1997 to identify the source and extent of selenium and other trace element impacts associated with phosphate mining activities. In addition to identifying the environmental impacts, the IMA Selenium Committee is developing mitigation measures to address selenium and other target element releases and to minimize the potential threat to the environment.

The IMA Selenium Committee consists of five companies currently mining or who have recently mined phosphate ore in Southeast Idaho: FMC Corporation (FMC); J.R. Simplot Company (Simplot); Monsanto Company (Monsanto); Nu-West Industries, Inc. (Nu-West); and, Rhodia, Inc. (Rhodia).

A sixth company, Astaris Production LLC (Astaris), which is a joint venture between FMC and Solutia, Inc., is the current operator of one of the four active mines. However, at this time they are not a participating member of the IMA Selenium Committee. These companies and their respective active and inactive mines are identified in Table 1-1, *Phosphate Mines in the Southeast Idaho Phosphate Resource Area.*

TABLE 1-1
PHOSPHATE MINES IN THE SOUTHEAST IDAHO PHOSPHATE RESOURCE AREA

Company	Mines	
	Active	**Inactive**
Astaris	Dry Valley Mine	None
FMC	None	Gay Mine[1]
Simplot	Smoky Canyon Mine	Lanes Creek Mine[2] Conda Mine Gay Mine[1]
Monsanto	Enoch Valley Mine	Henry Mine Ballard Mine
Nu-West	Rasmussen Ridge Mine	Mountain Fuel Mine Champ Mine North Maybe Canyon Mine South Maybe Canyon Mine[3] Georgetown Canyon Mine
Rhodia	None	Wooley Valley Mine

Notes: [1]Responsibility for Gay Mine is shared between FMC and Simplot.
[2]Simplot obtained Lanes Creek in 1997 as part of the Alumet Reserves. Alumet retains any and all environmental liabilities associated for the mine prior to the purchase.
[3]South Maybe Canyon Mine is not included in the scope of the Selenium Project. It is being addressed separately under a consent order between Nu-West and United States Forest Service.

The Selenium Project was instituted as a voluntary program to address the mining related environmental issues. The Selenium Working Group (SeWG) was established to facilitate communication with and participation by state, local, and federal agencies, the Shoshone-Bannock Tribes, the public, and the IMA Selenium Committee companies. In July 2000, federal, tribal, and state agencies signed an *Interagency Memorandum of Understanding concerning Contamination from Phosphate Mining Operations in Southeast Idaho* (Interagency MOU). The Interagency MOU specified the IDEQ as the lead agency for coordinating the Area-Wide Investigation and for establishing regional clean-up guidance to assist lead agencies in

implementing future site-specific remedial efforts in the Southeast Idaho Phosphate Mining Resource Area. The IDEQ Selenium Area-Wide Advisory Committee (SeAWAC) was formed to provide a forum for continued dialogue, report review, and technical discussions. The SeAWAC includes the same agencies and IMA company representatives as the SeWG which includes:

- Idaho Department of Environmental Quality (IDEQ)
- Idaho Department of Lands (IDL)
- Idaho Department of Fish and Game (IDFG)
- Idaho Department of Health and Welfare (IDHW)
- Idaho Department of Agriculture (IDA)
- Shoshone-Bannock Tribes of the Fort Hall Reservation
- United States Forest Service (USFS)
- United States Bureau of Land Management (USBLM)
- United States Bureau of Indian Affairs (USBIA)
- United States Fish and Wildlife Service (USFWS)
- United States Environmental Protection Agency (USEPA)
- United States Geological Survey (USGS)
- Southeastern District Health Department
- IMA Selenium Committee Members
- Other Interested Stakeholders (i.e. ranchers, Greater Yellowstone Coalition, Congressional staff members, etc.)

2.0 FIELD AND LABORATORY METHODOLOGIES

This section describes sample collection procedures and analytical methods for the small mammal, terrestrial invertebrate, surface soil, and vegetation sampling performed for the Summer 2001 Area-Wide Investigation in August-September 2001. In addition, the data validation procedures are described.

2.1 SAMPLING LOCATIONS

The area for this sampling event was defined by the boundary of the Blackfoot River watershed. Three mines were not included in the selection process for sampling. Gay Mine was not included for the following reasons; access requirements from the Shoshone-Bannock Indian tribe, and geographic location (distance). Smoky Canyon and Georgetown Canyon Mines were also not included as they are defined by different watersheds. This sampling effort was estimated to take several weeks, and geocentric locations were decided upon to minimize driving time, as well as to characterize the Blackfoot River watershed.

2.1.1 Small Mammal Sampling Locations

Small mammal sampling locations are listed in Table 2-1, *Small Mammal Sampling Locations*. Mapped locations of these sites can be found in Figure 2-1.

TABLE 2-1
SMALL MAMMAL SAMPLING LOCATIONS

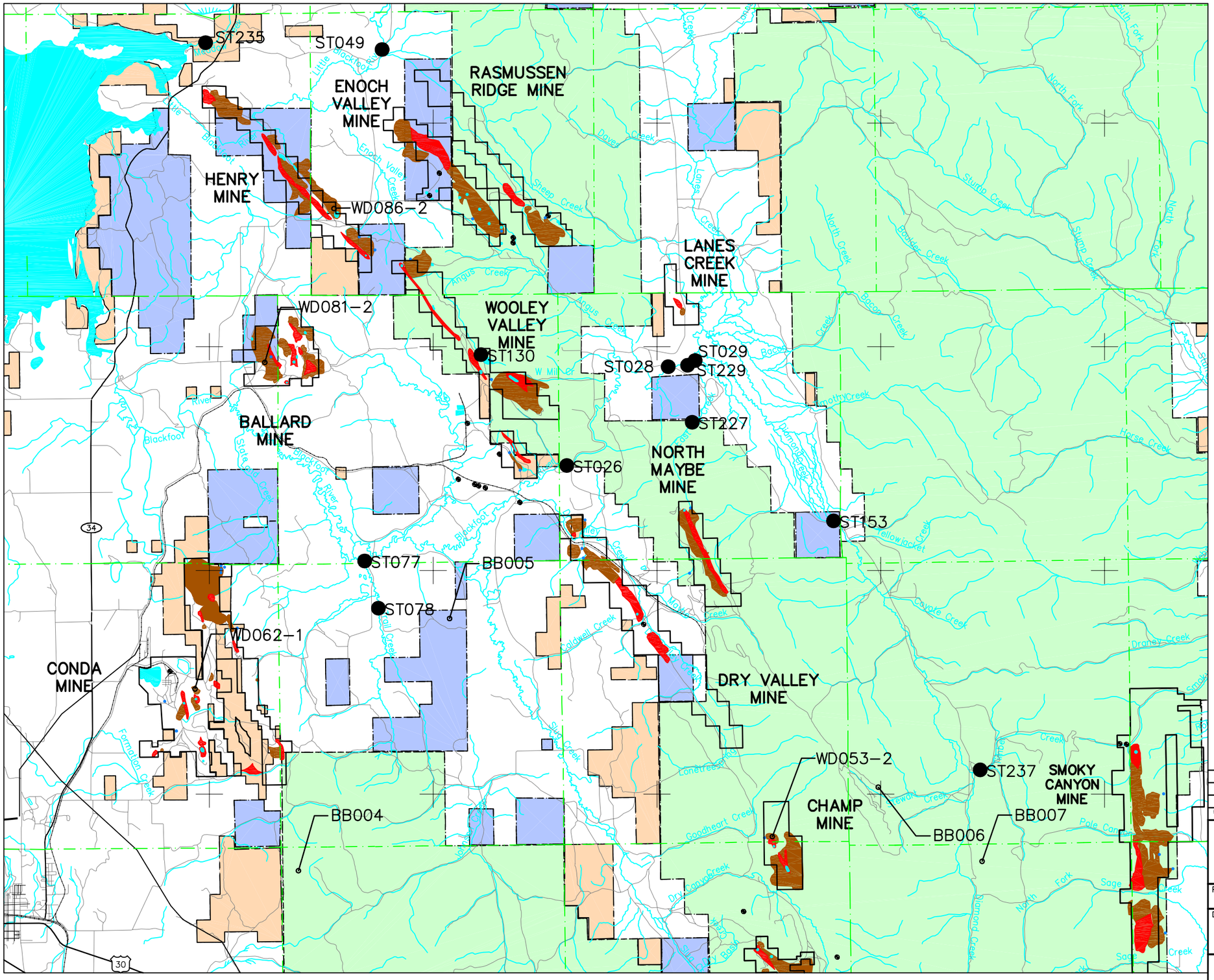
Location	Name	Description
Waste Rock Dumps	WD053	Champ Mine Extension Dump
	WD062	Conda Mine Middle Limb North Waste Dump
	WD081	Ballard Mine Pit #1 Overburden Dump #2
	WD086	Henry Mine Center Pit #1 Overburden Dump
Background Phosphoria Outcrops	Background #4	Background Phosphoria Outcrop, SE of Conda Mine
	Background #5	Background Phosphoria Outcrop, near N. end of Slug Valley
	Background #6	Background Phosphoria Outcrop, near Stewart Creek drainage
	Background #7	Background Phosphoria Outcrop, near Diamond Creek drainage
Impacted Riparian Zones	ST026	Blackfoot River, above Wooley Range Ridge Creek
	ST130	Angus Creek, below Upper Angus Creek Res.
	ST028	Blackfoot River, at Diamond Creek Rd.
	ST029	Blackfoot River, above Spring Creek
	ST229	Blackfoot River, below Spring Creek
	ST227	East Mill Creek, below Maybe Canyon Mine
	ST077	Pedro Creek
Background Riparian Zones	ST049	Little Blackfoot, above Reese Creek
	ST078	Trail Creek, above Camp G Creek
	ST153	Diamond Creek, above Kendall Creek
	ST235	Meadow Creek
	ST237	Timber Creek, above Diamond Creek

TABLE 2-1 SMALL MAMMAL SAMPLING LOCATIONS		
Location	**Name**	**Description**
Note: Additional impacted riparian zones were sampled due to unsuccessful capture of small mammals at certain locations.		

2.1.2 Terrestrial Invertebrate, Vegetation and Soil Sampling Locations

Terrestrial invertebrate samples, as well as vegetation and surface soil samples, were collected from co-located areas that corresponded to small mammal sampling locations. These locations were successful in the capture of the minimum necessary small mammal quota. These locations are listed in Table 2-2, *Terrestrial Invertebrate, Vegetation, and Soil Sampling Locations*.

TABLE 2-2 TERRESTRIAL INVERTEBRATE, VEGETATION AND SOIL SAMPLING LOCATIONS		
Location	**Name**	**Description**
Waste Rock Dumps	WD053	Champ Mine Extension Dump
	WD062	Conda Mine Middle Limb North Waste Dump
	WD081	Ballard Mine Pit #1 Overburden Dump #2
	WD086	Henry Mine Center Pit #1 Overburden Dump
Background Phosphoria Outcrops	Background #4	Background Phosphoria Outcrop, SE of Conda Mine
	Background #5	Background Phosphoria Outcrop, near N. end of Slug Valley
	Background #6	Background Phosphoria Outcrop, near Stewart Creek drainage
	Background #7	Background Phosphoria Outcrop, near Diamond Creek drainage
Impacted Riparian Zones	ST077	Pedro Creek
	ST227	East Mill Creek, below Maybe Canyon Mine
	ST026	Blackfoot River, above Wooley Range Ridge Creek
	ST130	Angus Creek, below Upper Angus Creek Res.
Background Riparian Zones	ST049	Little Blackfoot, above Reese Creek
	ST153	Diamond Creek, above Kendall Creek
	ST235	Meadow Creek
	ST237	Timber Creek, above Diamond Creek
Note: There were a lower number of terrestrial invertebrate, vegetation, and soil locations compared to small mammal locations due to unsuccessful capture of small mammals at certain locations. No terrestrial invertebrate, vegetation, or soil samples were collected at these locations.		



LEGEND

- CONTOURS
- CREEKS/RIVERS
- LAKES
- MARSH
- ROADS
- RAILROAD
- STATE LINE
- COUNTY LINE

- NATIONAL FOREST
- BUREAU OF LAND MANAGEMENT
- STATE OF IDAHO
- FORT HALL INDIAN RESERVATION
- MINE PIT LOCATION
- STOCKPOND LOCATION/TAILINGS POND
- WASTE ROCK DUMP LOCATION
- PRODUCTION WELL
- WASTE ROCK DUMP SEEP
- TAILINGS POND
- WD081-2 WASTE DUMP SAMPLING LOCATION
- BB004 UPLAND BACKGROUND SAMPLING LOCATION
- ST078 RIPARIAN STATION SAMPLING LOCATION

MAP KEY

SCALE
0 5000 10,000
Feet

REV. No.	REVISIONS	DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY
1	Issued for Review	3/25/02	P.Stenhouse	B.Taylor	P.Stenhouse

IDAHO MINING ASSOCIATION
SELENIUM COMMITTEE

PROJECT:
SUMMER 2001 AREA WIDE INVESTIGATION

DRAWING TITLE:
SAMPLING LOCATIONS

MONTGOMERY WATSON

Sheet 1 Of 1 Sheets
SCALE: As Shown
DRAWING No. FIG 2-1

AutoCAD FILE: Summer2001-4-1.dwg PROJECT NUMBER: 1227028.021807

2.2 SAMPLING AND ANALYSES

2.2.1 Small Mammal Sampling and Analyses

Small mammal sampling was conducted following the procedures outlined in the Summer 2001 Area-Wide Investigation Sampling and Analysis Plan (SAP) (MW, 2001). Before sampling began, sampling protocol was reviewed and four additional background areas were included. This change would allow for separate background area characterization for both the impacted upland areas (waste rock dumps) and impacted riparian zones.

Small mammal samples were analyzed for the parameters presented in Table 2-3, *Small Mammal Analytical Suite*. Aquatec Biological Sciences initially received all small mammal samples for analyses preparation and homogenization. The University of Idaho Analytical Sciences Laboratory (U of I) tested for all analytes listed. Quality assurance/quality control (QA/QC) samples were determined by U of I, based upon sufficient mass of sample for QA/QC procedures, and splits were sent to Applied Physics and Chemistry Laboratory (APCL) in Chino, CA for analysis.

TABLE 2-3
SMALL MAMMAL ANALYTICAL SUITE

Parameter	Method	Estimated Detection Limit	Units	Holding Time
Aluminum	3050/6010B	1.0	mg/kg (ww)	180 days
Antimony	3050/6010B	0.05	mg/kg (ww)	180 days
Arsenic	3050/6010B	0.01	mg/kg (ww)	180 days
Barium	3050/6010B	0.01	mg/kg (ww)	180 days
Beryllium	3050/6010B	0.005	mg/kg (ww)	180 days
Boron	3050/6010B	0.1	mg/kg (ww)	180 days
Cadmium	3050/6010B	0.002	mg/kg (ww)	180 days
Chromium	3050/6010B	0.01	mg/kg (ww)	180 days
Copper	3050/6010B	0.013	mg/kg (ww)	180 days
Lead	3050/6010B	0.005	mg/kg (ww)	180 days
Manganese	3050/6010B	0.005	mg/kg (ww)	180 days
Mercury	EPA 1631	N/A	mg/kg (ww)	28 days
Molybdenum	3050/6010B	0.05	mg/kg (ww)	180 days
Nickel	3050/6010B	0.005	mg/kg (ww)	180 days
Selenium	ICP-HG	0.01	mg/kg (ww)	180 days
Silver	3050/6010B	0.005	mg/kg (ww)	180 days
Thallium	3050/6010B	0.05	mg/kg (ww)	180 days
Uranium	3050/6010B	0.01	mg/kg (ww)	180 days
Vanadium	3050/6010B	0.1	mg/kg (ww)	180 days
Zinc	3050/6010B	0.1	mg/kg (ww)	180 days
Percent Moisture	OLM 03.1	0.1	%	

2.2.2 Terrestrial Invertebrate Sampling and Analyses

Terrestrial Invertebrate sampling was conducted following the procedures outlined in the Summer 2001 Area-Wide Investigation SAP (MW, 2001).

Soil samples were analyzed by the U of I for the parameters presented in Table 2-4, *Terrestrial Invertebrate Analytical Suite*. QA/QC samples were collected at a minimum rate of 10 percent. The U of I subsampled each QA/QC sample and sent samples to APCL for further QA analyses.

TABLE 2-4
TERRESTRIAL INVERTEBRATE ANALYTICAL SUITE

Parameter	Method	Estimated Detection Limit	Reporting Units	Holding Time
Aluminum	3050B/6010B	2.0	mg/kg (dw)	180 Days
Antimony	3050B/6010B	0.1	mg/kg (dw)	180 Days
Arsenic	3050B/6010B	0.02	mg/kg (dw)	180 Days
Barium	3050B/6010B	0.05	mg/kg (dw)	180 Days
Beryllium	3050B/6010B	0.01	mg/kg (dw)	180 Days
Boron	Na-fusion, ICP	0.2	mg/kg (dw)	180 Days
Cadmium	3050B/6010B	0.005	mg/kg (dw)	180 Days
Chromium	3050B/6010B	0.02	mg/kg (dw)	180 Days
Copper	3050B/6010B	0.05	mg/kg (dw)	180 Days
Lead	3050B/6010B	0.01	mg/kg (dw)	180 Days
Manganese	3050B/6010B	0.01	mg/kg (dw)	180 Days
Mercury	EPA 1631	N/A	mg/kg (dw)	28 Days
Molybdenum	3050B/6010B	0.1	mg/kg (dw)	180 Days
Nickel	3050B/6010B	0.01	mg/kg (dw)	180 Days
Selenium	ICP-HG	0.04	mg/kg (dw)	180 Days
Silver	3050B/6010B	0.01	mg/kg (dw)	180 Days
Thallium	3050B/6010B	0.1	mg/kg (dw)	180 Days
Uranium	3050B/6010B	0.04	mg/kg (dw)	180 Days
Vanadium	3050B/6010B	0.16	mg/kg (dw)	180 Days
Zinc	3050B/6010B	0.14	mg/kg (dw)	180 Days

2.2.3 Surface Soil Sampling and Analyses

Surface soil sampling was conducted following the procedures outlined in the Summer 2001 Area-Wide Investigation SAP (MW, 2001).

Surface soil samples were collected in conjunction with terrestrial invertebrate samples. Three composite soil samples were collected at each site. Each composite soil sample consisted of five replicates from randomly selected locations within each sampling quadrant. These samples were sent to the U of I for sieving and analyses. Table 2-5, *Surface Soil Analytical Suite,* lists analytes and methodology.

TABLE 2-5 SURFACE SOIL ANALYTICAL SUITE				
Parameter	**Method**	**Estimated Detection Limit**	**Reporting Limits**	**Holding Time**
Aluminum	3050B/6010B	2.0	mg/kg (dw)	180 Days
Antimony	3050B/6010B	0.38	mg/kg (dw)	180 Days
Arsenic	3050B/6010B	0.075	mg/kg (dw)	180 Days
Barium	3050B/6010B	0.019	mg/kg (dw)	180 Days
Beryllium	3050B/6010B	0.019	mg/kg (dw)	180 Days
Boron	Na-fusion, ICP	2	mg/kg (dw)	180 Days
Cadmium	3050B/6010B	0.019	mg/kg (dw)	180 Days
Chromium	3050B/6010B	0.075	mg/kg (dw)	180 Days
Copper	3050B/6010B	0.7	mg/kg (dw)	180 Days
Lead	3050B/6010B	0.038	mg/kg (dw)	180 Days
Manganese	3050B/6010B	2.2	mg/kg (dw)	180 Days
Mercury	EPA 1631	N/A	mg/kg (dw)	180 Days
Nickel	3050B/6010B	0.019	mg/kg (dw)	180 Days
Selenium	ICP-HG	0.04	mg/kg (dw)	180 Days
Silver	3050B/6010B	0.038	mg/kg (dw)	180 Days
Thallium	3050B/6010B	0.38	mg/kg (dw)	180 Days
Vanadium	3050B/6010B	3.1	mg/kg (dw)	180 Days
Zinc	3050B/6010B	0.54	mg/kg (dw)	180 Days
Fluoride	Na-fusion, ion chromatography	1.0	*	*
PH	USDA #60-21a	N/A	N/A	28 Days
Electrical Conductivity	9050A	0.001	dS/m	None Specified
Organic Carbon	USDA #60-24	0.06	%	28 Days
Particle Size Distribution	ASA #9 43-5	0.1	%	N/A

2.2.4 Vegetation Sampling and Analyses

Vegetation sampling was conducted following the procedures outlined in the Summer 2001 Area-Wide Investigation SAP (MW, 2001).

Vegetation samples were collected in conjunction with terrestrial invertebrate samples. Each vegetation sample consisted of a composite sample of five replicates that were collected from randomly selected locations from within each quadrat. Three composited samples were taken at each of the sampling stations, and sent to the U of I for analyses. Table 2-6, *Vegetation Analytical Suite* lists analytes and methodology.

TABLE 2-6 VEGETATION ANALYTICAL SUITE				
Parameter	**Method**	**Estimated Detection Limit**	**Reporting Limits**	**Holding Time**
Aluminum	3050B/6010B	2.0	mg/kg (dw)	180 Days
Antimony	3050B/6010B	0.1	mg/kg (dw)	180 Days
Arsenic	3050B/6010B	0.02	mg/kg (dw)	180 Days
Barium	3050B/6010B	0.05	mg/kg (dw)	180 Days
Beryllium	3050B/6010B	0.01	mg/kg (dw)	180 Days
Boron	Na-fusion, ICP	0.2	mg/kg (dw)	180 Days
Cadmium	3050B/6010B	0.005	mg/kg (dw)	180 Days
Chromium	3050B/6010B	0.02	mg/kg (dw)	180 Days
Copper	3050B/6010B	0.05	mg/kg (dw)	180 Days
Lead	3050B/6010B	0.01	mg/kg (dw)	180 Days
Manganese	3050B/6010B	0.01	mg/kg (dw)	180 Days
Mercury	EPA 1631	N/A	mg/kg (dw)	28 Days
Molybdenum	3050B/6010B	0.1	mg/kg (dw)	180 Days
Nickel	3050B/6010B	0.01	mg/kg (dw)	180 Days
Selenium	ICP-HG	0.04	mg/kg (dw)	180 Days
Silver	3050B/6010B	0.01	mg/kg (dw)	180 Days
Thallium	3050B/6010B	0.1	mg/kg (dw)	180 Days
Uranium	3050B/6010B	0.04	mg/kg (dw)	180 Days
Vanadium	3050B/6010B	0.16	mg/kg (dw)	180 Days
Zinc	3050B/6010B	0.14	mg/kg (dw)	180 Days

2.3 DATA VALIDATION

Data validation was conducted following USEPA protocols found in "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses" (USEPA, 1994). Data validation summaries for small mammals (Appendix B), terrestrial invertebrates (Appendix C), surface soils (Appendix D), and vegetation (Appendix E) are located in their respective appendices. These data were not censored during the validation process.

The U of I uses instrument detection limits (IDL), and estimated/method detection limits (EDL, MDL) when reporting data. Seven blank samples are run and the sigma value of the signal noise is multiplied by three. Sigma is a t-value for the 95% confidence limit at n-1 degrees of freedom. This initial value is then verified by running low level standards. Progressively lower concentrations of a constituent are run until a percent relative standard deviation (%RSD) of 90 – 110% is reached for three consecutive samples. The mean of the three samples becomes the new IDL. Depending on the matrix, the MDL may be different than the IDL. If samples are diluted, the MDL is a factor of the dilution, whereas samples that remain undiluted have an MDL that is equal to the IDL. (USEPA, 1996).

3.0 SAMPLING RESULTS

3.1 SMALL MAMMALS

Small mammal sampling methodology outlined in the field sampling plan dictated that three small mammals were to be collected at each sampling station. Four different zones of terrestrial habitat were identified prior to field sampling. These zones were, waste rock dumps, background upland areas (unmined phosphoria outcrops), impacted stream stations, and background stream stations. Capturing small mammals was successful at all waste dump and upland background areas. Seven impacted stream locations were sampled, however three locations did not produce any small mammals. At one impacted stream location that resulted in small mammal capture, only two of the three desired small mammals were collected. Four out of five background stream stations resulted in successful collection of small mammals. Various small mammals were captured at each location. These small mammals were Deer Mice, Least Chipmunks, Western Harvest Mice, and one Uinta Ground Squirrel.

Small mammal analytical results are presented in censored form in Table 3-1. USEPA data validation qualifiers for these results can be found in Appendix F.

3.2 TERRESTRIAL INVERTEBRATES

Terrestrial invertebrates were collected at stations that resulted in successful small mammal capture. The terrestrial invertebrate- insect analytical results are presented in censored form in Table 3-2. USEPA data validation qualifiers and uncensored data for these results can be found in Appendix G. Table 3-3 presents the censored analytical data for terrestrial invertebrates-worms. USEPA data validation qualifiers and uncensored data for these results can be found in Appendix H.

3.3 SURFACE SOILS

Surface soils were collected at stations that resulted in successful small mammal capture. The surface soil analytical results are presented in censored form in Table 3-4. USEPA data validation qualifiers and uncensored data for these results can be found in Appendix I.

3.4 VEGETATION

Vegetation samples were collected at stations that resulted in successful small mammal capture. The vegetation analytical results are presented in censored form in Table 3-5. USEPA data validation qualifiers and uncensored data for these results can be found in Appendix J.

TABLE 3-1
SUMMER 2001 AREA-WIDE INVESTIGATION
SMALL MAMMAL RESULTS

Station ID	Sample ID	Aluminum		Antimony		Arsenic		Barium		Beryllium		Boron		Cadmium		Chromium		Copper		Lead		Manganese		Mercury		Molybdenum		Nickel		Selenium		Silver		Thallium		Uranium		Vanadium		Zinc	
		mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag
BB004	082501MABB004-1-1	68		0.27		0.17	J	7.4		0.010	U	2.7	J	0.059	J	0.99	J	2.6	J	0.20	J	2.6	J	0.067	UJ	0.27	J	0.42		0.29	J	0.010	U	0.10	U	0.056		0.20	U	50	J
BB004	082901MABB004-1-2	36		0.13		0.032	J	2.6		0.075		2.1	J	1.2	J	0.59	J	2.3	J	0.32	J	2.8	J	0.067	UJ	0.12	J	0.32		0.47	J	0.040		0.10	U	0.020	U	0.20	U	55	J
BB004	083101MABB004-1-3	97		0.10	U	0.020	U	3.1		0.012		2.9	J	0.0041	UJ	0.57	J	0.81	J	0.11	J	1.2	J	0.067	UJ	0.10	UJ	0.061		0.61	J	0.010	U	0.10	U	0.040		0.20	U	89	J
BB005	082701MABB005-1-1	41		0.33		0.020	U	2.4		0.021		5.4	J	0.022	J	1.2	J	2.1	J	0.12	J	2.6	J	0.067	UJ	0.33	J	0.077		0.46	J	0.010	U	0.10	U	0.071		0.20	U	46	J
BB005	082701MABB005-1-2	64		1.2		0.020	U	2.3		0.025		5.7	J	0.039	J	1.3	J	2.3	J	0.098	J	4.1	J	0.067	UJ	0.54	J	0.18		0.51	J	0.010	U	0.10	U	0.12		0.20	U	31	J
BB005	082801MABB005-1-3	32		0.12		0.020	U	3.2		0.017		3.2	J	0.039	J	1.2	J	2.1	J	0.20	J	3.0	J	0.067	UJ	0.44	J	0.18		0.83	J	0.010	U	0.10	U	0.053		0.20	U	48	J
BB006	083101MABB006-1-1	1200		0.11		0.028	J	5.6		0.094		2.2	J	0.022	J	0.89	J	5.0	J	0.083	J	16	J	0.067	UJ	0.10	UJ	0.47		0.27	J	0.010	U	0.10	U	0.020	U	0.30	J	28	J
BB006	083101MABB006-1-2	1600		0.12		0.048	J	3.9		0.095		1.8	J	0.043	J	0.65	J	5.1	J	0.15	J	22	J	0.067	UJ	0.10	UJ	0.43		0.30	J	0.010	U	0.10	U	0.020	U	0.43	J	30	J
BB006	083101MABB006-1-3	100		0.16		0.065	J	4.4		0.14		3.5	J	0.37	J	0.72	J	3.2	J	0.20	J	6.9	J	0.067	UJ	0.32	J	0.44		1.2	J	0.016		0.10	U	0.020	U	0.30	J	32	J
BB007	083101MABB007-1-1	52		0.14		0.050	J	3.8		0.088		2.3	J	0.49	J	0.69	J	3.4	J	0.14	J	5.3	J	0.067	UJ	0.10	UJ	0.29		0.54	J	0.010	U	0.10	U	0.020	U	0.20	U	65	J
BB007	083101MABB007-1-2	790		0.10	U	0.038	J	8.2		0.085		1.3	J	0.032	J	0.62	J	2.9	J	0.11	J	11	J	0.067	UJ	0.10	UJ	0.37		0.41	J	0.010	U	0.10	U	0.020	U	0.20	U	29	J
BB007	083101MABB007-1-3	29		0.16		0.020	U	4.4		0.14		2.4	J	0.12	J	0.73	J	3.1	J	0.024	J	2.7	J	0.067	UJ	0.23	J	0.27		0.46	J	0.010	U	0.10	U	0.020	U	0.20	U	53	J
ST026	082301MAST026-1-1	22		0.30		0.13	J	2.2		0.010	U	2.8	J	0.14	J	1.0	J	2.5	J	0.068	J	2.8	J	0.067	UJ	0.30	J	0.61		1.7	J	0.010	U	0.10	U	0.083		0.20	U	33	J
ST026	082301MAST026-1-2	65		0.38		0.071	J	1.3		0.010	U	3.5	J	0.061	J	1.9	J	2.3	J	0.15	J	2.7	J	0.067	UJ	0.31	J	0.79		0.42	J	0.010	U	0.10	U	0.069		0.20	U	27	J
ST026	082301MAST026-1-3	340		0.26		0.084	J	3.5		0.010	U	2.6	J	0.049	J	1.2	J	3.0	J	0.13	J	5.5	J	0.067	UJ	0.23	J	0.57		0.35	J	0.010	U	0.10	U	0.066		0.20	U	29	J
ST049	090201MAST049-1-1	70		0.14		0.020	U	9.5		0.091		9.5	J	0.033	J	1.6	J	3.4	J	0.051	J	3.6	J	0.067	UJ	0.10	UJ	0.34		0.26	J	0.010	U	0.10	U	0.020	U	0.24	J	51	J
ST049	090401MAST049-1-2	400		0.10	U	0.020	U	8.6		0.012		4.3	J	0.13	J	0.70	J	1.5	J	0.079	J	5.2	J	0.067	UJ	0.10	UJ	0.22		0.55	J	0.010	U	0.10	U	0.039		0.22	J	24	J
ST049	090501MAST049-1-3	110		0.10		0.020	U	4.0		0.020		6.2	J	0.027	J	1.5	J	2.7	J	0.065	J	4.7	J	0.067	UJ	0.32	J	0.14		0.45	J	0.010	U	0.10	U	0.060		0.20	U	23	J
ST076	090501MAST076-1-1	45		0.14		0.020	U	3.6		0.022		7.0	J	0.012	J	2.0	J	1.9	J	0.29	J	2.3	J	0.067	UJ	0.42	J	0.52		1.2	J	0.010	U	0.10	U	0.065		0.20	U	37	J
ST076	090501MAST076-1-2	90		0.10	U	0.020	U	2.3		0.018		5.5	J	0.018	J	1.9	J	2.1	J	0.095	J	2.8	J	0.067	UJ	0.22	J	0.21		0.62	J	0.010	U	0.10	U	0.057		0.20	U	26	J
ST130	082401MAST130-1-1	59		0.32		0.094	J	6.7		0.010	U	2.7	J	0.032	J	1.2	J	3.0	J	0.20	J	3.0	J	0.067	UJ	0.49	J	0.52		0.57	J	0.010	U	0.10	U	0.089		0.20	U	30	J
ST130	082501MAST130-1-2	73		0.43		0.07	J	2.6		0.010	U	2.3	J	0.025	J	1.60	J	3.2	J	0.27	J	3.0	J	0.067	UJ	0.46	J	0.57		0.54	J	0.010	U	0.10	U	0.097		0.20	U	57	J
ST130	082501MAST130-1-3	35		0.29		0.081	J	2.7		0.010	U	2.7	J	0.028	J	1.30	J	2.6	J	0.14	J	3.2	J	0.067	UJ	0.45	J	0.40		0.76	J	0.010	U	0.10	U	0.072		0.20	U	38	J
ST153	082901MAST153-1-1	220		0.10	U	0.057	J	2.1		0.018		3.7	J	0.039	J	0.94	J	1.8	J	0.076	J	4.1	J	0.067	UJ	0.16	J	0.34		4.8	J	0.010	U	0.10	U	0.053		0.21	J	30	J
ST153	082901MAST153-1-2	28		0.10		0.020	U	1.6		0.019		5.4	J	0.015	J	1.3	J	1.4	J	0.037	J	1.9	J	0.067	UJ	0.17	J	0.010	U	1.3	J	0.010	U	0.10	U	0.062		0.20	U	22	J
ST153	082901MAST153-1-3	100		0.11		0.020	U	2.2		0.021		5.8	J	0.027	J	1.3	J	2.2	J	0.047	J	4.7	J	0.067	UJ	0.47	J	0.033		2.7	J	0.010	U	0.10	U	0.066		0.20	U	27	J
ST227	082801MAST227-1-1	100		0.26		0.060	J	4.9		0.22		7.9	J	0.060	J	2.0	J	4.5	J	0.053	J	6.0	J	0.067	UJ	0.45	J	0.57		3.4	J	0.010	U	0.10	U	0.020	U	0.42	J	36	J
ST227	082801MAST227-1-2	140		0.12		0.020	U	3.4		0.019		5.6	J	0.024	J	3.7	J	1.8	J	0.039	J	3.2	J	0.067	UJ	0.34	J	1.3		0.88	J	0.010	U	0.10	U	0.059		0.20	U	24	J
ST227	082801MAST227-1-3	48		0.12		0.020	U	2.2		0.022		5.9	J	0.016	J	1.3	J	1.7	J	0.054	J	2.6	J	0.067	UJ	0.42	J	0.010	U	1.2	J	0.010	U	0.10	U	0.065		0.20	U	26	J
ST235	090201MAST235-1-1	180		0.14		0.020	U	3.4		0.11		3.0	J	0.022	J	0.50	J	2.9	J	0.054	J	3.2	J	0.067	UJ	0.10	UJ	0.30		0.25	J	0.010	U	0.10	U	0.020	U	0.29	J	30	J
ST235	090201MAST235-1-2	25		0.11		0.020	U	4.0		0.10		1.2	J	0.025	J	0.63	J	2.6	J	0.074	J	1.8	J	0.067	UJ	0.10	UJ	0.28		0.25	J	0.010	U	0.10	U	0.020	U	0.20	U	30	J
ST235	090201MAST235-1-3	34		0.16		0.020	U	5.8		0.15		2.5	J	0.017	J	0.68	J	2.5	J	0.25	J	2.5	J	0.067	UJ	0.27	J	0.31		0.68	J	0.010	U	0.10	U	0.020	U	0.20	U	28	J
ST237	083001MAST237-1-1	180		0.15		0.020	U	3.7		0.14		7.5	J	0.037	J	1.2	J	2.4	J	0.12	J	5.3	J	0.067	UJ	0.22	J	0.40		0.62	J	0.010	U	0.10	U	0.020	U	0.49	J	22	J
ST237	083001MAST237-1-2	51		0.10	U	0.020	U	4.8		0.090		2.0	J	0.059	J	0.59	J	2.3	J	0.096	J	5.4	J	0.067	UJ	0.10	UJ	0.26		0.41	J	0.010	U	0.10	U	0.020	U	0.20	U	27	J
ST237	083001MAST237-1-3	160		0.11		0.18	J	7.6		0.094		2.4	J	0.037	J	0.82	J	2.2	J	0.18	J	11	J	0.067	UJ	0.10	UJ	0.33		0.43	J	0.010	U	0.10	U	0.020	U	0.21	J	24	J
WD053	082501MAWD053-2-1	70		0.33		0.14	J	2.5		0.010	U	3.0	J	0.070	J	1.4	J	3.2	J	0.11	J	5.3	J	0.067	UJ	1.1	J	0.88		1.9	J	0.010	U	0.10	U	0.093		0.20	U	28	J
WD053	082501MAWD053-2-2	14		0.33		0.13	J	2.8		0.010	U	2.2	J	0.030	J	2.0	J	2.0	J	0.14	J	1.4	J	0.067	UJ	0.43	J	0.38		2.1	J	0.010	U	0.10	U	0.090		0.20	U	24	J
WD053	082701MAWD053-2-3	23		0.10	U	0.020	U	3.0		0.017		4.7	J	0.027	J	0.82	J	1.5	J	0.032	J	1.6	J	0.067	UJ	0.25	J	0.045		2.0	J	0.010	U	0.10	U	0.055		0.20	U	25	J
WD062	082201MAWD062-1-1	37		0.30		0.31	J	0.99		0.010	U	6.8	J	0.25	J	1.6	J	2.9	J	0.13	J	1.7	J	0.067	UJ	0.60	J	0.71		8.8	J	0.010	U	0.10	U	0.074		0.20	U	45	J
WD062	082201MAWD062-1-2	27		0.27		0.18	J	0.92		0.14		3.8	J	0.18	J	1.4	J	2.9	J	0.65	J	1.7	J	0.067	UJ	0.38	J	0.56		5.0	J	0.0110		0.10	U	0.032		0.36	J	32	J
WD062	082201MAWD062-1-3	34		0.23		0.58	J	1.3		0.15		4.1	J	0.077	J	1.2	J	2.9	J	0.010	UJ	1.7	J	0.067	UJ	0.29	J	0.60		17.0	J	0.010	U	0.10	U	0.020	U	0.20	U	31	J
WD081	082201MAWD081-2-1	51		0.24		0.27	J	0.49		0.17		2.0	J	0.13	J	1.3	J	2.5	J	0.010	U	1.8	J	0.067	UJ	0.35	J	0.51		6.5	J	0.010		0.10	U	0.030		0.27	J	27	J
WD081	082201MAWD081-2-2	30		0.19		0.40	J	0.65		0.13		2.3	J	0.30	J	2.1	J	11	J	3.0	J	2.3	J	0.067	UJ	0.40	J	1.0		11	J	0.034		0.10	U	0.025		0.55	J	27	J
WD081	082201MAWD081-2-3	30		0.16		0.32	J	0.81		0.093		2.8	J	0.15	J	1.3	J	2.1	J	0.084	J	2.2	J	0.067	UJ	0.45	J	1.8		9.0	J	0.010	U	0.10	U	0.020	U	0.25	J	37	J
WD086	082201MAWD086-2-1	80		0.18		0.053	J	3.6		0.15		2.0	J	0.049	J	1.2	J	2.2	J	0.062	J	2.7	J	0.067	UJ	0.18	J	0.47		2.2	J	0.010	U	0.10	U	0.021		0.27	J	38	J
WD086	082201MAWD086-2-2	47		0.16		0.12	J	4.0		0.14		4.0	J	0.047	J	1.3	J	2.8	J	0.014	J	1.8	J	0.067	UJ	0.24	J	0.43		2.6	J	0.010	U	0.10	U	0.020	U	0.21	J	28	J
WD086	082201MAWD086-2-3	87		0.17		0.035	J	1.1		0.14		2.6	J	0.095	J	1.3	J	3.0	J	0.010	UJ	2.6	J	0.067	UJ	0.52	J	0.67		2.0	J	0.011		0.10	U	0.026		0.35	J	28	J

Notes:
Data validation was performed in accordance with Montgomery Watson SOP-NW-18.1 and USEPA Laboratory Data Validation Funtional Guidelines for Evaluating Inorganic Analyses.
Flag refers to the USEPA data qualifier (flag) assigned to the data resulting from the data validation procedure. More than one flag may be assigned during the data validation process.
Small mammal data are presented in wet weight (mg/kg)
Data qualifier definitions are:
(U) - The material was analyzed for, but was not detected above the level of the associated value. The associated value is 5 X the highest blank concentration, or the sample detection limit.
(J) - The associated value is an estimated quantity.
(R) - The data are unusable.
(UJ) - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N/A - Not Available.

TABLE 3-2
SUMMER 2001 AREA-WIDE INVESTIGATION
TERRESTRIAL INVERTEBRATE RESULTS- INSECTS

Station ID	Sample ID	Aluminum		Antimony		Arsenic		Barium		Beryllium		Boron		Cadmium		Chromium		Copper		Lead		Manganese		Mercury		Molybdenum		Nickel		Selenium		Silver		Thallium		Uranium		Vanadium		Zinc	
		mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag
BB004	090401TIBB004-1/2	100		0.14		0.16		15		0.22		19		2.4		9.7		31		0.15		49	J			0.44		5.6	J	0.62		0.010	U	0.10	U	0.040	U	0.31		120	
BB006	090401TIBB006-1/2																													1.1											
ST026	082501TIST026-1	450		0.13		0.22		23		0.23		20		1.7		4.2		16		0.29		79	J	0.031	UJ	0.93		1.5	J	2.4		0.010	U	0.10	U	0.062		1.1		190	
ST026	082501TIST026-2	740		0.15		0.28		30		0.24		22		1.5		3.1		13		0.45		94	J	0.036	J	0.69		0.84	J	4.4		0.010	U	0.10	U	0.088		1.4		180	
ST026	082501TIST026-3	910		0.12		0.27		27		0.26		17		1.5		3.6		13		0.51		50	J	0.035	J	0.73		0.83	J	3		0.010	U	0.10	U	0.12		1.8		200	
ST049	090801TIST049-1/2	800		0.11		0.22		16		0.28		22		0.89		10		44		0.52		89	J			0.51		5.7	J	0.67		0.010	U	0.10	U	0.058		1.5		140	
ST076	090801TIST076-1	940		0.10	U	0.37		15		0.25		11		0.37		3.1		33		0.59		36	J			0.62		2.4	J	1.8		0.010	U	0.10	U	0.046		2.1		170	
ST076	090801TIST076-2	190		0.10	U	0.22		8.9		0.22		12		0.36		2.3		40		0.10		36	J			0.68		0.97	J	1.3		0.010	U	0.10	U	0.040	U	0.46		180	
ST076	090801TIST076-3																													2.4											
ST130	082801TIST130-1	360		0.13		0.31		12		0.23		16		2.5		3.6		28		0.20		180	J	0.031	UJ	0.36		1.4	J	2		0.010	U	0.10	U	0.040	U	1.1		150	
ST130	082801TIST130-2	170		0.20		0.11		5.3		0.23		16		1.1		5.4		29		0.08		68	J	0.031	UJ	0.68		3	J	1.6		0.010	U	0.10	U	0.040	U	0.56		160	
ST130	082801TIST130-3	310		0.10	U	0.33		5.1		0.23		17		1.7		11		24		0.20		160	J			0.69		5.1	J	6		0.010	U	0.10	U	0.046		1.0		140	
ST153	083101TIST153-1																													4.1											
ST153	083101TIST153-2																													1.9											
ST153	083101TIST153-3																													3.3											
ST227	090101TIST227-1	97		0.15		0.54		8.7		0.21		19		1.4		2.4		33		0.092		68	J	0.031	UJ	1.0		1	J	13		0.010	U	0.10	U	0.040	U	0.40		190	
ST227	090101TIST227-2	140		0.13		0.56		4.5		0.22		24		1.9		2.7		23		0.10		59	J	0.031	UJ	1.3		1.1	J	14		0.010	U	0.10	U	0.040	U	0.30		180	
ST227	090101TIST227-3	200		0.11		0.62		3.3		0.22		15		3.6		3.3		37		0.091		41	J	0.031	UJ	1.8		1.3	J	11		0.010	U	0.10	U	0.040	U	0.37		220	
ST235	090801TIST235-1	280		0.13		0.11		5.5		0.23		15		0.093		2.5		34		0.21		21	J	0.044	U	0.53		1.1	J	0.6		0.010	U	0.10	U	0.040	U	0.63		120	
ST235	090801TIST235-2																													2.1											
ST235	090801TIST235-3	910		0.10		0.15		11		0.25		17		0.23		3.6		28		0.51		28	J	0.029	U	0.23		1.6	J	0.6		0.010	U	0.10	U	0.074		2.0		120	
ST237	090301TIST237-1																													1.8											
ST237	090301TIST237-2																													1.8											
ST237	090301TIST237-3																													0.94											
WD053	082901TIWD053-2-1																													4.4											
WD053	082901TIWD053-2-3	1400		0.10	U	0.53		9.8		0.31		22		1.5		9.1		13		0.82		47	J			0.56		5.2	J	3.8		0.010	U	0.10	U	0.17		4.3		180	
WD062	082701TIWD062-1-1	51		0.14		0.68		1.8		0.21		9.1		4.8		2.7		46		0.044		35	J	0.031	UJ	4.0		8.7	J	13		0.010	U	0.10	U	0.040	U	0.46		270	
WD062	082701TIWD062-1-2	62		0.10	U	0.63		1.4		0.21		6.7		4.6		3.2		43		0.057		32	J	0.031	UJ	3.6		9	J	18		0.010	U	0.10	U	0.040	U	0.22		270	
WD062	082701TIWD062-1-3	54		0.10	U	0.87		1.7		0.22		9.4		7		4.7		44		0.074		47	J	0.031	UJ	6.0		12	J	29		0.010	U	0.10	U	0.040	U	0.30		290	
WD081	082301TIWD081-2-1	160		0.30		0.55		3.8		0.23		30		5.6		8.2		11		0.31		52	J	0.031	UJ	1.8		3	J	30		0.010	U	0.10	U	0.62		3.8		200	
WD081	082301TIWD081-2-2	330		0.34		0.61		4.4		0.26		32		5.6		11		10		1.9		48	J	0.031	UJ	1.1		3.8	J	29		0.010	U	0.10	U	0.96		7.0		230	
WD081	082301TIWD081-2-3	82		0.19		0.83		3.4		0.22		14		7.3		4.9		14		0.13		63	J	0.031	UJ	2.9		2.1	J	30		0.010	U	0.10	U	0.28		2.4		240	
WD086	082401TIWD086-2-1	130		0.19		0.30		1.6		0.23		22		1.9		8.5		20		0.18		23	J	0.031	UJ	1.2		2.6	J	7.9		0.010	U	0.10	U	0.44		3.0		180	
WD086	082401TIWD086-2-2	170		0.19		0.41		2.8		0.23		31		1.5		14		14		0.19		18	J	0.031	UJ	0.77		4.3	J	12		0.010	U	0.10		0.53		4.0		200	
WD086	082401TIWD086-2-3	140		0.16		0.35		2.0		0.24		19		4.2		9.7		22		0.23		30	J	0.031	UJ	2.2		3.5	J	10		0.010	U	0.14		0.40		3.1		200	

Notes:
Data validation was performed in accordance with Montgomery Watson SOP-NW-18.1 and USEPA Laboratory Data Validation Funtional Guidelines for Evaluating Inorganic Analyses.
Flag refers to the USEPA data qualifier (flag) assigned to the data resulting from the data validation procedure. More than one flag may be assigned during the data validation process.
Terrestrial invertebrate- insect data are presented in dry weight (mg/kg)
Data qualifier definitions are:
(U) - The material was analyzed for, but was not detected above the level of the associated value. The associated value is 5 X the highest blank concentration, or the sample detection limit.
(J) - The associated value is an estimated quantity.
(R) - The data are unusable.
(UJ) - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N/A - Not Available.

TABLE 3-3
SUMMER 2001 AREA-WIDE INVESTIGATION
TERRESTRIAL INVERTEBRATE RESULTS DATA- WORMS

Station ID	Sample ID	Aluminum		Antimony		Arsenic		Barium		Beryllium		Boron		Cadmium		Chromium		Copper		Lead		Manganese		Mercury		Molybdenum		Nickel		Selenium		Silver		Thallium		Uranium		Vanadium		Zinc	
		mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag
ST026	082501EWST026-1	4800		0.11		0.98		66		0.43		7.7		8.0		7.0		1.3		2.8		140	J	0.21	J	0.10	U	2.1	J	30		0.010	U	0.10	U	0.64		9.4		290	
ST026	082501EWST026-2	3200		0.12		1.8		42		0.35		8.9		8.7		6.0		2.6		2.0		77	J	0.16	J	0.10	U	2.1	J	41		0.010	U	0.10	U	0.42		6.5		300	
ST026	082501EWST026-3	6500		0.10	U	0.98		85		0.47		6.8		12		7.1		1.5		3.6		160	J	0.34	J	0.10	U	2.2	J	42		0.010	U	0.10	U	0.76		12		240	
ST049	090801EWST049-1																													30											
ST049	090801EWST049-2	13000		0.10	U	0.65		160		0.71		35		5.3		7.5		1.3		11		530	J	0.13	J	0.10	U	2.4	J	12		0.010	U	0.17		1.7		24		210	
ST130	082101EWST130-1	15000		0.12		1.8		100		0.78		8.5		27		14		3.1		8.5		640	J			0.10	U	5.8	J	44		0.010	U	0.17		1.2		28		280	
ST130	082801EWST130-2																													41											
ST130	082801EWST130-3	16000		0.17		1.6		87		0.93		10		10		12		2.6		8.7		840	J			0.10	U	5.0	J	80		0.010	U	0.21		1.7		33		200	
ST153	083101EWST153-2	7300		0.12		0.40		95		0.54		9.4		6.5		10		1.0		5.5		550	J	0.063	J	0.10	U	1.9	J	4.6		0.010	U	0.14		1.9		21		170	
ST227	090101EWST227-1	8800		0.17		1.6		76		0.57		8.0		34		13		2.1		6.7		260	J	0.42	J	0.10	U	5.0	J	120		0.11		0.22		1.6		31		330	
ST227	090101EWST227-2	6500		0.22		1.7		58		0.54		9.8		70		23		2.3		4.9		190	J	0.32	J	0.10	U	5.4	J	180		0.042		0.33		2.4		47		400	
ST227	090101EWST227-3	9400		0.21		1.7		83		0.63		10		61		26		2.9		6.7		450	J	0.44	J	0.10	U	6.0	J	260		0.043		0.56		3.3		62		360	
ST235	090801EWST235-1	5900		0.10	U	0.44		57		0.56		31		2.5		10		0.91		4.9		66	J			0.10	U	2.7	J	3		0.010	U	0.10	U	0.69		13		100	
ST237	090301EWST237-1	13000		0.10	U	0.96		100		0.61		8.6		12		5.8		1.8		9.9		320	J	0.30	J	0.10	U	3.4	J	28		0.010	U	0.21		0.95		26		370	
ST237	090301EWST237-2	13000		0.28		0.81		100		0.62		8.0		8.3		5.9		1.9		8.5		320	J	0.14	J	0.10	U	3.4	J	18		0.010	U	0.20		0.69		25		280	
ST237	090301EWST237-3	14000		0.14		0.82		110		0.69		7.5		8.5		5.9		1.9		9.7		340	J	0.22	J	0.10	U	3.7	J	21		0.010	U	0.23		0.67		31		250	

Notes:
Data validation was performed in accordance with Montgomery Watson SOP-NW-18.1 and USEPA Laboratory Data Validation Funtional Guidelines for Evaluating Inorganic Analyses.
Flag refers to the USEPA data qualifier (flag) assigned to the data resulting from the data validation procedure. More than one flag may be assigned during the data validation process.
Terrestrial invertebrate - worm data are presented in dry weight (mg/kg)
Data qualifier definitions are:
(U) - The material was analyzed for, but was not detected above the level of the associated value. The associated value is 5 X the highest blank concentration, or the sample detection limit.
(J) - The associated value is an estimated quantity.
(R) - The data are unusable.
(UJ) - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N/A - Not Available.

TABLE 3-4
SUMMER 2001 AREA-WIDE INVESTIGATION
SURFACE SOIL RESULTS

		Aluminum		Antimony		Arsenic		Barium		Beryllium		Boron		Cadmium		Chromium		Clay		Copper		Lead		Manganese		Mercury		Molybdenum		Nickel		Selenium	
Station ID	Sample ID	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	%		mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag
BB004	090401SSBB004-1	11000	R	0.96	J	6.4	R	120	J	0.49	J	2.0	U	1	R	23	J	4.6		10	J	13	R	630	J	0.022	J	N/A		12	J	0.47	
BB004	090401SSBB004-2	11000	R	1.0	J	6.2	R	110	J	0.47	J	2.0	U	0.76	R	21	J	1.6		9.6	J	10	R	520	J	0.023	J	N/A		12	J	0.41	
BB004	090401SSBB004-3	12000	R	0.66	J	6.7	R	130	J	0.5	J	2.0	U	0.87	R	23	J	2.6		9.9	J	13	R	620	J	0.021	J	N/A		13	J	0.44	
BB005	083001SSBB005-1	29000	R	0.79	J	8.5	R	270	J	1.3	J	15		0.71	R	44	J	30		31	J	17	R	2600	J	0.044	J	N/A		30	J	0.017	
BB005	083001SSBB005-2	31000	R	0.96	J	9.0	R	280	J	1.5	J	2.0	U	0.71	R	40	J	28		28	J	17	R	2500	J	0.028	J	N/A		31	J	0.73	
BB005	083001SSBB005-3	30000	R	1.1	J	9.8	R	240	J	1.2	J	2.0	U	0.57	R	38	J	28		32	J	22	R	2400	J	0.025	J	N/A		24	J	0.85	
BB006	090401SSBB006-1	25000	R	0.61	J	8.5	R	240	J	1	J	2.0	U	0.69	R	35	J	25		21	J	21	R	3200	J	0.046	J	N/A		22	J	0.78	
BB006	090401SSBB006-2	26000	R	0.59	J	8.1	R	250	J	1	J	2.0	U	0.73	R	35	J	24		18	J	24	R	3400	J	0.042	J	N/A		21	J	0.61	
BB006	090401SSBB006-3	25000	R	1.0	J	7.8	R	220	J	0.97	J	2.0	U	0.69	R	33	J	23		19	J	22	R	2900	J	0.042	J	N/A		21	J	0.60	
BB007	090301SSBB007-1	35500	R	1.2	J	8.1	R	265	J	1.2	J	2.0	U	12	R	125	J	26		17	J	23	R	810	J	0.043	J	N/A		41	J	3.3	
BB007	090301SSBB007-2	31000	R	0.97	J	8.7	R	270	J	1.2	J	2.0	U	13	R	98	J	28		16	J	22	R	830	J	0.046	J	N/A		46	J	2.5	
BB007	090301SSBB007-3	31000	R	1.2	J	7.0	R	270	J	1.1	J	2.0	U	14	R	100	J	4.6		15	J	16	R	630	J	0.028	J	N/A		40	J	2.8	
ST026	082501SSST026-1	6500	R	0.50	J	3.0	R	82	J	0.41	J	2.0	U	0.97	R	26	J	1.6		6.2	J	3.8	R	190	J	0.077		N/A		16	J	1.5	
ST026	082501SSST026-2	10000	R	0.74	J	3.2	R	110	J	0.63	J	2.0	U	1	R	21	J	23		9.2	J	6.4	R	240	J	0.075	U	N/A		14	J	1	
ST026	082501SSST026-3	7100	R	0.57	J	2.9	R	99	J	0.49	J	2.0	U	0.82	R	16	J	1.6		7.1	J	4.7	R	250	J	0.075	U	N/A		11	J	3.7	
ST049	090801SSST049-1	28000	R	0.38	U	8.0	R	290	J	1.1	J	2.0	U	1.3	R	65	J	31		18	J	15	R	1800	J	0.039	J	N/A		26	J	1.1	
ST049	090801SSST049-2	28000	R	0.38	U	6.3	R	190	J	0.65	J	4		1.1	R	50	J	25		17	J	12	R	1500	J	0.040	J	N/A		15	J	1.3	
ST049	090801SSST049-3	36000	R	0.38	U	2.7	R	100	J	0.1	J	13		0.44	R	53	J	31		19	J	6.5	R	1000	J	0.038	J	N/A		5.8	J	1.2	
ST076	090801SSST076-1	29000	R	0.38	U	11	R	460	J	1.9	J	29		2.4	R	45	J	30		17	J	28	R	600	J	0.036	J	N/A		35	J	1.5	
ST076	090801SSST076-2	27000	R	0.38	U	10	R	470	J	1.9	J	15		2.4	R	49	J	29		18	J	29	R	610	J	0.038	J	N/A		38	J	1.5	
ST076	090801SSST076-3	35000	R	0.38	U	6.4	R	270	J	1.1	J	11		1.4	R	50	J	29		18	J	17	R	380	J	0.041	J	N/A		22	J	1.7	
ST130	082801SSST130-1	36000	R	0.84	J	9.3	R	210	J	1.8	J	18		4.1	R	86	J	34		31	J	17	R	1800	J	0.056	J	N/A		48	J	1.3	
ST130	082801SSST130-2	33000	R	0.93	J	7.9	R	230	J	1.7	J	5.7		3.1	R	63	J	29		29	J	19	R	2300	J	0.037	J	N/A		180	J	2.5	
ST130	082801SSST130-3	33000	R	0.70	J	7.6	R	190	J	1.7	J	4		2.6	R	62	J	8.9		24	J	16	R	1500	J	0.039	J	N/A		47	J	1.7	
ST153	083101SSST153-1	18000	R	0.90	J	5.9	R	110	J	0.76	J	2.0	U	1.1	R	39	J	3.6		14	J	11	R	750	J	0.021	J	N/A		19	J	0.97	
ST153	083101SSST153-2	16000	R	1.3	J	6.1	R	100	J	0.67	J	2.0	U	0.92	R	41	J	2.6		14	J	9.4	R	1100	J	0.015	J	N/A		20	J	1.0	
ST153	083101SSST153-3	20000	R	0.5	J	7.2	R	130	J	0.89	J	2.0	U	1	R	46	J	5.1		18	J	11	R	1100	J	0.023	J	N/A		24	J	0.92	
ST227	090101SSST227-1	28000	R	1.0	J	8.5	R	190	J	1.1	J	2.0	U	2.5	R	67	J	28		24	J	15	R	1100	J	0.051	J	N/A		34	J	4.7	
ST227	090101SSST227-2	27000	R	0.68	J	8.7	R	210	J	1.1	J	2.0	U	2.2	R	59	J	29		24	J	15	R	1300	J	0.050	J	N/A		30	J	4.4	
ST227	090101SSST227-3	24000	R	1.5	J	11	R	160	J	1	J	2.0	U	9.6	R	150	J	24		38	J	13	R	1000	J	0.13	J	N/A		72	J	29	
ST235	090801SSST235-03	18000	R	0.40	J	6.3	R	150	J	0.81	J	2.6		0.50	R	43	J	3.6		12	J	11	R	460	J	0.02	J	N/A		18	J	0.77	
ST235	090801SSST235-1	12000	R	0.79	J	5.6	R	100	J	0.57	J	2.0	U	0.42	R	30	J	3.6		6.8	J	8.1	R	270	J	0.012	J	N/A		13	J	0.36	
ST235	090801SSST235-2	25000	R	0.53	J	7.5	R	205	J	0.99	J	2.0	U	0.65	R	50.5	J	3.6		13	J	14	R	585	J	0.014	J	N/A		22	J	0.41	
ST237	090301SSST237-1	24000	R	0.64	J	7.2	R	150	J	1	J	2.0	U	0.82	R	40	J	25		20	J	14	R	620	J	0.031	J	N/A		24	J	1.0	
ST237	090301SSST237-2	25000	R	0.76	J	8.8	R	160	J	1	J	2.0	U	0.91	R	41	J	23		19	J	14	R	1100	J	0.036	J	N/A		25	J	2.3	
ST237	090301SSST237-3	24000	R	0.68	J	7.7	R	160	J	1	J	2.0	U	0.89	R	39	J	23		19	J	14	R	880	J	0.031	J	N/A		24	J	1.3	
WD053	082901SSWD053-2-1	8600	R	0.73	J	16	R	48	J	0.92	J	12		1.8	R	40	J	15		27	J	7.5	R	290	J	0.13	J	N/A		68	J	5.1	
WD053	082901SSWD053-2-2	11000	R	0.51	J	15	R	53	J	1	J	2.0	U	2.8	R	50	J	16		30	J	7.1	R	310	J	0.17	J	N/A		79	J	5.0	
WD053	082901SSWD053-2-3	8600	R	0.63	J	15	R	43	J	0.85	J	2.0	U	1.5	R	39	J	15		30	J	7.1	R	270	J	0.12	J	N/A		67	J	5.3	
WD062	082701SSWD062-1-1	12500	R	3.7	J	39	R	88	J	2.6	J	5.8		24	R	595	J	26		87	J	9.3	R	160	J	0.51	J	N/A		215	J	33	
WD062	082701SSWD062-1-2	14000	R	1.7	J	34	R	90	J	2.4	J	12		28	R	670	J	26		89	J	9.1	R	150	J	0.51	J	N/A		220	J	28	
WD062	082701SSWD062-1-3	15000	R	1.7	J	41	R	91	J	2.3	J	12		21	R	670	J	25		86	J	8.8	R	140	J	0.52	J	N/A		200	J	36	
WD081	082301SSWD081-2-1	19000	R	3.4	J	21	R	140	J	1.7	J	2.0	U	44	R	530	J	22.9		79	J	33	R	380	J	0.36		N/A		180	J	19	
WD081	082301SSWD081-2-2	14000	R	3.4	J	23	R	110	J	1.6	J	2.0	U	48	R	630	J	20.1		84	J	29	R	290	J	0.38		N/A		200	J	24	
WD081	082301SSWD081-2-3	17000	R	3.5	J	23	R	110	J	1.4	J	4.9		41	R	640	J	12.6		87	J	17	R	410	J	0.39		N/A		200	J	19	
WD086	082401SSWD086-2-1	8800	R	6.5	J	34	R	99	J	1.8	J	2.0	U	28	R	740	J	23		130	J	12	R	300	J	0.54		N/A		290	J	17	
WD086	082401SSWD086-2-2	11000	R	4.5	J	32	R	120	J	1.8	J	21		28	R	740	J	23		120	J	10	R	480	J	0.49		N/A		320	J	12	
WD086	082401SSWD086-2-3	13000	R	4.1	J	31	R	110	J	1.7	J	15		35	R	750	J	14		120	J	11	R	500	J	0.47		N/A		290	J	17	

Notes:
Data validation was performed in accordance with Montgomery Watson SOP-NW-18.1 and USEPA Laboratory Data Validation Funtional Guidelines for Evaluating Inorganic Analyses.
Flag refers to the USEPA data qualifier (flag) assigned to the data resulting from the data validation procedure. More than one flag may be assigned during the data validation process.
Surface soil data are presented in dry weight (mg/kg)
Data qualifier definitions are:
(U) - The material was analyzed for, but was not detected above the level of the associated value. The associated value is 5 X the highest blank concentration, or the sample detection limit.
(J) - The associated value is an estimated quantity.
(R) - The data are unusable.
(UJ) - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N/A - Not Available.

TABLE 3-4
SUMMER 2001 AREA-WIDE INVESTIGATION
SURFACE SOIL RESULTS

Station ID	Sample ID	Silver		Thallium		Uranium		Vanadium		Zinc		Fluoride		pH		Electical Conductivity		Organic Carbon		>2 mm		Sand %		Silt %		Texture	
		mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag			µS/cm	Flag	mg/kg	Flag								
BB004	090401SSBB004-1	0.053		0.38	U	N/A		27	J	53	J	110	J	6.2		0.23		2.7		0		53		42		SL	
BB004	090401SSBB004-2	0.038	U	0.38	U	N/A		25	J	40	J	140	J	6		0.2		2.3		1.0		59		39		SL	
BB004	090401SSBB004-3	0.043		0.38	U	N/A		30	J	51	J	80	J	5.9		0.24		2.5		1.0		55		43		SL	
BB005	083001SSBB005-1	0.06		0.38	U	N/A		51	J	100	J	180	J	6.9		0.37		3.5		0		18		52		SiCL	
BB005	083001SSBB005-2	0.073		0.38	U	N/A		54	J	97	J	170	J	6.9		0.37		3		0		21		50		SiCL	
BB005	083001SSBB005-3	0.16		0.38	U	N/A		51	J	110	J	160	J	7.2		0.48		3		0		20		52		SiCL	
BB006	090401SSBB006-1	0.044		0.38	U	N/A		46	J	100	J	130	J	6.2		0.31		3.5		0		18		57		SiL	
BB006	090401SSBB006-2	0.041		0.38	U	N/A		46	J	100	J	98	J	6		0.23		3.6		1.0		15		61		SiL	
BB006	090401SSBB006-3	0.041		0.38	U	N/A		44	J	98	J	69	J	6		0.31		3.1		1.0		17		60		SiL	
BB007	090301SSBB007-1	0.13		0.79	J	N/A		80	J	660	J	500	J	6.6		0.23		4.6		0		13		62		SiL	
BB007	090301SSBB007-2	0.12		0.76	J	N/A		78	J	530	J	290	J	6.4		0.19		5		0		12		60		SiCL	
BB007	090301SSBB007-3	0.18		0.64	J	N/A		100	J	470	J	310	J	6.6		0.19		2.3		0		51		44		SL	
ST026	082501SSST026-1	0.082		0.38	U	N/A		15	J	33	J	240	J	7.7		0.87		1.5		24		67		31		SL	
ST026	082501SSST026-2	0.078		0.38	U	N/A		22	J	52	J	190	J	7.5		1.7		3		19		32		44		L	
ST026	082501SSST026-3	0.064		0.38	U	N/A		16	J	37	J	200	J	7.6		1.2		1.9		19		66		32		SL	
ST049	090801SSST049-1	0.079		0.38	U	N/A		57	J	100	J	140	J	6.7		0.46		4.7		34		17		52		SiCL	
ST049	090801SSST049-2	0.041		0.38	U	N/A		52	J	90	J	110	J	6.8		0.58		5.8		34		24		51		SiL	
ST049	090801SSST049-3	0.038	U	0.38	U	N/A		57	J	95	J	59	J	6.6		0.31		4.9		36		16		53		SiCL	
ST076	090801SSST076-1	0.13		0.68	J	N/A		51	J	110	J	74	J	7.6		0.67		5.8		44		13		58		SiCL	
ST076	090801SSST076-2	0.11		0.71	J	N/A		50	J	110	J	150	J	7.4		0.62		6		29		14		57		SiCL	
ST076	090801SSST076-3	0.038	U	0.42	J	N/A		54	J	110	J	130	J	7.6		0.54		6.2		39		13		59		SiCL	
ST130	082801SSST130-1	0.22		0.4	J	N/A		75	J	180	J	79	J	6.8		0.65		3.5		40		20		46		CL	
ST130	082801SSST130-2	0.22		0.38	U	N/A		66	J	150	J	69	J	6.9		1.6		4		27		32		40		CL	
ST130	082801SSST130-3	0.16		0.38	U	N/A		63	J	130	J	220	J	6.7		0.81		1.6		30		49		42		L	
ST153	083101SSST153-1	0.13		0.38	U	N/A		40	J	93	J	360	J	6.9		0.59		2.1		28		51		45		SL	
ST153	083101SSST153-2	0.15		0.38	U	N/A		39	J	72	J	390	J	7.6		0.71		1.4		58		65		32		SL	
ST153	083101SSST153-3	0.099		0.38	U	N/A		48	J	100	J	300	J	7.2		0.52		2.1		29		49		46		SL	
ST227	090101SSST227-1	0.26		0.38	U	N/A		69	J	140	J	180	J	6.8		0.48		4.8		27		17		55		SiCL	
ST227	090101SSST227-2	0.24		0.38	U	N/A		66	J	150	J	280	J	7		0.82		5.6		34		14		58		SiCL	
ST227	090101SSST227-3	1.3		0.51	J	N/A		140	J	370	J	380	J	7		0.73		4		25		22		54		SiL	
ST235	090801SSST235-03	0.062		0.38	U	N/A		37	J	62	J	66	J	7.3		0.65		2		29		52		45		SL	
ST235	090801SSST235-1	0.050		0.38	U	N/A		27	J	39	J	130	J	7.4		0.76		0.84		29		49		47		SL	
ST235	090801SSST235-2	0.095		0.38	U	N/A		48	J	70	J	120	J	7.6		0.56		1.1		26		56		40		SL	
ST237	090301SSST237-1	0.070		0.38	U	N/A		50	J	100	J	200	J	7		0.70		5.15		28		18		58		SiL	
ST237	090301SSST237-2	0.076		0.38	U	N/A		51	J	100	J	130	J	7.2		0.60		3.5		30		20		57		SiL	
ST237	090301SSST237-3	0.061		0.38	U	N/A		49	J	98	J	210	J	7.2		0.57		4.4		21		20		56		SiL	
WD053	082901SSWD053-2-1	0.075		0.4	J	N/A		34	J	150	J	130	J	7.4		0.40		0.28		0		69		16		SL	
WD053	082901SSWD053-2-2	0.12		0.38	U	N/A		42	J	190	J	120	J	7.4		0.31		0.34		0		66		18		SL	
WD053	082901SSWD053-2-3	0.062		0.38	U	N/A		34	J	150	J	200	J	7.4		0.28		0.26		0		70		15		SL	
WD062	082701SSWD062-1-1	3.4		1.0	J	N/A		255	J	860	J	960	J	7.2		0.68		3.4		0		28		47		L	
WD062	082701SSWD062-1-2	3.1		1.2	J	N/A		290	J	860	J	850	J	7.2		0.68		3.9		0		30		45		L	
WD062	082701SSWD062-1-3	2.6		1.2	J	N/A		260	J	790	J	640	J	7.2		0.69		3.7		0		29		46		L	
WD081	082301SSWD081-2-1	4.5		1.5	J	N/A		450	J	760	J	1000	J	7.3		1.1		3		0		40		37		L	
WD081	082301SSWD081-2-2	3.3		1.4	J	N/A		530	J	930	J	740	J	7.4		0.68		3.5		0		44		36		L	
WD081	082301SSWD081-2-3	4.4		1.4	J	N/A		420	J	860	J	1000	J	7.4		0.59		2.8		0		55		32		SL	
WD086	082401SSWD086-2-1	4.0		1.1	J	N/A		250	J	990	J	1200	J	6.8		0.64		3.5		1.0		27		50		SiL/L	
WD086	082401SSWD086-2-2	3.6		1.4	J	N/A		290	J	1100	J	750	J	6.9		0.52		3.3		0		30		48		L	
WD086	082401SSWD086-2-3	0.87		1.6	J	N/A		330	J	920	J	990	J	6.8		0.68		3.4		0		46		40		L	

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TABLE 3-5
SUMMER 2001 AREA-WIDE INVESTIGATION
VEGETATION RESULTS

Station ID	Sample ID	Aluminum mg/kg	Flag	Antimony mg/kg	Flag	Arsenic mg/kg	Flag	Barium mg/kg	Flag	Beryllium mg/kg	Flag	Boron mg/kg	Flag	Cadmium mg/kg	Flag	Chromium mg/kg	Flag	Copper mg/kg	Flag	Lead mg/kg	Flag	Manganese mg/kg	Flag	Mercury mg/kg	Flag	Molybdenum mg/kg	Flag	Nickel mg/kg	Flag	Selenium mg/kg	Flag	Silver mg/kg	Flag	Thallium mg/kg	Flag	Uranium mg/kg	Flag	Vanadium mg/kg	Flag	Zinc mg/kg	Flag
BB004	090401VEBB004-1	86		0.24		0.21		66		0.010 U	U	37		0.58		2.5	J	4.3	J	0.75		140	J	0.046		1.3		0.65		0.099		0.12		0.12		0.046		0.16 U	U	21	J
BB004	090401VEBB004-2	68		0.22		0.18		57		0.010 U	U	27		0.42		1.7	J	4.2	J	0.72		180	J	0.044		1.4		0.37		0.052		0.11		0.11		0.042		0.26		19	J
BB004	090401VEBB004-3	74		0.22		0.21		63		0.010 U	U	29		0.25		2.0	J	3.8	J	0.73		200	J	0.048		1.0		0.49		0.12		0.11		0.12		0.046		0.18		14	J
BB005	083001VEBB005-1	250		0.10 U	U	0.19		31		0.010 U	U	21		0.061		0.55	J	7.8	J	0.76		74	J	0.032	J	1.2		0.61		0.11		0.010 U	U	0.10 U	U	0.040 U	U	0.53		20	J
BB005	083001VEBB005-2	180		0.10 U	U	0.16		32		0.010 U	U	24		0.070		0.63	J	5.5	J	0.53		88	J	0.034	J	1.8		0.63		0.12		0.010 U	U	0.10 U	U	0.040 U	U	0.30		16	J
BB005	083001VEBB005-3	260		0.10 U	U	0.17		28		0.011		20		0.062		0.66	J	4.2	J	0.73		100	J	0.059	J	2.2		0.61		0.10		0.010 U	U	0.10 U	U	0.040 U	U	0.46		19	J
BB006	090401VEBB006-1	63		0.20		0.17		57		0.010 U	U	23		0.098		1.7	J	4.0	J	0.62		120	J	0.036		0.75		240		0.20		0.10		0.10		0.040 U	U	0.16 U	U	25	J
BB006	090401VEBB006-2	68		0.22		0.24		82		0.010 U	U	48		0.30		1.5	J	6.4	J	0.67		190	J	0.078		0.61		0.51		0.14		0.11		0.11		0.043		0.19		45	J
BB006	090401VEBB006-3	56		0.21		0.16		46		0.010 U	U	24		0.11		1.3	J	3.8	J	0.48		140	J	0.049		0.69		0.24		0.21		0.10		0.11		0.040 U	U	0.16 U	U	23	J
BB007	090301VEBB007-1	100		0.23		0.22		48		0.010 U	U	37		0.30		1.9	J	3.9	J	1.1		52	J	0.21	J	0.97		0.31		0.32		0.13		0.13		0.046		0.15		32	J
BB007	090301VEBB007-2	70		0.26		0.32		81		0.010		32		0.87		1.4	J	7.4	J	0.88		100	J	0.039	J	1.9		0.50		0.42		0.14		0.14		0.046		0.16 U	U	46	J
BB007	090301VEBB007-3	140		0.24		2.1		91		0.010 U	U	30		3.7		1.4	J	7.9	J	1.3		400	J	0.034	J	1.1		0.70		0.38		0.27		0.13		0.046		0.16 U	U	82	J
ST026	082501VEST026-1	290		0.10 U	U	0.21		53		0.010 U	U	19		0.25		1.0	J	3.9	J	0.39		51	J	0.075	UR	0.56		0.72		0.35		0.010 U	U	0.10 U	U	0.040 U	U	0.97		31	J
ST026	082501VEST026-2	260		0.15		0.23		73		0.016		29		0.17		1.2	J	3.9	J	0.50		100	J	0.075	UR	0.61		0.78		0.89		0.010 U	U	0.10 U	U	0.040 U	U	1.0		28	J
ST026	082501VEST026-3	120		0.10 U	U	0.19		34		0.017		64		0.11		1.5	J	5.4	J	0.60		37	J	0.075	UR	0.71		0.82		0.99		0.010 U	U	0.10 U	U	0.040 U	U	0.98		22	J
ST049	090801VEST049-1	210		0.22		0.24		78		0.010 U	U	13		0.14		1.5	J	3.8	J	0.67		610	J	0.033	UJ	0.85		0.28		0.20		0.11		0.11		0.052		0.19		24	J
ST049	090801VEST049-2	480		0.24		0.32		64		0.044		23		1.8		9.9	J	3.0	J	1.0		260	J	0.037	J	0.71		1.9		0.23		0.093		0.14		0.84		5.5		66	J
ST049	090801VEST049-3	270		0.21		0.21		44		0.010 U	U	12		0.24		1.9	J	4.3	J	0.72		120	J	0.033	UJ	0.95		0.45		0.16		0.10		0.11		0.061		0.41		29	J
ST076	090801VEST076-1	220		0.21		0.24		68		0.010 U	U	15		0.17		1.7	J	4.6	J	0.81		200	J	0.067	UJ	1.2		0.35		0.51		0.10		0.11		0.052		0.16		27	J
ST076	090801VEST076-2	270		0.22		0.22		62		0.016		9.8		0.23		1.6	J	4.4	J	0.70		84	J	0.033	UJ	0.53		0.58		0.73		0.17		0.13		0.060		0.68		27	J
ST076	090801VEST076-3	190		0.20		0.20		51		0.010 U	U	11		0.23		1.7	J	4.8	J	0.72		93	J	0.033	UJ	0.91		0.70		0.62		0.12		0.11		0.048		0.39		33	J
ST130	082801VEST130-1	280		0.10 U	U	0.20		32		0.020		46		0.28		1.1	J	5.8	J	0.35		26	J	0.025	J	0.72		1.1		1.1		0.010 U	U	0.10 U	U	0.040 U	U	1.0		31	J
ST130	082801VEST130-2	270		0.10 U	U	0.23		31		0.014		35		0.18		0.95	J	4.3	J	0.33		440	J	0.030	J	0.35		0.97		0.88		0.010 U	U	0.10 U	U	0.040 U	U	0.98		25	J
ST130	082801VEST130-3	170		0.17		0.17		20		0.016		35		0.37		0.83	J	7.4	J	0.58		200	J	0.020	J	0.45		0.91		1.1		0.010 U	U	0.10 U	U	0.040 U	U	0.70		33	J
ST153	083101VEST153-1	310		0.10 U	U	0.22		33		0.010 U	U	30		0.34		0.67	J	3.1	J	0.90		36	J	0.037	J	1.3		0.59		0.55		0.010 U	U	0.10 U	U	0.040 U	U	0.92		28	J
ST153	083101VEST153-2	160		0.10 U	U	0.17		58		0.010 U	U	28		0.13		0.93	J	4.7	J	0.61		160	J	0.026	J	0.74		1.0		0.27		0.010 U	U	0.10 U	U	0.040 U	U	0.55		19	J
ST153	083101VEST153-3	410		0.10 U	U	0.33		47		0.024		43		0.36		1.6	J	9.9	J	0.52		200	J	0.033	J	1.1		1.5		0.75		0.010 U	U	0.10 U	U	0.060		1.4		40	J
ST227	083101VEST227-1	77		0.27		0.30		37		0.010 U	U	68		0.18		1.7	J	3.5	J	0.50		230	J	0.018	J	1.1		0.38		3.9		0.13		0.12		0.047		0.19		21	J
ST227	090101VEST227-2	96		0.22		0.56		45		0.010 U	U	50		0.25		1.4	J	4.0	J	0.58		200	J	0.018	J	1.1		0.49		12		0.15		0.11		0.042		0.21		23	J
ST227	090101VEST227-3	120		0.22		0.86		46		0.010 U	U	60		0.38		2.8	J	3.4	J	0.43		530	J	0.022	J	0.89		1.4		19		0.12		0.12		0.080		1.6		29	J
ST235	090801VEST235-1	400		0.20		0.23		23		0.011		13		0.089		1.8	J	4.0	J	0.78		61	J	0.041		0.79		0.51		0.16		0.089		0.10		0.059		0.82		23	J
ST235	090801VEST235-2	360		0.20		0.25		28		0.014		16		0.077		2.0	J	4.0	J	0.68		120	J	0.038		0.77		0.48		0.27		0.094		0.11		0.058		0.71		21	J
ST235	090801VEST235-3	430		0.26		0.28		33		0.017		12		0.10		2.1	J	5.0	J	0.94		68	J	0.036		1.1		0.48		0.097		0.11		0.12		0.068		0.76		24	J
ST237	090301VEST237-1	120		0.21		0.20		38		0.010 U	U	50		0.27		1.6	J	4.3	J	0.50		100	J	0.024	J	0.71		0.44		0.23		0.10		0.11		0.052		0.41		29	J
ST237	090301VEST237-2	170		0.22		0.23		37		0.010 U	U	48		0.21		1.6	J	4.1	J	0.65		170	J	0.037	J	0.70		0.44		0.19		0.11		0.11		0.050		0.48		21	J
ST237	090301VEST237-3	120		0.23		0.23		29		0.010 U	U	38		0.35		1.6	J	4.6	J	0.60		120	J	0.041	J	0.71		0.55		0.32		0.16		0.12		0.053		0.66		37	J
WD053	082901VEWD053-2-1	89		0.10 U	U	0.23		20		0.010 U	U	31		0.37		0.83	J	5.4	J	0.56		90	J	0.029	J	2.8		1.7		1.7		0.010 U	U	0.14		0.040 U	U	0.30		32	J
WD053	082901VEWD053-2-2	210		0.10 U	U	0.28		19		0.019		41		1.4		1.6	J	5.6	J	0.51		79	J	0.038	J	3.9		2.7		1.3		0.010 U	U	0.11		0.042		1.1		31	J
WD053	082901VEWD053-2-3	190		0.10 U	U	0.32		28		0.024		51		1.7		1.7	J	5.5	J	0.37		110	J	0.033	J	3.6		3.7		2.5		0.010 U	U	0.10 U	U	0.040 U	U	0.88		32	J
WD062	082701VEWD062-1-1	36		0.10 U	U	0.16		18		0.010 U	U	20		1.6		0.69	J	4.0	J	0.47		42	J	0.020	J	5.0		3.5		1.7		0.010 U	U	0.20		0.040 U	U	0.73		91	J
WD062	082701VEWD062-1-2	41		0.10 U	U	0.19		15		0.010 U	U	22		1.2		0.74	J	4.6	J	0.44		54	J	0.043	J	7.3		4.0		2.4		0.010 U	U	0.15		0.040 U	U	0.34		120	J
WD062	082701VEWD062-1-3	30		0.10 U	U	0.55		19		0.010 U	U	30		1.5		0.65	J	4.0	J	0.43		25	J	0.019	J	6.0		4.8		19		0.010 U	U	0.18		0.040 U	U	0.70		74	J
WD081	082301VEWD081-2-1	51		0.10 U	U	0.98		16		0.013		38	J	1.3		1.2	J	7.1	J	0.48		62	J	0.075	UR	5.2		2.8		39		0.010 U	U	0.10 U	U	0.058		0.80		82	J
WD081	082301VEWD081-2-2	37		0.10 U	U	0.33		14		0.010 U	U	25		1.4		0.94	J	4.9	J	0.44		72	J	0.075	UR	3.4		1.9		9.1		0.010 U	U	0.10 U	U	0.040 U	U	0.78		71	J
WD081	082301VEWD081-2-3	44		0.10 U	U	0.73		20		0.010 U	U	22		1.1		0.91	J	4.1	J	0.31		59	J	0.075	UR	3.9		2.1		26		0.010 U	U	0.10 U	U	0.040 U	U	0.74		37	J
WD086	082401VEWD086-2-1	37		0.10 U	U	0.57		17		0.010 U	U	19		0.94		0.74	J	3.7	J	0.26		47	J	0.075	UR	3.2		1.8		4.4		0.010 U	U	0.10 U	U	0.040 U	U	0.76		36	J
WD086	082401VEWD086-2-2	83		0.12		0.46		6.9		0.014		28		1.5		5.7	J	6.8	J	1.7		50	J	0.075	UR	2.7		4.5		7.5		0.010 U	U	0.36		0.15		2.2		56	J
WD086	082401VEWD086-2-3	58		0.10 U	U	0.32		5.4		0.012		29		1.8		3.7	J	5.9	J	0.53		30	J	0.075	UR	2.7		4.0		4.7		0.010 U	U	0.42		0.093		2.1		41	J

Notes:
Data validation was performed in accordance with Montgomery Watson SOP-NW-18.1 and USEPA Laboratory Data Validation Funtional Guidelines for Evaluating Inorganic Analyses.
Flag refers to the USEPA data qualifier (flag) assigned to the data resulting from the data validation procedure. More than one flag may be assigned during the data validation process.
Vegetation data are presented in dry weight (mg/kg)
Data qualifier definitions are:
(U) - The material was analyzed for, but was not detected above the level of the associated value. The associated value is 5 X the highest blank concentration, or the sample detection limit.
(J) - The associated value is an estimated quantity.
(R) - The data are unusable.
(UJ) - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N/A - Not Available.

4.0 REFERENCES

Montgomery Watson (MW), 2001. *Summer 2001 Area-Wide Investigation Sampling and Analysis Plan, Southeast Idaho Phosphate Resource Area Selenium Project.* Prepared for the Idaho Mining Association Selenium Committee.

TetraTech EM Inc. (TtEMI), 2001a. *Draft Data Gap Technical Memorandum.* Prepared for the Idaho Department of Environmental Quality.

TetraTech EM Inc. (TtEMI), 2001b. "Technical Note: Small Mammal Sampling". Draft, prepared for the Idaho Department of Environmental Quality.

TetraTech EM Inc. (TtEMI), 2001c. "Technical Note: Terrestrial Invertebrate Sampling". Draft, prepared for the Idaho Department of Environmental Quality.

U.S. Environmental Protection Agency (USEPA). 1994. Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses. United States Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA/540/R/94/083. Publication 9240-1-26.

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APPENDICES

Appendix A
IDEQ Technical Notes

"Technical Note: Small Mammal Sampling"
"Technical Note: Terrestrial Invertebrate Sampling"

Technical Note: Small Mammal Sampling

Technical Note
Small Mammal Sampling

This technical note is intended to provide guidance to the Idaho Mining Association (IMA) on the formulation of a detailed work plan for the collection and analysis of small mammal tissue within the Selenium Project study area. The detailed work plan will be developed by the IMA and submitted to the Idaho Department of Environmental Quality (IDEQ) for review and approval prior to the implementation of critical fieldwork. The recommendations presented herein represent a minimum level of effort to meet area wide risk concerns and the IMA may propose a more extensive program, as appropriate. This area wide small mammal sampling and analysis may supplement, but does not replace any potential requirements for site-specific characterization of the mines. Administrative issues concerning this technical note should be addressed to Mr. Richard Clegg of the IDEQ at 547-1940. Technical issues or concerns should be addressed to Mr. Joe Davis of Tetra Tech EM Inc. at 615-790-6696.

Objective:

For carnivorous upper trophic level terrestrial species, small mammals from the downstream riparian areas and waste rock disposal areas are likely to represent an important exposure pathway from contaminated soil to higher trophic levels. However, limited information is available concerning the contaminant concentrations in small mammals within the Selenium Project study area. The data contained in the TRC report for the Maybe Canyon Mine indicates a significant uptake of inorganic contaminants into the small mammal population and subsequent exposure to higher trophic levels.

The movement of chemicals from soil into lower-trophic levels, such as invertebrates and plants and subsequently to small mammals, is one of the largest uncertainties in the ecological risk assessment (ERA). Upper trophic level avian and mammalian carnivores feed on small mammals. Evaluation of these upper-trophic-level receptors is dependent on modeled concentrations in their food sources. Therefore, small mammals will be collected to reduce the uncertainties. The analytical data from this sampling effort will be used to develop biotransfer factors and modeled doses for use in the ERA.

Sampling Design:

Small mammal tissue collection locations must be co-located with soil, terrestrial invertebrate, and plant tissue sampling locations. Data must be collected from four impacted riparian areas downstream from the mines, four waste rock disposal areas, and four unimpacted background areas. The IMA shall propose appropriate sampling areas in the work plan with rationale justifying each selected area.

A directed (judgmental) sampling approach is considered appropriate for the small mammal tissue sampling since the exact locations of collection within an individual sampling area will be dependent on available habitat and organism availability. The

individual sampling areas should be located using a geographic information system (GIS) format that is compatible with the Selenium Project GIS standards.

The work plan should include consideration of the following conditions.

1) The most likely small mammals present will be deer mice and voles. The different species should be processed and held until the end of the trapping effort. Decision on the species to analyze should be made at the completion of the trapping effort.

2) If small mammals are collected in an area without existing soil or plant tissue data in close proximity, composite soil and plant tissue samples must be collected and analyzed around each sample location. It is preferred that only one plant group be collected for analysis. The suggested plant group is grass and effort should be made to collect plants in seed. Samples should be collected within a 25-meter radius of the small mammal sampling location. Stainless steel shears should be used to remove the entire above ground parts of the plant that are still growing for analysis. A minimum of 50 grams of plant material should be collected for each composite sample. The procedures for these collections must also be included in the work plan.

3) In each sampling area, three separate tissue samples should be collected and analyzed from the area.

4) The proposed impacted sampling locations can be associated with any of the mines listed in Table 1. It should be noted that some data on small mammals already exists for the Maybe Canyon Mine. To maximize available data, it is recommended that the proposed sampling areas not be associated with the Maybe Canyon Mine.

5) The proposed analytes and methods are listed in Table 2.

6) The tissue analyzed will be whole body samples. Excess soil will be brushed off of the animal's fur prior to processing. The preparation of the tissue samples for analysis should in general follow the recommended protocols for the Puget Sound Estuary Program (PSEP 1986) and the U.S. Environmental Protection Agency's (EPA) "Fish, Field and Laboratory Method for Evaluating the Biological Integrity of Surface Waters" (Klenim and others 1993).

7) If soil samples are collected, the samples shall be a composite of at least 5 samples from the general area of the invertebrate collection. These samples shall be collected from the 0 to 12 inch depth interval.

8) In general, the testing laboratory will require at least 25 grams of tissue for each test plus another 25 grams of tissue for each quality assurance procedure. The IMA should confirm the amount of tissue required to achieve the detection limits

indicated in Table 2 with the selected analytical laboratory. A sample may consist of a single specimen of sufficient size or a composite of two or more smaller specimens of the same species.

9) Sample location should be surveyed using standard surveying methods or a geographic positioning system. The sample sites should be clearly marked in the field to accommodate subsequent agency review or follow-up sampling.

Sampling Methods

Small mammals should be live-trapped using box traps set out in a 10-meter radial design around selected soil sampling locations. Traps will be baited with appropriate bait such as seeds, oats, or peanut butter and provided with a small amount of bedding material. If there is an ant buildup around the trap, then the bait used should be changed because the small mammal will not take the ant infested bait. Traps should be checked at least twice each day, once in the morning and once in the evening. Trapping at any given location will be terminated when sufficient tissue is collected at that location. If a total of 150 trap nights are completed for a given location without any captures, that location will be abandoned. A trap night is defined as one night for one trap. Therefore, if ten traps are placed at a single location, each day the traps are in place would be defined as 10 trap nights.

Captured specimens must be identified and measured using standard methods. Photographs will be taken for later verification of field identification. Individuals to be taken for tissue analysis will be euthanized. Excess soil will be brushed off of the animal's fur. Specimens will then be placed in labeled, containers and kept at 4 °C until delivery to the laboratory where they should be frozen until analyzed. A sample will consist of the whole body, including fur.

Number of Samples:

A minimum of 3 tissue samples should be collected from each of the 12 sampling areas selected. Additional samples may be collected at the discretion of the field sampling team.

Schedule:

A timeline should be provided for fieldwork, lab analysis, preliminary data delivery, and reporting. Field activities should begin no later than August 15, 2001. Final data packages and deliverables are due by Monday, October 29, 2001. The IDEQ Remedial Project Manager (RPM) will be kept informed of any field schedule modifications or changes in projected sampling team locations to allow for appropriate quality assurance (QA) inspections by the Agency. The IDEQ will accompany the sampling team at the initial sites to clarify procedural aspects of the work with subsequent review as necessary.

Data Presentation

Official laboratory reports and QA/quality control (QC) data should be supplied in electronic and hard copy formats. Raw laboratory data reported below the detection limit may be submitted if the reports are accompanied by clearly identified method detection limits (MDL). EPA data validation should be provided with the final report.

Table 1. Area Wide Mines Included in Spring 2001 Waste Rock Characterization

Area Wide Mines	
Dry Valley	Champ
Gay	North Maybe Canyon
Smoky Canyon	Georgetown Canyon
Lanes Creek	Enoch Valley
Conda	Henry
Rasmussen Ridge	Ballard
Mountain Fuel	Wooley Valley

Table 2. Analytes, Methods, and Recommended Detection Limits for Small Mammal Analyses

Parameter	Small mammal Tissue	Recommended Detection Limits (mg/kg)
Aluminum	3050B/6010B	2.0
Antimony	3050B/6010B	0.2
Arsenic	3050B/6010B	0.2
Barium	3050B/6010B	0.5
Beryllium	3050B/6010B	0.02
Boron	3050B/6010B	0.2
Cadmium	3050B/6010B	0.02
Chromium	3050B/6010B	0.06
Copper	3050B/6010B	0.2
Lead	3050B/6010B	0.1
Manganese	3050B/6010B	0.04
Mercury	3050B/6010B	0.01
Molybdenum	3050B/6010B	0.2
Nickel	3050B/6010B	0.2
Selenium	ICP-HG	0.2
Silver	3050B/6010B	0.07
Thallium	3050B/6010B	0.3
Uranium	3050B/6010B	0.2
Vanadium	3050B/6010B	0.2
Zinc	3050B/6010B	0.2
Percent Moisture	OLM 03.1	0.1%

References

Klenim, D.J., Q.T. Stober, and J.M. Lazorchak. 1993. Fish, Field and Laboratory Method for Evaluating the Biological Integrity of Surface Waters. EPA 600/R-92/111, U.S. Environmental Protection Agency, Cincinnati.

Oak Ridge National Laboratory. 1996. "Waste Area Grouping 2 Phase 1A Task Data Report: Ecological Risk Assessment and White Oak Creek Watershed Screening Ecological Risk Assessment." May 13.

Puget Sound Estuary Program (PSEP) 1986. "Recommended Protocols for Measuring Metals in Puget Sound Water, Sediment and Tissue Samples." *Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound*. USEPA Region 10, Seattle, WA.

Technical Note: Terrestrial Invertebrate Sampling

Technical Note
Terrestrial Invertebrate Sampling

This technical note is intended to provide guidance to the Idaho Mining Association (IMA) on the formulation of a detailed work plan for the collection and analysis of terrestrial invertebrate tissue within the Selenium Project study area. The detailed work plan will be developed by the IMA and submitted to the Idaho Department of Environmental Quality (IDEQ) for review and approval prior to the implementation of critical fieldwork. The recommendations presented herein represent a minimum level of effort to meet area wide risk concerns and the IMA may propose a more extensive program, as appropriate. This area wide terrestrial invertebrate sampling and analysis may supplement, but does not replace any potential requirements for site-specific characterization of the mines. Administrative issues concerning this technical note should be addressed to Richard Clegg of the IDEQ at 547-1940. Technical issues or concerns should be addressed to Joe Davis of Tetra Tech EM Inc. at 615-790-6696.

Objective:

For terrestrial species, plant tissue and terrestrial invertebrates from the downstream riparian areas and waste rock disposal areas are likely to represent the most significant transfer mechanisms from contaminated soil to higher trophic levels. However, limited information is available concerning the contaminant concentrations in terrestrial invertebrates within the Selenium Project study area. The data contained in the TRC report for the Maybe Canyon Mine indicates a significant uptake of inorganic contaminants into the terrestrial invertebrate population and subsequent exposure to higher trophic levels.

The movement of chemicals from soil into lower-trophic levels, such as invertebrates, is one of the largest uncertainties in the ecological risk assessment (ERA). Omnivorous and insectivorous avian and mammalian species feed on terrestrial invertebrates. Evaluation of these upper-trophic-level receptors is dependent on modeled concentrations in their food sources. Therefore, terrestrial invertebrates will be collected to reduce the uncertainties. The analytical data from this sampling effort will be used to develop biotransfer factors for use in the ecological risk assessments.

Sampling Design:

Terrestrial invertebrate tissue collection locations must be co-located with soil, small mammal, and plant tissue sampling locations. Data must be collected from four impacted riparian areas downstream from the mines, four waste rock disposal areas, and four unimpacted background areas. The IMA shall propose appropriate sampling areas in the work plan with rationale justifying each selected area. Terrestrial invertebrate tissue collection will be conducted based on a three-tiered approach, dependent upon the quantity of tissue biomass of the desired organisms available for collection (for example, if sufficient biomass is not available for the desired organism during field sampling, the next level of the tier will be attempted; the third tier will only be used if the first two tiers

are unsuccessful). Tissue collection is preferred over bioaccumulation testing because of the degree of uncertainty associated with assessing site-specific bioaccumulation factors for laboratory bioaccumulation tests. Therefore, the bioaccumulation testing should not be conducted unless tissue samples are unavailable. The tiered approach for the terrestrial invertebrate tissue collection is summarized below:

TIER 1	TIER 2	TIER 3
Earthworm species tissue collection	**Aboveground, non-flying insects tissue collection**	**Soil bioaccumulation testing with *Eisenia foetida***

Test methods and conditions for soil bioaccumulation testing are described in Appendix A.

A directed (judgmental) sampling approach is considered appropriate for the terrestrial invertebrate tissue sampling since the exact locations of collection within an individual sampling area will be dependent on available habitat and organism availability. The individual sampling areas should be located using a GIS format that is compatible with the Selenium Project GIS standards.

The work plan should include consideration of the following conditions.

1) If earthworms or non-flying insects are collected in an area without existing soil or plant tissue data in close proximity, composite soil and plant tissue samples must be collected and analyzed around each sample location. It is preferred that only one plant group be collected for analysis. The suggested plant group is grass and effort should be made to collect plants in seed. Samples should be collected within a 25-meter radius of the invertebrate sampling location. Stainless steel shears should be used to remove the entire above ground parts of the plant that are still growing for analysis. A minimum of 50 grams of plant material should be collected for each composite sample. The procedures for these collections must also be included in the work plan.

2) In each sampling area, three separate tissue samples should be collected and analyzed from the area.

3) The proposed impacted sampling locations can be associated with any of the mines listed in Table 1. It should be noted that some data on terrestrial invertebrates already exists for the Maybe Canyon Mine. To maximize available data, it is recommended that the proposed sampling areas not be associated with the Maybe Canyon Mine.

4) The proposed analytes and methods are listed in Table 2.

5) The tissue analyzed will be whole body samples and will not be depurated prior to analysis. The preparation of the tissue samples for analysis should in general follow the recommended protocols for the Puget Sound Estuary Program (PSEP 1986) and the U.S. Environmental Protection Agency's (EPA) "Fish, Field and Laboratory Method for Evaluating the Biological Integrity of Surface Waters" (Klenim and others 1993).

6) If soil samples are collected, the samples shall be a composite of at least 5 samples from the general area of the invertebrate collection. These samples shall be collected from the 0 to 12 inch depth interval.

7) In general, the testing laboratory will require at least 25 grams of tissue for each test plus another 25 grams of tissue for each quality assurance procedure. The IMA should confirm the amount of tissue required to achieve the detection limits indicated in Table 2 with the selected analytical laboratory.

8) Sample locations should be surveyed using standard surveying methods or a geographic positioning system. The sample sites should clearly marked in the field to accommodate subsequent agency review or follow-up sampling.

Sampling Methods

The following sampling methods or combination of methods may be used to collect invertebrate tissue. The specific methods used are at the discretion of the field team leader.

- Sweep nets can be used for aboveground-dwelling invertebrates. Aboveground-dwelling invertebrates may be collected using sweep nets within a 20 to 25-meter radius of each sampling location. If adequate tissue cannot be collected using this method, the radius may be expanded to 50 meters or more around each soil sampling station

- Aboveground-and subsurface-dwelling invertebrates may be collected using pitfall traps. Pitfall traps measuring about 1 liter, with a mouth diameter of about 4 inches, will be set into the ground so that the jars are placed flush with the soil surface. Traps will be left on site before sunset and checked the following morning.

- Aboveground-and subsurface-dwelling invertebrates may be collected using mustard solution (Oak Ridge National Laboratory 1996). Mustard solution will be used in one to three areas within a 1-meter radius of each sampling station. Mustard trapping will be conducted the day after pitfall traps are set to collocate sampling locations with the minimum of disturbance to invertebrates sampled using pitfall traps. Vegetation in a 1- by 1-foot area will be cleared completely within 1 meter of each sampling location. An aqueous solution of powered

mustard mixed with 1.5 gallons of water will be poured on the area, and all invertebrates that come to the surface will be collected.

- Subsurface dwelling invertebrates may also be collected using electrodes driven into the ground or by manual excavation.

Collected invertebrates must be immediately segregated by type (such as, earthworms or insects and then insects should be segregated by family), identified, weighed, and stored in labeled plastic bags in a cooler for further processing and analyses.

Number of Samples:

A minimum of 3 tissue samples should be collected from each of the 12 sampling areas selected. Additional samples may be collected at the discretion of the field sampling team.

Schedule:

A timeline should be provided for fieldwork, lab analysis, preliminary data delivery, and reporting. Field activities should begin no later than August 15, 2001. Final data packages and deliverables are due by Monday, October 29, 2001. The IDEQ Remedial Project Manager (RPM) will be kept informed of any field schedule modifications or changes in projected sampling team locations to allow for appropriate quality assurance (QA) inspections by the Agency. The IDEQ will accompany the sampling team at the initial sites to clarify procedural aspects of the work with subsequent review as necessary.

Data Presentation

Official laboratory reports and QA/quality control (QC) data should be supplied in electronic and hard copy formats. Raw laboratory data reported below the detection limit may be submitted if the reports are accompanied by clearly identified method detection limits (MDL). EPA data validation should be provided with the final report.

Table 1. Area Wide Mines Included in Spring 2001 Waste Rock Characterization

Area Wide Mines	
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Lanes Creek	Enoch Valley
Conda	Henry
Rasmussen Ridge	Ballard
Mountain Fuel	Wooley Valley

Table 2. Analytes, Methods, and Recommended Detection Limits for Invertebrate Tissue Analyses

Parameter	EPA Method	Recommended Detection Limits (mg/kg)
Aluminum	3050B/6010B	2.0
Antimony	3050B/6010B	0.2
Arsenic	3050B/6010B	0.2
Barium	3050B/6010B	0.5
Beryllium	3050B/6010B	0.02
Boron	3050B/6010B	0.2
Cadmium	3050B/6010B	0.02
Chromium	3050B/6010B	0.06
Copper	3050B/6010B	0.2
Lead	3050B/6010B	0.1
Manganese	3050B/6010B	0.04
Mercury	3050B/6010B	0.01
Molybdenum	3050B/6010B	0.2
Nickel	3050B/6010B	0.2
Selenium	ICP-HG	0.2
Silver	3050B/6010B	0.07
Thallium	3050B/6010B	0.3
Uranium	3050B/6010B	0.2
Vanadium	3050B/6010B	0.2
Zinc	3050B/6010B	0.2
Percent Moisture	OLM 03.1	0.1%

Notes:

EPA U.S. Environmental Protection Agency
HG Hydride gas
ICP Inductively coupled plasma
mg/kg Milligrams per kilogram

References

American Society for Testing Materials (ASTM). 1999. "Standard Guide for Conducting Laboratory Soil Toxicity or Bioaccumulation Tests with the Lumbricid Earthworm *Eisenia foetida*." ASTM Method E 1676-97. ASTM. 1999. In ASTM *Standards on Biological Effects and Environmental Fate, Second Edition*. West Conshohocken, Pennsylvania.

Klenim, D.J., Q.T. Stober, and J.M. Lazorchak. 1993. Fish, Field and Laboratory Method for Evaluating the Biological Integrity of Surface Waters. EPA 600/R-92/111, U.S. Environmental Protection Agency, Cincinnati.

Oak Ridge National Laboratory. 1996. "Waste Area Grouping 2 Phase 1A Task Data Report: Ecological Risk Assessment and White Oak Creek Watershed Screening Ecological Risk Assessment." May 13.

Puget Sound Estuary Program (PSEP) 1986. "Recommended Protocols for Measuring Metals in Puget Sound Water, Sediment and Tissue Samples." *Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound*. USEPA Region 10, Seattle, WA.

APPENDIX A

EARTHWORM WHOLE-SOIL TOXICITY TESTING

A.1 INTRODUCTION

If sufficient invertebrate biomass is not collected for tissue analysis, soil samples will be collected for conducting bioaccumulation tests. The toxicity-testing laboratory will provide to the selected analytical laboratory enough tissue biomass to conduct the necessary chemical analyses of the invertebrate tissues. This section presents the testing methodology for the soil bioaccumulation tests

A.1.1 Test Procedures

Soils shall be tested using the earthworm *Eisenia foetida*. Table A-1 presents test conditions for conducting soil toxicity testing with *E. foetida*, as taken from ASTM Test Method E 1676-97 (ASTM 1999). This is a 28-day, static, whole-soil mortality and bioaccumulation test. Test organisms shall be greater than 60 days old. There shall be a minimum of 10 earthworms per replicate, with a minimum of four replicates per test concentration of 100 percent soil. Appropriate controls shall be used. Test endpoints are mortality and bioaccumulation.

This test is acceptable if the following conditions are met:

- 90 percent or greater survival in the controls
- Reference toxicant test results fall within control limits

Other performance-based criteria, which shall be followed, may be found in the specified method (ASTM 1999). The contractor shall document for inclusion in the laboratory report, adherence to all performance-based criteria. Any deviations from protocol must be recorded and indicated in the report.

A.1.2 Reporting Requirements

The contractor should include in its toxicity test report the basic information specified by EPA and ASTM in their protocols, as well as the following information to facilitate the data validation process:

- Information on the condition of the organisms after receipt from any supplier, including water quality conditions.
- Copies of all laboratory sheets to verify the measurement of all environmental parameters. Copies of original, hand signed copies only, not summaries.
- The narrative should detail any deviations from the accepted protocol or standard operating procedure (SOP) and reasons for the deviations.

Copies of reference toxicant tests must be provided by the laboratory for all organisms tested.

Table A-1

Test Conditions For Conducting 28-Day Mortality And Bioaccumulation Toxicity Tests With *Eisenia fetida*[1]

Parameter	**CONDITIONS**
Test Type	Static
Test Duration	28 days for morality and bioaccumulation
Temperature	19 to 25 ºC
Light Quality	Ambient laboratory illumination
Light Intensity	100 to 1,080 lux
Photoperiod	Continuous illumination
Test Chamber	Plexiglass containers 30 cm deep and 15 cm in diameter. Each end closed with one 17-cm-diameter PVC and either 340 micron Nytex mesh or cotton muslin cloth. Bottom end placed in a 20 cm-diameter plastic dish of test water to allow water movement into the substrate.
Total Soil Mass	200 grams (dry weight)
Artificial Soil Composition	10 percent (by weight) 2.36-millimeter screened sphagnum peat, 20 percent colloidal kaolinite clay, and 70 percent grade 70 silica sand
Test Soil Moisture Content	Hydrated to 35 or 45 percent of dry weight or 75 percent of water holding capacity
Renewal of Test Medium	None
Age of Test Organisms	Sexually mature, fultellate adults
Number of Organisms per Chamber	10
Number of Replicates	4
Feeding	None
Test Chamber Cleaning	None
Test concentrations	100 percent soil
Soil quality	pH, salinity, and percent moisture measured every 7 days during the test; and temperature measured continuously
Soil weight required	4,000 grams
Biological endpoints	Mortality and bioaccumulation
Test acceptability	Control survival greater than or equal to 90 percent, satisfaction of test conditions and acceptable reference toxicant test results

Notes:

[1] American Society for Testing and Materials. 1999. "Standard Guide for Conducting Laboratory Soil Toxicity or Bioaccumulation Tests with the Lumbricid Earthworm *Eisenia foetida*." ASTM Method E 1676-97. ASTM. 1999. In ASTM *Standards on Biological Effects and Environmental Fate, Second Edition*. West Conshohocken, Pennsylvania

cm Centimeter
˚C degree Celsius

Appendix B
Small Mammal Data Validation Summary

APPENDIX B

SUMMER 2001 IDAHO MINING ASSOCIATION AREA-WIDE INVESTIGATION

SMALL MAMMAL DATA VALIDATION SUMMARY

The following is a summary of the data validation and quality control (QC) review conducted for the Summer 2001 Area-Wide Investigation sampling effort. This effort was completed on the behalf of the Idaho Mining Association (IMA). For health and safety reasons, all small mammal samples were sent to Aquatech Biological Sciences located in Willston, VT for sample preparation, which included homogenization and preservation with nitric acid. The University of Idaho Analytical Sciences Laboratory (U of I) located in Moscow, ID was the primary analytical laboratory performing the analyses. The U of I subcontracted Silver Valley Laboratories Analytical, Inc. (SVL) located in Kellogg, ID to perform the mercury analyses. The Applied Physics & Chemistry Laboratory (APCL) located in Chino, CA was the quality assurance (QA) laboratory tasked with analyzing small mammal samples collected at QA sampling locations. The laboratories were selected prior to sampling, and were proficient in the analysis of metals and other parameters as requested by the Idaho Department of Environmental Quality (IDEQ). Data analyzed by U of I and APCL were subjected to validation procedures outlined by the *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses* (EPA, December 1994).

Forty-seven small mammal samples were collected and submitted to Aquatec Biological Sciences where they were ground and denatured. Aquatec submitted the denatured samples to

the U of I. The U of I split out five QA/QC samples and submitted them to APCL for analysis. All sample submittals were made under chain-of-custody protocols. The U of I laboratory analyzed the samples for the following:

- EPA 3050B/6010B (Al, V, Zn)
- EPA 3050B/6020B (Ag, As, B, Ba, Be, Cd, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Tl, U)
- ICP Hydride (Se)

SVL analyzed the samples for the following:

- EPA 7471 (Hg)

APCL analyzed the samples for the following:

- SW 6010B (Ag, Al, As, B, Ba, Be, Cd, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn)
- SW 7471A (Hg)

Data quality objectives (DQOs) are qualitative and quantitative statements that specify the quality of these data required to meet the goals of site investigation and/or to support decisions made in environmental management activities. DQOs for the Summer 2001 Area-Wide Investigation were expressed in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC). The results of QC samples were evaluated against the DQOs and the quality of the data was assessed according to the PARCC parameters. QC sample results that fall outside these criteria serve to signal unacceptable or biased data that could result in corrective actions being implemented, or qualification of the data. The following is a summary review of these data, including data qualification that resulted from the data validation.

Precision and Accuracy

Precision and accuracy were evaluated based on the QC results generated from calibrations, spiked samples, laboratory duplicates, interference check samples, laboratory control samples and serial dilutions.

All U of I, SVL, and APCL calibrations were acceptable.

U of I only performed spike recovery on selenium and cadmium. Cadmium results were acceptable; selenium results were not acceptable and associated results were qualified as estimated (J), according to the criteria. Spike analyses performed by U of I include Laboratory blank spikes and matrix spikes for both analytes. All SVL spike recoveries were acceptable. SVL performed blank spikes and matrix spikes for mercury. All APCL spike recoveries were acceptable except aluminum, which was qualified as estimated (J), according to the criteria. APCL performed the following spike analyses on all analytes: Laboratory Control Spike, Laboratory Control Spike Duplicate, Matrix Spike, Matrix Spike Duplicate and Post Digest Spike Sample Recovery (for methods SW6010B, SW7471A).

All U of I duplicates were acceptable except boron, cadmium, lead, and molybdenum. U of I analyte data with unacceptable duplicate performance were qualified as estimated (J), according to the criteria. SVL did not perform any duplicate analyses. All APCL duplicates were acceptable.

Interference check samples were analyzed by APCL only; all results were satisfactory.

The U of I analyzed all Standard reference materials (SRM) with acceptable results except cadmium, zinc, vanadium, lead, molybdenum, manganese, copper, chromium, and arsenic. U of I data that did not have acceptable SRM results for each analyte were qualified as estimated (J, UJ) according to the criteria. U of I analyzed SRMs and provided 95% confidence ranges for the following reference materials: TORT 2 (Se, V, Zn), APG 4073 (Se), House Reference Alfalfa (Al, Ba, Cr, Cu, Mn, Mo, Ni, V, Zn), and House Reference Liver (As, Cd, Cr, Cu, Pb, Mn, Mo, Se, Zn). A 95% confidence range was not available for barium, rendering the SRM data unusable. The SVL mercury SRM results were not acceptable, all mercury sample results <IDL were qualified as estimated (UJ). APCL did not analyze laboratory control samples or standard reference materials.

U of I did not perform serial dilutions. All serial dilutions performed by APCL were acceptable.

Representativeness

U of I evaluated representativeness through the analysis of laboratory method blanks and equipment blanks (for mercury and selenium only). The evaluation of blanks is conducted before and during the analytical process. All blank results were below detection limit, and no field sample results were qualified. All SVL blank results were below the EDL, therefore no sample results were qualified. APCL analyzed Initial Calibration Blanks and Continuing Calibration Blanks (ICB/CCB) and a laboratory method blank. All blank results were below the detection limit and no sample results were qualified.

Completeness

All samples were collected and analyzed as specified in the *Summer 2001 Area-Wide Investigation Sampling and Analysis Plan* (MWH, 2001). U of I field data was complete. APCL field data and laboratory QC data was complete.

Both laboratories provided raw data packets that contained information on the specific analytes to which small mammal samples were subjected. Field QA/QC samples were collected and analyzed by the U of I, SVL, and APCL as required. Analytical data were discoverable in raw data packets from the U of I, SVL, and APCL. APCL performed QA/QC analyses on all analytes analyzed by U of I with the exception of uranium. All sample analytical holding times were met within acceptable limits. Spike quantities were written on various QC sheets. U of I laboratory provided 95% confidence ranges for SRMs on QC sheets.

Comparability

Comparability was achieved by U of I, SVL, and APCL analyzing the samples according to the required methods. Each laboratory used acceptable methodology, which is recognized by the EPA in analyzing samples. Detection limits were reported by each laboratory for each specific analyte and included in either the raw data packet or electronic files.

Summary of Data Quality

The evaluation of the PARCC criteria provided information on the quality of the data. The data were considered usable as a result of the validation.

References

US Environmental Protection Agency, 1994. "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses." Publication 9240.1-26, EPA/540/R/94/083, PB95-963525. Office of Solid Waste and Emergency Response, USEPA, Washington, D.C.

Montgomery Watson Harza, 2001. IMA Selenium Committee Field Sampling Plan "Sampling and Analysis Plan – Southeast Idaho Phosphate Resource Area Selenium Project, Summer 2001 Area – Wide Investigation." August 2001 -Final. Bellevue, Washington.

INORGANIC DATA ASSESSMENT SUMMARY

PROJECT: IMA Selenium Project	SITE: Southeast Idaho
LABORATORY: Sample Preparing Laboratory: Aquatech Biological Sciences Primary Laboratory: U of I- Holm Research Center Subcontract Laboratory: SVL Analytical, Inc. QA Laboratory: APCL	SDG:
SAMPLES/MATRIX/ANALYSES:	
• Summer 2001	
• Matrix: Small Mammals	
• Method: EPA 3050B/6010B, EPA 3050B/6020B, EPA 245.7, ICP Hydride, SW 6010B, SW7471A	
• Analyses: Ag, Al, As, B, Ba, Be, Cd, Cr, Cu, Hg, Pb, Mn, Mo, Ni, Sb, Se, Tl, U, V, Zn	

DATA ASSESSMENT SUMMARY

REVIEW ITEM	ICP	AA	HG	CYANIDE	OTHER
1. Data completeness	O				
2. Holding Times	O				
3. Calibration	O				
4. Blanks	O				
5. ICS	O				
6. LCS	O				
7. Duplicate RPD	O				
8. Spike Recovery	O				
9. MSA	NA				
10. Other QC	O				
11. Field Duplicates	NA				
12. Result Verification	O				
13. Overall Assessment	O				

O=Data had no problems/or qualified due to minor problems.
M=Data qualified due to major problems.
NA=Data review item not applicable.
X=Problems but do not affect data.
Z=Data unacceptable.

Comments/Qualified Results:

- This data validation summary summarizes all individual analyte data assessments for Summer 2001 small mammal data. See individual sections below for a summary of the results from the individual analyte data assessments. All data were acceptable with some qualifications.

Verified and Validated by: _____ Date: _____

Reviewed and Approved by:_____ Date: _____

INORGANIC DATA ASSESSMENT SUMMARY

	Acceptable Yes	No
1. Data package completeness (check if present)	_X_	___

_X_Case narrative
_X_Chain of custody
_X_Sample Results
_X_ICV/CCV Results
_X_Blank Results
_X_ICP Interference Check Results
_X_Spike Recovery Results
_X_Duplicate Results
_X_LCS Results
___Standard Addition Results
_X_ICP Serial Dilution

_X_Instrument Det. Limits
___ICP Correction Factors
___ICP Linear Ranges
_X_Preparation Logs
_X_Analysis Run Logs
_X_ICP Raw Data
___GFAA Raw Data
___Hg Raw Data
___Cyanide Raw Data
___Other_____

Comments/Qualified Results:

- LCS analyses performed by U of I and SVL only.
- ICP interference checks completed on APCL analyses only.
- ICP serial dilution performed by APCL only.

2. Holding times (check all that apply)	_X_	___

_X_ICP/GFAA metals completed in <6 mos from collection
___Mercury analyzed in <28 days from collection
___Cyanide completed in 14 days from collection

Qualify as estimated (J, UJ) all results analyzed past the holding times listed but within 2 X the limit. Qualify detects as estimated (J) and non-detects unusable (UR) for results analyzed greater than 2 X above the limit. If soil data are qualified based on water holding time criteria, note.

Comments/Qualified Results:

- UI- All samples were analyzed within acceptable holding times.
- SVL- There are no holding times for mercury in small mammal tissue. However, samples were preserved appropriately and analyzed within six months of collection.
- APCL- All samples were analyzed within acceptable holding times.

INORGANIC DATA ASSESSMENT SUMMARY

	Acceptable Yes	No
3. Calibrations (check all that apply)	_X_	___

___GFAA/Hg correlation coefficient <0.995, results estimated (J, UJ)
_X_ICV/CCV %R, ICP 89-111%, Hg 80-120%, Cn 85-115%, results acceptable
___ICV/CCV %R, ICP 75-89%, Hg 65-79%, Cn 70-84%m results <IDL estimated (UJ)
___ICV/CCV %R, ICP <75%, Hg <65%, Cn <70%, results unusable (R)
___ICV/CCV %R, ICP >125%, Hg >135%, Cn >130%, results >IDL unusable (R), <IDL acceptable
___ICV/CCV %R, ICP 75-89% or 111-125%, Hg 65-79% or 121-135%, Cn 70-84% or 116-130%, results >IDL estimated (J)

Comments/Qualified Results:

- U of I - All calibrations were acceptable.
- SVL- All calibrations were acceptable.
- APCL- All calibrations were acceptable.

4. Blanks (check all that apply)	_X_	___

__Detects reported ICB/CCB, list:

___Detects in preparation blanks, list:

___Detects in field blanks, list:

Qualify as undetected (U) all sample concentrations $\leq$5 X any blank concentrations.

Comments/Qualified Results:

- None of the blank results for U of I, SVL, and APCL were above the detection limit. No qualifiers were assigned.

INORGANIC DATA ASSESSMENT SUMMARY

	Acceptable Yes	No
5. Interference Checks (check all that apply)	_X_	___

_X_ICS A/B Recoveries Acceptable
___Al, Ca, Fe, Mg sample concentrations >ICS concentrations
___ICS %R> 120%, results > IDL estimated (J)
___ICS %R 50-79%, results>IDL estimated (J), possible false negative
___ICS %R 50-79%, results <IDL estimated (UJ)
___ICS %R <50%, results >IDL and <IDL rejected (R/UR)
___ICS %R>120, results <IDL acceptable

Comments/Qualified Results:

- U of I- no ICP interference check samples were analyzed.
- SVL- no ICP interference check samples were analyzed.
- APCL- ICP interference check samples for method SW6010B were acceptable.

6. Laboratory Control Samples (check all that apply)	_X_	___

_X_LCS %R 80-120 (Ag, Sb no limits); if 95% confidence range is given, such range prevails.
_X_LCS %R 50-79% or >120%, results>IDL estimated (J); or outside of 95% confidence range.
_X_LCS %R 50-79% and results <IDL estimated (UJ); or outside the lower end of 95% confidence range.
___ LCS %R <50% and all results rejected (R/UR)
_X_LCS %R >120%, results <IDL acceptable; or outside the upper end of 95% confidence range.

Comments/Qualified Results:

- U of I- cadmium and copper, results were qualified as estimated (J) for sample concentrations >IDL and estimated (UJ) for sample concentrations <IDL.
- U of I- arsenic, chromium, vanadium, zinc, lead, molybdenum, and manganese were qualified as estimated (J) for sample concentrations >IDL.
- SVL- mercury results >EDL were qualified as estimated (J).
- APCL – laboratory control samples were not analyzed. Laboratory control spikes were included in section “8. Spike Recovery”.

7. Duplicate (check all that apply)	_X_	___

_X_Duplicate RPD $\leq$20% for waters ($\leq$35% for soils) for results >5X CRDL
_X_Duplicate Range is within $\pm$CRDL ($\pm$2xCRDL for soils) for results $\leq$ 5X CRDL
_X_Qualify positive results estimated (J) if the above criteria were not met.

Comments/Qualified Results:

- U of I- boron, cadmium, lead and molybdenum results were qualified as estimated (J) for all sample concentrations >IDL.
- SVL- no duplicate analyses were performed for mercury.
- APCL- duplicates were performed on laboratory control spikes and matrix spikes. Duplicate verification results were not performed on MWH samples and were not used in the data validation process. All duplicates were acceptable.

INORGANIC DATA ASSESSMENT SUMMARY

	Acceptable Yes	No
8. Spike Recovery (check all that apply)	_X_	___

_X_Spike %R with 75-125%
_X_Spike %R 30-74%, >125%, results >IDL estimated (J)
_X_Spike %R 30-74% results <IDL estimated (UJ)
___Spike %R <30%, results <IDL rejected (UR)
___Field blank used for spike analysis
_X_Spike % R >125%, results <IDL acceptable
___Sample concentration exceeds spike concentration by a factor of >4x, acceptable

Comments/Qualified Results:

- U of I- selenium sample concentrations >EDL were qualified as estimated (J) and sample concentrations <EDL were qualified as estimated (UJ).
- SVL- mercury spike recoveries were acceptable.
- APCL- aluminum >RL were qualified as estimated (J).

9. GFAA Performance (check all that apply)	NA

___Duplicate injection RSD<20%
___Duplicate injection RSD>20%, results >CRDL estimated (J)
___Analytical spike %R 85-115%
___Analytical spike %R 40-85%, results >IDL estimated (J)
___Analytical spike %R 10-40%, results <IDL estimated (UJ)
___Analytical spike %R <10%, results <IDL rejected (R)
___Analytical spike %R <40%, results >IDL estimated (J)
___MSA required but not run, results estimated (J)
___MSA run at incorrect level, results estimated (J)
___MSA correlation coefficient <0.995, results estimated (J)

Comments/Qualified Results:

- APCL – not applicable.
- SVL- not applicable.
- UI – not applicable.

10. Serial Dilution (check all that apply)	_X_ ___

_X_Serial Dilution %D within 10% for sample results >50x the IDL
___Serial Dilution %D greater than 10%, results >50x the IDL estimated (J)

Comments/Qualified Results:

- U of I- serial dilution analyses were not performed.
- SVL- serial dilution analyses were not performed.
- APCL – serial dilution analyses were acceptable.

INORGANIC DATA ASSESSMENT SUMMARY

	Acceptable Yes	No
11. Field Duplicates (check all that apply)	NA	

___Field duplicate RPD ≤20% waters (≤35% for soils)
___Field duplicate range is within ±CRDL (±2x CRDL for soils) for results <5xCRDL

Note: There are no qualification requirements for field QC samples exceeding limits.

Comments/Qualified Results:

- U of I- no field duplicates collected.
- SVL- no field duplicates collected.
- APCL- no field duplicates collected.

12. Result Verification (check all that apply) __X_ ___

_X_All results supported in raw data

Comments/Qualified Results:

- U of I- all results below the respective detection limits were reported as BDL (below detection limit). Data not checked 100%, but no transcription errors/anomalies were noted on items checked.
- SVL- Data not checked 100%, but no transcription errors/anomalies were noted on items checked.
- APCL- all results below the method detection limit were reported as not detected. Not detected results were reported as less than the respective reporting limit in the hard copy analytical report and as zero (0 ug/L) in the electronic data analytical report. Data not checked 100%, but no transcription errors/anomalies were noted on items checked.

13. Overall Assessment __X_ ___

- U of I, SVL, and APCL data were acceptable. Data were qualified (flagged) as estimated (UJ, J) and undetected (U) for various reasons. Discussion is included in the above sections, as well as in the data assessment summary for each analyte from U of I, SVL, and APCL.
- Sample results <EDL (U of I, and SVL) or <RL (APCL) were qualified as undetected (U) for the following analytes:

  U of I
  Ag, As, Mo, Ni, Pb, Sb, Se, Tl, V, U

  SVL
  Hg

  APCL
  Ag, As, B, Ba, Be, Cd, Cr, Mo, Ni, Pb, Sb, Se, Tl, V

Appendix C
Terrestrial Invertebrate Data Validation Summary

APPENDIX C

SUMMER 2001 IDAHO MINING ASSOCIATION AREA-WIDE INVESTIGATION

TERRESTRIAL INVERTEBRATES DATA VALIDATION

SUMMARY – INSECTS AND WORMS

The following is a summary of the data validation and quality control (QC) review conducted for the Summer 2001 Area-Wide Investigation sampling of terrestrial invertebrates. This effort was completed on the behalf of the Idaho Mining Association (IMA). The University of Idaho Analytical Sciences Laboratory (U of I) located in Moscow, ID was the primary analytical laboratory performing the analyses. The U of I subcontracted Silver Valley Laboratories Analytical, Inc. (SVL) located in Kellogg, ID to perform mercury analyses on some of the terrestrial invertebrate samples. The Applied Physics & Chemistry Laboratory (APCL) located in Chino, CA was the quality assurance (QA) laboratory tasked with analyzing terrestrial invertebrate samples collected at QA sampling locations. The laboratories were selected prior to sampling, and were proficient in the analysis of metals and other parameters as requested by the Idaho Department of Environmental Quality (IDEQ). Data analyzed by U of I, SVL, and APCL laboratories were subjected to validation procedures outlined by the *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses* (EPA, December 1994).

Of the fifty-one total terrestrial invertebrate samples collected and submitted under chain-of-custody to U of I, thirty-five were insect samples and sixteen were worm samples. The U of I

submitted five QA/QC insect samples and three QA/QC worm samples to APCL under chain of custody. U of I analyzed the samples for the following:

- EPA 3050/6010B (Al, V, Zn)
- EPA 3050/6020B (Ag, As, B, Ba, Be, Cd, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Tl, U)
- EPA 245.7 (Hg) for some terrestrial invertebrate samples
- ICP Hydride (Se)

SVL analyzed some samples for the following:

- SW7471 (Hg) for some terrestrial invertebrate samples

APCL analyzed the samples for the following:

- SW6010B (Ag, Al, As, B, Ba, Be, Cd, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn)
- SW7471A (Hg)

Data quality objectives (DQOs) are qualitative and quantitative statements that specify the quality of data required to meet the goals of the site investigation and/or to support decisions made in environmental management activities. DQOs for the Summer 2001 Area-Wide Investigation were expressed in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC). The results of QC samples were evaluated against the DQOs and the quality of these data was assessed according to the PARCC parameters. QC sample results that fall outside these criteria serve to signal unacceptable or biased data that could result in corrective actions being implemented, or qualification of the data. The following is a summary review of these data, including data qualification that resulted from the data validation.

Precision and Accuracy

Precision and accuracy were evaluated based on the QC results generated from calibrations, laboratory control samples (LCS) or standard reference material (SRM) samples, laboratory duplicates, and spiked samples.

Calibrations: All U of I, SVL, and APCL calibrations were acceptable. No qualification was necessary.

LCS or SRM Samples: U of I analyzed SRMs with acceptable results for the following analytes: House Reference Alfalfa (Al, B, Ba, Cr, Cu, Mn, Mo, Ni, V, Zn); House Reference Liver (B, Cd, Cr, Cu, Pb, Mn, Hg, Mo, Se, Zn); and TORT 2 (Hg-EPA245.7, Se). Manganese and nickel were qualified as estimated (J) due to low SRM recovery. LCS/SRM samples analyzed by SVL were acceptable. APCL did not perform LCS anaylses.

Laboratory Duplicates: U of I, and SVL, and APCL duplicates were acceptable.

Spike Recoveries: A spike recovery for U of I was unacceptable, all U of I mercury data was qualified as estimated (UJ/J) according to the criteria. Due to unacceptable SVL spike recoveries, all SVL mercury data >EDL (by EPA 7471) were qualified as estimated (J). All APCL spike recoveries were acceptable.

Representativeness

Representativeness was evaluated through the analysis of laboratory method blanks and equipment blanks prior to and during the analytical process. One U of I laboratory blank was detected, sample results >5x the highest blank detection were qualified as undetected (U). All SVL, and APCL blanks were acceptable, therefore no qualification was necessary.

Completeness

Field QC samples were collected and analyzed, and laboratory samples were analyzed as specified in the *Summer 2001 Area-Wide Investigation Sampling and Analysis Plan* (MWH, 2001). U of I, SVL, and APCL field data were complete.

The laboratories provided raw data packets containing information on the specific parameters analyzed for terrestrial invertebrate samples. All the analytical data provided in the packets were discoverable. Field QA/QC samples were collected and analyzed as required. All sample analytical holding times were met within acceptable limits. Blank spike and matrix spike amounts were written on various QC sheets. U of I provided 95% confidence ranges for the SRMs. APCL did not include a summary packet for check standards, but it was included in the raw data printouts.

Comparability

Comparability was achieved by analyzing the samples according to the required methods. Each laboratory used acceptable methodology, which is recognized by the EPA in analyzing samples. Detection limits were reported by each laboratory for each specific analyte and included in either the raw data packet or electronic files.

Summary of Data Quality

The evaluation of the PARCC criteria provided information on the quality of the data. All data were acceptable.

References

U.S. Environmental Protection Agency, 1994. "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses." Publication 9240.1-26, EPA/540/R/94/083, PB95-963525. Office of Solid Waste and Emergency Response, USEPA, Washington, D.C.

Montgomery Watson Harza, 2001. IMA Selenium Committee Field Sampling Plan "Sampling and Analysis Plan – Southeast Idaho Phosphate Resource Area Selenium Project, Summer 2001 Area – Wide Investigation." August 2001 -Final. Bellevue, Washington.

INORGANIC DATA ASSESSMENT SUMMARY

PROJECT: IMA Selenium Project	SITE: Southeast Idaho
LABORATORY: Primary Laboratory: U of I- Holm Research Center Subcontract Laboratory: SVL Analytical, Inc. QC Laboratory: APCL	SDG:
SAMPLES/MATRIX/ANALYSES:	
• Summer 2001	
• Matrix: Terrestrial Invertebrates	
• Methods: EPA 3050B/6010B & 3050B/6020B, EPA 245.7, ICP-Hydride, and SW7471A	
• Analysis: Ag, Al, As, B, Ba, Be, Cd, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn, Hg	

DATA ASSESSMENT SUMMARY

REVIEW ITEM	ICP	AA	HG	CYANIDE	OTHER
1. Data completeness	O				
2. Holding Times	O				
3. Calibration	O				
4. Blank	O				
5. ICS	O				
6. LCS	See Discussion				
7. Duplicate RPD	O				
8. Spike Recovery	O				
9. MSA	NA				
10. Other QC	NA				
11. Field Duplicates	NA				
12. Result Verification	O				
13. Overall Assessment	O				

O=Data had no problems/or qualified due to minor problems.
M=Data qualified due to major problems.
NA=Data review item not applicable.
X=Problems but do not affect data.
Z=Data unacceptable.

Comments/Qualified Results:
All data were acceptable. See individual sections below for an explanation of the results from the data validation process.

Verified and Validated by: _____ Date: _____

Reviewed and Approved by:_____ Date: _____

INORGANIC DATA ASSESSMENT SUMMARY

	Acceptable Yes	No
1. Data package completeness (check if present)	X	__

_x_Case narrative
_x_Chain of custody
_x_Sample Results
_x_ICV/CCV Results
_x_Blank Results
_x_ICP Interference Check Results
_x_Spike Recovery Results
_x_Duplicate Results
_x_LCS Results
___Standard Addition Results
_x_ICP Serial Dilution

_x_Instrument Det. Limits
___ICP Correction Factors
___ICP Linear Ranges
_x_Preparation Logs
_x_Analysis Run Logs
_x_ICP Raw Data
___GFAA Raw Data
___Hg Raw Data
___Cyanide Raw Data
___Other_____

Comments/Qualified Results:

- ICP interference checks and ICP serial dilution completed on APCL analyses only.
- LCS conducted on U of I, and SVL analyses only.

2. Holding times (check all that apply)	X	__

_x_ICP/GFAA metals completed in <6 mos from collection
___Mercury analyzed in <28 days from collection
___Cyanide completed in 14 days from collection

Qualify as estimated (J, UJ) all results analyzed past the holding times listed but within 2 times (X) the limit. Qualify detects as estimated (J) and non-detects unusable (UR) for results analyzed greater than 2 X above the limit. If soil data are qualified based on water holding time criteria, note.

Comments/Qualified Results:

- All samples were analyzed by U of I, SVL, and APCL within acceptable holding times.
- The above holding time for mercury is not applicable for terrestrial invertebrates, however, all mercury samples were analyzed within six months of collection.

INORGANIC DATA ASSESSMENT SUMMARY

	Acceptable Yes	No
3. Calibrations (check all that apply)	X	__

___GFAA/Hg correlation coefficient <0.995, results estimated (J, UJ)
_x_ICV/CCV %R, ICP 89-111%, Hg 80-120%, Cn 85-115%, results acceptable
___ICV/CCV %R, ICP 75-89%, Hg 65-79%, Cn 70-84%m results <IDL estimated (UJ)
___ICV/CCV %R, ICP <75%, Hg <65%, Cn <70%, results unusable (R)
___ICV/CCV %R, ICP >125%, Hg >135%, Cn >130%, results >IDL unusable (R), <IDL acceptable
___ICV/CCV %R, ICP 75-89% or 111-125%, Hg 65-79% or 121-135%, Cn 70-84% or 116-130%, results >IDL estimated (J)

Comments/Qualified Results:

- Initial and continuing calibrations were within acceptable range for U of I, SVL, and APCL.
- No qualification was necessary.

4. Blanks (check all that apply)	X	__

___Detects reported ICB/CCB

___Detects in preparation blanks

___Detects in field blanks

Qualify as undetected (U) all sample concentrations $\leq$5 X any blank concentrations.

Comments/Qualified Results:

- U of I reported a blank detection for mercury (EPA 245.7), therefore associated sample results were qualified as undetected (U) according to the criteria. All other U of I blanks were acceptable.
- SVL blanks were acceptable for mercury (EPA 7471).
- All APCL blanks were acceptable.

Acceptable
Yes No

5. Interference Checks (check all that apply) NA

_x_ICS A/B Recoveries Acceptable
___Al, Ca, Fe, Mg sample concentrations >ICS concentrations
___ICS %R> 120%, results > IDL estimated (J)
___ICS %R 50-79%, results>IDL estimated (J), possible false negative
___ICS %R 50-79%, results <IDL estimated (UJ)
___ICS %R <50%, results >IDL and <IDL rejected (R/UR)
___ICS %R>120, results <IDL acceptable

Comments/Qualified Results:

- U of I - Interference checks not run.
- SVL- Interference checks not run.
- APCL – Interference checks run for all analyses except boron.
- No qualification necessary.

6. Laboratory Control Samples (check all that apply) X __

_x_LCS %R 80-120 (Ag, Sb no limits)
_x_LCS %R 50-79% or >120%, results>IDL estimated (J)
___LCS %R 50-79% and results <IDL estimated (UJ)
___LCS %R <50% and all results rejected (R/UR)
_x_LCS %R >120%, results <IDL acceptable

Comments/Qualified Results:

- U of I- manganese results greater than EDL were qualified as estimated (J) due to results outside of the 95% confidence range in 2 of 5 SRM samples. Nickel results greater than EDL were qualified as estimated (J) due to results outside of the 95% confidence range in 2 of 5 SRM samples.
- SVL- LCS/SRM recoveries were acceptable.
- APCL did not perform LCS analysis.

7. Duplicate (check all that apply) X __

_x_Duplicate RPD $\leq$20% for waters ($\leq$35% for soils) for results >5X CRDL
___Duplicate Range is within $\pm$CRDL ($\pm$2xCRDL for soils) for results $\leq$ 5X CRDL
___Qualify positive results estimated (J) if the above criteria were not met.

Comments/Qualified Results:

- No qualification necessary

Acceptable
Yes No

8. Spike Recovery (check all that apply) NA

_x_Spike %R with 75-125%
_x_Spike %R 30-74%, >125%, results >IDL estimated (J)
_x_Spike %R 30-74% results <IDL estimated (UJ)
___Spike %R <30%, results <IDL rejected (UR)
___Field blank used for spike analysis
_x_Spike % R >125%, results <IDL acceptable
___Sample concentration exceeds spike concentration by a factor of >4x, acceptable

Comments/Qualified Results:

- U of I performed spike recovery analysis on mercury and selenium only. Results were acceptable for selenium. One mercury spike recovery was unacceptable, mercury data was qualified (UJ/J).
- SVL spike recoveries were not acceptable, mercury sample results >EDL were qualified as estimated (J).
- APCL performed spike recovery analysis on all analytes. No qualification was necessary.

9. GFAA Performance (check all that apply) NA

___Duplicate injection RSD<20%
___Duplicate injection RSD>20%, results >CRDL estimated (J)
___Analytical spike %R 85-115%
___Analytical spike %R 40-85%, results >IDL estimated (J)
___Analytical spike %R 10-40%, results <IDL estimated (UJ)
___Analytical spike %R <10%, results <IDL rejected (R)
___Analytical spike %R <40%, results >IDL estimated (J)
___MSA required but not run, results estimated (J)
___MSA run at incorrect level, results estimated (J)
___MSA correlation coefficient <0.995, results estimated (J)

Comments/Qualified Results:

- U of I – not applicable
- SVL- not applicable
- APCL – not applicable

10. Serial Dilution (check all that apply) NA

_x_Serial Dilution %D within 10% for sample results >50x the IDL
___Serial Dilution %D greater than 10%, results >50x the IDL estimated (J)

Comments/Qualified Results:

- U of I - no serial dilution tests conducted
- SVL- no serial dilution tests conducted
- APCL - no qualification necessary

Acceptable
Yes No

11. Field Duplicates (check all that apply) NA

___Field duplicate RPD ≤20% waters (≤35% for soils)
___Field duplicate range is within ±CRDL (±2x CRDL for soils) for results <5xCRDL

Note: There are no qualification requirements for field QC samples exceeding limits.

Comments/Qualified Results:

- No field Duplicates were collected for analysis.

12. Result Verification (check all that apply) X __

_x_All results supported in raw data

Comments/Qualified Results:

- U of I – results included and verifiable
- SVL- results included and verifiable
- APCL – results included and verifiable

13. Overall Assessment

- Discussion is included in the above sections, as well as in the data assessment summary for each analyte from U of I, SVL (mercury), and APCL.

- Sample results < EDL (U of I, and SVL) or <RL (APCL) were qualified as undetected (U) for the following analytes:

U of I
antimony
molybdenum
silver
thallium
uranium

SVL
mercury

APCL
antimony
arsenic
beryllium
boron
chromium
lead
mercury
molybdenum
silver
thallium
vanadium

Appendix D
Surface Soil Data Validation Summary

APPENDIX D

SUMMER 2001 IDAHO MINING ASSOCIATION AREA-WIDE INVESTIGATION

SOIL DATA VALIDATION AND QUALITY CONTROL SUMMARY REPORT

The following is a summary of the data validation and quality control (QC) review conducted for the Summer 2001 Area-Wide Investigation sampling of surface soil. This effort was completed on the behalf of the Idaho Mining Association (IMA). The University of Idaho Analytical Sciences Laboratory (U of I) located in Moscow, ID was the primary analytical laboratory performing the analyses. The Applied Physics & Chemistry Laboratory (APCL) located in Chino, CA was the quality assurance (QA) laboratory tasked with analyzing surface soil samples collected at QA sampling locations. Both laboratories were selected prior to sampling, and both were proficient in the analysis of metals and other parameters as requested by the Idaho Department of Environmental Quality (IDEQ). Data analyzed by U of I and APCL were subjected to validation procedures outlined by the *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses* (EPA, December 1994).

Forty-eight total surface soil samples were taken, which included five randomly selected samples collected with additional amounts for QA/QC analyses. Samples were submitted under chain-of-custody to U of I and QA/QC samples to APCL. U of I analyzed the samples for the following:

- EPA 3050B/6010B (Al, Cu, Mn, Na, V, Zn)
- EPA 3050B/6020B (Ag, As, Ba, Be, Cd, Cr, Ni, Pb, Sb, Tl)
- ICP and EPA 245.7(Hg)

- ICP Na-fusion (B)
- ICP Hydride (Se)
- Ion chromatography (F)
- Hydrometer (clay, >2 mm, sand, silt, texture)
- Saturated paste (electrical conductivity, pH)
- Walkey/Black (OC)

APCL analyzed the QC samples for the following:

- EPA 300 (F)
- EPA 415.1 (TOC)
- SW6010B (Ag, Al, As, B, Ba, Be, Cd, Cr, Cu, Mn, Ni, Pb, Sb, Se, Tl, V, Zn)
- SW7471A (Hg)
- D2216 (Moisture)
- EPA 120.1 (Electric conductivity)
- SW9045 (pH)

Note: Molybdenum was not analyzed in soil because IDEQ had removed it from the list of analytes to test for in soil.

Data validation was not applicable to the following methods, due to the fact that the analytes analyzed were not inorganic: hydrometer, saturated paste, Walkey/Black, D2216, EPA 120.1, and SW9045. The laboratories verified the data packages prior to submitting the data for these analytes.

Data quality objectives (DQOs) are qualitative and quantitative statements that specify the quality of these data required to meet the goals of site investigation and/or to support decisions

made in environmental management activities. DQOs for the Summer 2001 Area-Wide Investigation were expressed in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC). The results of QC samples were evaluated against the DQOs and the quality of these data was assessed according to the PARCC parameters. QC sample results that fall outside these criteria serve to signal unacceptable or biased data that could result in corrective actions being implemented, or qualification of the data. The following is a summary review of these data, including data qualification that resulted from the data validation.

Precision and Accuracy

Precision and accuracy were evaluated based on the QC results generated from calibrations, interference check samples, laboratory control samples (LCS) or standard reference material (SRM) samples, laboratory duplicates, spiked samples, and serial dilutions.

Calibrations: U of I results for antimony, beryllium, and chromium data were qualified as estimated (J) due to calibrations outside the acceptable range. All other U of I calibrations were acceptable. All calibrations for APCL were acceptable.

Interference Check Samples: U of I did not run checks for ICP interference. All ICP interference checks by APCL were acceptable.

LCS or SRM Samples: U of I analyzed the following SRMs: NIST-2709 and NIST-2711 Montana Soil for mercury; NIST-2709 for selenium; and HRM-J, NIST-2710, and NIST-2711 for metals screen. Barium, beryllium, copper, nickel, vanadium and thallium were flagged as

estimated (UJ/J) due to low SRM recovery, and aluminum, arsenic, cadmium, lead, and sodium data were qualified as rejected (UR/R) due to unacceptable SRM recoveries. Mercury (EPA 245.7) sample results greater than the EDL were qualified as estimated (J) due to SRM recoveries greater than the 95% confidence range. Mercury (ICP) SRM recoveries were acceptable. APCL did not analyze samples for LCS or SRM.

Laboratory Duplicates: All U of I duplicate results were acceptable except for aluminum, arsenic, barium, cadmium, chromium, lead, manganese, nickel, sodium, vanadium, and zinc. Sample results for the fore-mentioned analytes > method detection limit (MDL) were qualified as estimated (J) due to a relative percent difference (RPD) > 35%. All APCL duplicates were acceptable.

Spike Recoveries: U of I matrix spike recovery results were low for fluoride, leading to results being qualified as estimated (UJ/J) according to the criteria. All other U of I recovery results were acceptable. All APCL spike recoveries were acceptable.

Serial Dilutions: U of I did not analyze for serial dilution. Serial dilution was measured by APCL for several analytes. Cadmium and arsenic sample results greater than fifty times the reporting limit (RL) were qualified as estimated (J).

Representativeness

Representativeness was evaluated through the analysis of laboratory method blanks and equipment blanks prior to and during the analytical process.

Blanks: U of I blank samples reported detects for aluminum, barium, copper, fluoride, nickel and zinc. Data for the respective analytes less than or equal to five times the highest blank concentrations were qualified as undetected (U). No APCL data was qualified for blank detections.

Completeness

Field QC samples were collected and analyzed, and laboratory samples were analyzed as specified in the *Summer 2001 Area-Wide Investigation Sampling and Analysis Plan* (MWH, 2001). The U of I and APCL field data were complete. APCL did not analyze samples for sodium.

Both laboratories provided raw data packets containing information on the specific parameters analyzed for surface soil samples. All the analytical data provided in the packets were discoverable. Field QA/QC samples were collected and analyzed by U of I and APCL as required. All sample analytical holding times were met within acceptable limits. Blank spike and matrix spike amounts were written on various QC sheets. APCL did not include a summary packet for check standards, but it was included in the raw data printouts.

Comparability

Comparability was achieved by analyzing the samples according to the required methods. Each laboratory used acceptable methodology, which is recognized by the EPA in analyzing samples. Detection limits were reported by each laboratory for each specific analyte and included in either the raw data packet or electronic files.

Summary of Data Quality

The evaluation of the PARCC criteria provided information on the quality of the data.

Aluminum, arsenic, cadmium, lead, and sodium data from the U of I were rejected due to SRM recoveries outside of acceptable limits.

References

U.S Environmental Protection Agency, 1994. "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses". Publication 9240.1-26, EPA/540/R/94/083, PB95-963525. Office of Solid Waste and Emergency Response, USEPA, Washington, D.C.

Montgomery Watson Harza, 2001. "Sampling and Analysis Plan – Southeast Idaho Phosphate Resource Area Selenium Project, Summer 2001, Area – Wide Investigation". Bellevue, Washington.

INORGANIC DATA ASSESSMENT SUMMARY

PROJECT: IMA Selenium Project	SITE: Southeast Idaho
LABORATORY: Primary Laboratory: U of I- Holm Research Center QC Laboratory: APCL	SDG:
SAMPLES/MATRIX/ANALYSES:	
• Summer 2001	
• Matrix: Surface Soil	
• Methods: EPA 3050B/6010B, 3050B/6020B, EPA 245.7, ICP, ICP-Hydride, ICP-Na-Fusion, Ion Chromatography, EPA 300, EPA 415.1, SW7471A	
• Analysis: Ag, Al, As, B, Ba, Be, Ca, Cd, Cr, Cu, F, Fe, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn, Hg, TOC	

DATA ASSESSMENT SUMMARY

REVIEW ITEM	ICP	AA	HG	CYANIDE	OTHER
1. Data completeness	O				
2. Holding Times	O				
3. Calibration	See Discussion				
4. Blank	See Discussion				
5. ICS	O				
6. LCS	See Discussion				
7. Duplicate RPD	See Discussion				
8. Spike Recovery	See Discussion				
9. MSA	NA				
10. Serial Dilution	See Discussion				
11. Field Duplicates	NA				
12. Result Verification	O				
13. Overall Assessment	See Discussion				

O = Data had no problems/or qualified due to minor problems.
M = Data qualified due to major problems.
NA = Data review item not applicable.
X = Problems but do not affect data.
Z = Data unacceptable.

Comments/Qualified Results:

- All samples results for aluminum, arsenic, cadmium, lead, and sodium were rejected due to low recovery in lab control samples. All other data were acceptable. See individual sections below for an explanation of the results from the data validation process.

Verified and Validated by: _____ Date: _____

Reviewed and Approved by:_____ Date: _____

INORGANIC DATA ASSESSMENT SUMMARY

	Acceptable Yes	No
1. Data package completeness (check if present)	X	__

_x_Case narrative
_x_Chain of custody
_x_Sample Results
_x_ICV/CCV Results
_x_Blank Results
_x_ICP Interference Check Results
_x_Spike Recovery Results
_x_Duplicate Results
_x_LCS Results
___Standard Addition Results
_x_ICP Serial Dilution
_x_Instrument Det. Limits
___ICP Correction Factors
___ICP Linear Ranges
_x_Preparation Logs
_x_Analysis Run Logs
_x_ICP Raw Data
___GFAA Raw Data
___Hg Raw Data
___Cyanide Raw Data
___Other_____

Comments/Qualified Results:

- ICP interference checks and serial dilution completed on APCL analyses only.
- LCS/SRM analyses conducted by U of I only.

2. Holding times (check all that apply)	X	__

_x_ICP/GFAA metals completed in <6 mos from collection
___Mercury analyzed in <28 days from collection
___Cyanide completed in 14 days from collection

Qualify as estimated (J, UJ) all results analyzed past the holding times listed but within 2 X the limit. Qualify detects as estimated (J) and non-detects unusable (UR) for results analyzed greater than 2 X above the limit. If soil data are qualified based on water holding time criteria, note.

Comments/Qualified Results:

- All samples were analyzed by the U of I within acceptable holding times.
- All samples were analyzed by APCL within acceptable holding times.

	Acceptable Yes	No
3. Calibrations (check all that apply)	X	__

___GFAA/Hg correlation coefficient <0.995, results estimated (J, UJ)
_x_ICV/CCV %R, ICP 89-111%, Hg 80-120%, Cn 85-115%, results acceptable
___ICV/CCV %R, ICP 75-89%, Hg 65-79%, Cn 70-84%m results <IDL estimated (UJ)
___ICV/CCV %R, ICP <75%, Hg <65%, Cn <70%, results unusable (R)
___ICV/CCV %R, ICP >125%, Hg >135%, Cn >130%, results >IDL unusable (R), <IDL acceptable
_x_ICV/CCV %R, ICP 75-89% or 111-125%, Hg 65-79% or 121-135%, Cn 70-84% or 116-130%, results >IDL estimated (J)

Comments/Qualified Results:

- U of I – antimony, beryllium, and chromium data flagged as estimated (J) due to calibrations outside of acceptable range
- APCL results were all acceptable.

4. Blanks (check all that apply)	X	__

_x_Detects reported ICB/CCB

___Detects in preparation blanks

_x_Detects in field blanks

Qualify as undetected (U) all sample concentrations $\leq$5 X any blank concentrations.

Comments/Qualified Results:

- U of I:
  -Aluminum had detects in 6 of 12 blank sample resulting in data flagged as undetected (U).
  -Barium had a detect in 1 of 14 blank samples resulting in data flagged as undetected (U).
  -Copper had detects in 3 of 12 blank samples resulting in data flagged as undetected (U).
  -Fluoride had detects in 2 of 8 blank samples resulting in data flagged as undetected (U).
  -Nickel and zinc had detects in 4 of 14 blank samples resulting in data flagged as undetected (U).

- APCL results were all below detection limit.

Acceptable
Yes No

5. Interference Checks (check all that apply) NA

_x_ICS A/B Recoveries Acceptable
___Al, Ca, Fe, Mg sample concentrations >ICS concentrations
___ICS %R> 120%, results > IDL estimated (J)
___ICS %R 50-79%, results>IDL estimated (J), possible false negative
___ICS %R 50-79%, results <IDL estimated (UJ)
___ICS %R <50%, results >IDL and <IDL rejected (R/UR)
___ICS %R>120, results <IDL acceptable

Comments/Qualified Results:

- U of I -- Interference checks not run
- APCL – Interference checks run for all analysis but TOC, sodium, fluoride and boron.

6. Laboratory Control Samples (check all that apply) X __

_x_LCS %R 80-120 (Ag, Sb no limits)
_x_LCS %R 50-79% or >120%, results>IDL estimated (J)
_x_LCS %R 50-79% and results <IDL estimated (UJ)
_x_LCS %R <50% and all results rejected (R/UR)
_x_LCS %R >120%, results <IDL acceptable

Comments/Qualified Results:

- U of I:
  -Aluminum results were qualified R/UR due to low recovery in 7 of 12 LCS samples.
  -Arsenic results were qualified R/UR due to low recovery in 16 of 23 LCS samples.
  -Barium results were qualified J/UJ due to low recovery in 7 of 23 LCS samples.
  -Beryllium results were qualified J/UJ due to low recovery in 1 of 16 LCS samples.
  -Cadmium results were qualified R/UR due to low recovery in 16 of 23 LCS samples.
  -Copper results were qualified J/UJ due to low recovery in 8 of 18 LCS samples.
  -Lead results were qualified R/UR due to low recovery in all 16 LCS samples.
  -Mercury (EPA 245.7) results >EDL were qualified as estimated (J) due to high recoveries.
  -Mercury (ICP) LCS results were acceptable.
  -Nickel results were qualified J/UJ due to low recovery in 5 of 23 LCS samples.
  -Sodium results were qualified R/UR due to low recovery in all 18 LCS samples.
  -Thallium results were qualified J due to low recovery in 3 of 7 LCS samples.
  -Vanadium results were qualified J/UJ due to low recovery in 2 of 12 LCS samples.

- LCS analyses not conducted by APCL.

Acceptable
Yes No

7. Duplicate (check all that apply) X __

_x_Duplicate RPD ≤20% for waters (≤35% for soils) for results >5X CRDL
_x_Duplicate Range is within ±CRDL (±2xCRDL for soils) for results ≤ 5X CRDL
_x_Qualify positive results estimated (J) if the above criteria were not met.

Comments/Qualified Results:

Aluminum, arsenic, barium, cadmium, chromium, lead, manganese, nickel, sodium, vanadium and zinc results >MDL were qualified as estimated (J) due to a RPD > 35% in 1 of 3 samples.

8. Spike Recovery (check all that apply) NA

_x_Spike %R with 75-125%
_x_Spike %R 30-74%, >125%, results >IDL estimated (J)
_x_Spike %R 30-74% results <IDL estimated (UJ)
___Spike %R <30%, results <IDL rejected (UR)
___Field blank used for spike analysis
___Spike % R >125%, results <IDL acceptable
___Sample concentration exceeds spike concentration by a factor of >4x, acceptable

Comments/Qualified Results:

- U of I:
  -Fluoride results were qualified as estimated (J/UJ) due to low recovery in 9 of 13 spiked samples.

- APCL results were all acceptable.

9. GFAA Performance (check all that apply) NA

___Duplicate injection RSD<20%
___Duplicate injection RSD>20%, results >CRDL estimated (J)
___Analytical spike %R 85-115%
___Analytical spike %R 40-85%, results >IDL estimated (J)
___Analytical spike %R 10-40%, results <IDL estimated (UJ)
___Analytical spike %R <10%, results <IDL rejected (R)
___Analytical spike %R <40%, results >IDL estimated (J)
___MSA required but not run, results estimated (J)
___MSA run at incorrect level, results estimated (J)
___MSA correlation coefficient <0.995, results estimated (J)

Comments/Qualified Results:

- U of I – not applicable
- APCL – not applicable

Acceptable
Yes No

10. Serial Dilution (check all that apply) NA

_x_Serial Dilution %D within 10% for sample results >50x the IDL
_x_Serial Dilution %D greater than 10%, results >50x the IDL estimated (J)

Comments/Qualified Results:

- U of I – No serial dilution tests were conducted.
- APCL – Cadmium and arsenic data >50 X the reporting limit were qualified as estimated (J).

11. Field Duplicates (check all that apply) NA

___Field duplicate RPD ≤20% waters (≤35% for soils)
___Field duplicate range is within ±CRDL (±2x CRDL for soils) for results <5xCRDL

Note: There are no qualification requirements for field QC samples exceeding limits.

Comments/Qualified Results:

- No field Duplicates were collected for analysis.

12. Result Verification (check all that apply) X __

_x_All results supported in raw data

Comments/Qualified Results:

- U of I – Results included and verifiable.
- APCL – Results included and verifiable.

13. Overall Assessment

- All samples results for aluminum, arsenic, cadmium, lead, and sodium were rejected due to low recovery in lab control samples. Data were flagged as estimated (UJ/J) and undetected (U) for various reasons. Discussion is included in the above sections, as well as in the data assessment summary for each analyte from the U of I and APCL.

- Sample results <RL (APCL) or < estimated detection limit (EDL) (U of I) were qualified as undetected (U) for the following analytes:

U of I	APCL
boron	antimony
silver	mercury
thallium	thallium

Appendix E
Vegetation Data Validation Summary

APPENDIX E

SUMMER 2001 IDAHO MINING ASSOCIATION AREA-WIDE INVESTIGATION VEGETATION DATA VALIDATION SUMMARY

The following is a summary of the data validation and quality control (QC) review conducted for the Summer 2001 Area-Wide Investigation sampling of vegetation. This effort was completed on the behalf of the Idaho Mining Association (IMA). The University of Idaho Analytical Sciences Laboratory (U of I) located in Moscow, ID was the primary analytical laboratory performing the analyses. The U of I subcontracted Silver Valley Laboratories Analytical, Inc. (SVL) located in Kellogg, ID to perform mercury analyses on some of the vegetation samples. The Applied Physics & Chemistry Laboratory (APCL) located in Chino, CA was the quality assurance (QA) laboratory tasked with analyzing vegetation samples collected at QA sampling locations. The laboratories were selected prior to sampling, and were proficient in the analysis of metals and other parameters as requested by the Idaho Department of Environmental Quality (IDEQ). Data analyzed by U of I, SVL, and APCL were subjected to validation procedures outlined by the *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses* (EPA, December 1994).

Fifty-three total vegetation samples were collected, which included five randomly selected samples collected with additional volume for QA/QC analysis and five field equipment blanks. Samples were submitted under chain-of-custody to U of I. U of I split the QA/QC samples and submitted them to APCL under chain-of-custody. U of I analyzed the samples for the following:

- EPA 3050B/6010B (Al, V, Zn)
- EPA 3050B/6020B (Ag, As, B, Ba, Be, Cd, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Tl, U)
- ICP and EPA 245.7 (Hg) for some vegetation samples
- ICP Hydride (Se)

SVL analyzed some samples for the following:

- EPA 7471 (Hg) for some vegetation samples

APCL analyzed the QA/QC samples for the following:

- SW 6010B (Ag, Al, As, B, Ba, Be, Cd, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn)
- SW 7471A (Hg)

Data quality objectives (DQOs) are qualitative and quantitative statements that specify the quality of these data required to meet the goals of site investigation and/or to support decisions made in environmental management activities. DQOs for the Summer 2001 Area-Wide Investigation were expressed in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC). The results of QC samples were evaluated against the DQOs and the quality of the data was assessed according to the PARCC parameters. QC sample results that fall outside these criteria serve to signal unacceptable or biased data that could result in corrective actions being implemented, or qualification of the data. The following is a summary review of these data, including data qualification that resulted from the data validation.

Precision and Accuracy

Precision and accuracy were evaluated based on the QC results generated from calibrations, interference check samples, laboratory control samples (LCS) or standard reference material (SRM) samples, laboratory duplicates, spiked samples, and serial dilutions.

Calibrations: All U of I calibrations were acceptable with the exception of mercury. U of I mercury sample results greater than the reporting limit were qualified as estimated (J). All SVL mercury calibrations were acceptable. All APCL calibrations were acceptable with the exception of boron, resulting in the boron sample results greater than the reporting limit being qualified as unusable (R).

Interference Check Samples: U of I and SVL did not perform interference checks. Interference check samples were analyzed by APCL; all results were satisfactory.

LCS or SRM Samples: U of I analyzed all SRMs with acceptable results except for chromium, copper, manganese, mercury, and zinc. U of I data that did not have acceptable SRM results for each analyte were qualified as estimated (J) according to the criteria. U of I analyzed SRMs and provided 95% confidence ranges for the following reference materials: TORT-2 (Hg, Se, V, Zn), House Reference Alfalfa (Al, B, Ba, Cr, Cu, Mn, Mo, Ni, V, Zn), and House Reference Liver (B, Cd, Cr, Cu, Hg, Pb, Mn, Mo, Se, Zn). A 95% confidence range was not available for barium or boron, rendering the SRM data unusable. SVL mercury sample results were qualified as estimated (UJ/J) according to the criteria for SRM samples. APCL did not analyze laboratory control samples or standard reference materials.

Duplicates: All U of I and APCL laboratory duplicates were acceptable. APCL performed duplicate analysis on two laboratory control spikes, a matrix spike and a sample. U of I performed duplicate analyses on samples. SVL did not perform duplicate analyses for mercury.

Spike Recoveries: U of I only performed spike recovery on mercury, selenium and cadmium, all results were acceptable with the exception of mercury. U of I mercury sample results greater than the reporting limit were qualified as estimated (J) and results less than the reporting limit were qualified as estimated (UJ). Spike analyses performed by U of I include laboratory blank spikes and matrix spikes. SVL mercury spike recoveries were acceptable. All APCL spike recoveries were acceptable. APCL performed the following spike analyses on all analytes: laboratory control spike, laboratory control spike duplicate, matrix spike, matrix spike duplicate and post digest spike sample recovery (for methods SW6010B, SW7471A).

Serial Dilutions: U of I, and SVL did not perform serial dilutions. All serial dilutions performed by APCL were acceptable.

Representativeness

U of I evaluated representativeness through the analysis of laboratory method blanks and equipment blanks prior to and during the analytical process. Detections in equipment blanks occurred for the following analytes: aluminum, antimony, boron, copper, nickel, and uranium, however; due to the different detection limit for equipment blanks than for field sample results, no data was qualified as a result of the detections in equipment blanks. Detections in laboratory blanks occurred in manganese and silver. Any sample results less than or equal to five times the

highest blank concentration were qualified as undetected (U). All SVL blank results for mercury were acceptable. APCL analyzed Initial Calibration Blanks and Continuing Calibration Blanks (ICB/CCB) as well as laboratory method blanks. All blank results were below the detection limit and no sample results were qualified.

Completeness

All samples were collected and analyzed as specified in the *Summer 2001 Area-Wide Investigation Sampling and Analysis Plan* (MWH, 2001). U of I and SVL field data was complete. APCL field data and laboratory QC data was complete.

All laboratories provided raw data packets that contained information on the specific analytes to which vegetation samples were subjected. All the analytical data provided in the packets were discoverable. Field QA/QC samples were collected and analyzed as required. APCL performed QA/QC analyses on all analytes analyzed by U of I or SVL with the exception of uranium. All sample analytical holding times were met within acceptable limits. Blank spike and matrix spike amounts were written on various QC sheets. U of I provided 95% confidence ranges for SRMs on QC sheets.

Comparability

Comparability was achieved by all the laboratories analyzing the samples according to the required methods. Each laboratory used acceptable methodology, which is recognized by the EPA in analyzing samples. Detection limits were reported by each laboratory for each specific analyte and included in either the raw data packet or electronic files.

Summary of Data Quality

The evaluation of the PARCC criteria provided information on the quality of the data. The data were considered usable as a result of the validation, with the exception of the results for boron from APCL.

References

U.S. Environmental Protection Agency, 1994. "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses." Publication 9240.1-26, EPA/540/R/94/083, PB95-963525. Office of Solid Waste and Emergency Response, USEPA, Washington, D.C.

Montgomery Watson Harza, 2001. IMA Selenium Committee Field Sampling Plan "Sampling and Analysis Plan – Southeast Idaho Phosphate Resource Area Selenium Project, Summer 2001 Area – Wide Investigation." August 2001 -Final. Bellevue, Washington.

INORGANIC DATA ASSESSMENT SUMMARY

PROJECT: IMA Selenium Project	SITE: Southeast Idaho
LABORATORY: Primary Laboratory: U of I- Holm Research Center Subcontract Laboratory: SVL Analytical, Inc. QA Laboratory: APCL	SDG:
SAMPLES/MATRIX/ANALYSES:	
• Summer 2001	
• Matrix: Vegetation	
• Method: EPA 3050B/6010B, EPA 3050B/6020B, EPA 245.7, ICP Hydride, SW 6010B, SW7471A	
• Analyses: Ag, Al, As, B, Ba, Be, Cd, Cr, Cu, Hg, Pb, Mn, Mo, Ni, Sb, Se, Tl, V, Zn, U	

DATA ASSESSMENT SUMMARY

REVIEW ITEM	ICP	AA	HG	CYANIDE	OTHER
1. Data completeness	O				
2. Holding Times	O				
3. Calibration	See discussion				
4. Blanks	O				
5. ICS	O				
6. LCS	O				
7. Duplicate RPD	O				
8. Spike Recovery	O				
9. MSA	NA				
10. Other QC	O				
11. Field Duplicates	NA				
12. Result Verification	O				
13. Overall Assessment	O				

O=Data had no problems/or qualified due to minor problems.
M=Data qualified due to major problems.
NA=Data review item not applicable.
X=Problems but do not affect data.
Z=Data unacceptable.

Comments/Qualified Results:

- This data validation summary summarizes all individual analyte data assessments for Summer 2001 vegetation data. See individual sections below for a summary of the results from the individual analyte data assessments. Except for the results of boron for APCL, all data were acceptable with some qualifications.

Verified and Validated by: _____ Date: _____

Reviewed and Approved by:_____ Date: _____

INORGANIC DATA ASSESSMENT SUMMARY

	Acceptable Yes	No
1. Data package completeness (check if present)	__X_	___

_X_Case narrative
_X_Chain of custody
_X_Sample Results
_X_ICV/CCV Results
_X_Blank Results
_X_ICP Interference Check Results
_X_Spike Recovery Results
_X_Duplicate Results
_X_LCS Results
___Standard Addition Results
_X_ICP Serial Dilution

_X_Instrument Det. Limits
___ICP Correction Factors
___ICP Linear Ranges
_X_Preparation Logs
_X_Analysis Run Logs
_X_ICP Raw Data
___GFAA Raw Data
___Hg Raw Data
___Cyanide Raw Data
___Other_____

Comments/Qualified Results:

- LCS analysis performed by U of I and SVL only.
- ICP interference checks completed on APCL analyses only.
- ICP serial dilution performed by APCL only.

2. Holding times (check all that apply)	__X_	___

_X_ICP/GFAA metals completed in <6 mos from collection
___Mercury analyzed in <28 days from collection
___Cyanide completed in 14 days from collection

Qualify as estimated (J, UJ) all results analyzed past the holding times listed but within 2 times (X) the limit. Qualify detects as estimated (J) and non-detects unusable (UR) for results analyzed greater than 2 X above the limit. If soil data are qualified based on water holding time criteria, note.

Comments/Qualified Results:

- UI- All samples were analyzed within acceptable holding times.
- SVL- All samples were analyzed within six months.
- APCL- All samples were analyzed within acceptable holding times.

Note: the holding time for mercury is not applicable to vegetation matrices.

Acceptable
Yes No

3. Calibrations (check all that apply) __X_ ___

___GFAA/Hg correlation coefficient <0.995, results estimated (J, UJ)
_X_ICV/CCV %R, ICP 89-111%, Hg 80-120%, Cn 85-115%, results acceptable
___ICV/CCV %R, ICP 75-89%, Hg 65-79%, Cn 70-84%m results <IDL estimated (UJ)
___ICV/CCV %R, ICP <75%, Hg <65%, Cn <70%, results unusable (R)
_x_ICV/CCV %R, ICP >125%, Hg >135%, Cn >130%, results >IDL unusable (R), <IDL acceptable
_x_ICV/CCV %R, ICP 75-89% or 111-125%, Hg 65-79% or 121-135%, Cn 70-84% or 116-130%, results >IDL estimated (J)

Comments/Qualified Results:

- U of I - All calibrations were acceptable with the exception of boron. Sample results > RL were qualified as unusable (R).
- SVL- All calibrations were acceptable.
- APCL- All calibrations were acceptable.

4. Blanks (check all that apply) _X_ ___

x_Detects reported ICB/CCB, list:

UI
Detections in equipment blanks:
Al: 5 detects, highest at 45 ug/L
B: 5 detects, highest at .2 mg/L
U: detect at .34 ug/L
Sb: 2 detects, highest at 3.6 ug/L
Ni: 2 detects, highest at 8.1 ug/L
Cu: detect at .47 ug/L

Detections in laboratory blanks:
Ag: 11 ug/kg
Mn: 15 ug/kg

___Detects in preparation blanks, list:

___Detects in field blanks, list:

Qualify as undetected (U) all sample concentrations ≤5 X any blank concentrations.

Comments/Qualified Results:

- U of I detections in equipment blanks did not result in any qualifiers being assigned due to the difference in reporting limits between equipment blanks and samples. The laboratory blank detections resulted in data over 5 X blank concentration qualified as undetected (U).
- SVL- All blanks were acceptable, no detection's reported.
- APCL- All blanks were acceptable, no detection's reported.

Acceptable

Yes No

5. Interference Checks (check all that apply) __X_ ___

_X_ICS A/B Recoveries Acceptable
___Al, Ca, Fe, Mg sample concentrations >ICS concentrations
___ICS %R> 120%, results > IDL estimated (J)
___ICS %R 50-79%, results>IDL estimated (J), possible false negative
___ICS %R 50-79%, results <IDL estimated (UJ)
___ICS %R <50%, results >IDL and <IDL rejected (R/UR)
___ICS %R>120, results <IDL acceptable

Comments/Qualified Results:

- U of I- no ICP interference check samples were analyzed.
- SVL- no ICP interference check samples were analyzed.
- APCL- ICP interference check samples were acceptable.

6. Laboratory Control Samples (check all that apply) __X_ ___

_X_LCS %R 80-120 (Ag, Sb no limits); if 95% confidence range is given, such range prevails.
_X_LCS %R 50-79% or >120%, results>IDL estimated (J); or outside of 95% confidence range.
___LCS %R 50-79% and results <IDL estimated (UJ); or outside the lower end of 95% confidence range.
___ LCS %R <50% and all results rejected (R/UR)
_X_LCS %R >120%, results <IDL acceptable; or outside the upper end of 95% confidence range.

Comments/Qualified Results:

- U of I- zinc, manganese, mercury, copper and chromium were qualified as estimated (J) for sample concentrations >IDL.
- SVL- all mercury sample results >EDL (0.033 or 0.067 ug/g) are qualified as estimated (J). All sample results <EDL are qualified as estimated (UJ).
- APCL – laboratory control samples were not analyzed. Laboratory control spikes were included in section “8. Spike Recovery”.

7. Duplicate (check all that apply) __X_ ___

_X_Duplicate RPD $\leq$20% for waters ($\leq$35% for soils) for results >5X CRDL
_X_Duplicate Range is within $\pm$CRDL ($\pm$2xCRDL for soils) for results $\leq$ 5X CRDL
___Qualify positive results estimated (J) if the above criteria were not met.

Comments/Qualified Results:

- U of I- all sample duplicates were acceptable.
- SVL- duplicate analysis was not performed for mercury.
- APCL- duplicates were performed on two laboratory control spikes, one matrix spike, and one sample. All duplicates were acceptable.

Acceptable

Yes No

8. Spike Recovery (check all that apply) __X_ ___

_X_Spike %R with 75-125%
_X_Spike %R 30-74%, >125%, results >IDL estimated (J)
_X_Spike %R 30-74% results <IDL estimated (UJ)
___Spike %R <30%, results <IDL rejected (UR)
___Field blank used for spike analysis
___Spike % R >125%, results <IDL acceptable
___Sample concentration exceeds spike concentration by a factor of >4x, acceptable

Comments/Qualified Results:

- U of I- performed only on mercury, selenium, and cadmium. Se and Cd results were acceptable. Mercury results flagged; results >EDL as (J) and <EDL as (UJ).
- SVL- all results were acceptable.
- APCL- all results were acceptable.

9. GFAA Performance (check all that apply) NA

___Duplicate injection RSD<20%
___Duplicate injection RSD>20%, results >CRDL estimated (J)
___Analytical spike %R 85-115%
___Analytical spike %R 40-85%, results >IDL estimated (J)
___Analytical spike %R 10-40%, results <IDL estimated (UJ)
___Analytical spike %R <10%, results <IDL rejected (R)
___Analytical spike %R <40%, results >IDL estimated (J)
___MSA required but not run, results estimated (J)
___MSA run at incorrect level, results estimated (J)
___MSA correlation coefficient <0.995, results estimated (J)

Comments/Qualified Results:

- U of I – not applicable.
- SVL- not applicable.
- APCL – not applicable.

10. Serial Dilution (check all that apply) __X_ ___

_X_Serial Dilution %D within 10% for sample results >50x the IDL
___Serial Dilution %D greater than 10%, results >50x the IDL estimated (J)

Comments/Qualified Results:

- U of I- serial dilution analyses were not performed.
- SVL- serial dilution analyses were not performed.
- APCL - serial dilution analyses were acceptable.

Acceptable
Yes No

11. Field Duplicates (check all that apply) NA

___Field duplicate RPD ≤20% waters (≤35% for soils)
___Field duplicate range is within ±CRDL (±2x CRDL for soils) for results <5xCRDL

Note: There are no qualification requirements for field QC samples exceeding limits.

Comments/Qualified Results:
- Uof I- no field duplicates collected.
- SVL- no field duplicates collected.
- APCL- no field duplicates collected.

12. Result Verification (check all that apply) __X_ ___

_X_All results supported in raw data

Comments/Qualified Results:
- U of I- all results below the respective detection limits were reported as BDL (below detection limit). Data not checked 100%, but no transcription errors/anomalies were noted on items checked.
- SVL- data are valid.
- APCL- all results below the method detection limit were reported as not detected. Not detected results were reported as less than the respective reporting limit in the hard copy analytical report and as zero (0 ug/L) in the electronic data analytical report. Data not checked 100%, but no transcription errors/anomalies were noted on items checked.

13. Overall Assessment __X_ ___
- U of I, SVL, and APCL data were acceptable. Data were qualified (flagged) as estimated (UJ or J), undetected (U), and unusable (R) for various reasons. Discussion is included in the above sections, as well as in the data assessment summary for each analyte from U of I, SVL, and APCL.
- Sample results <EDL (U of I, and SVL) or <RL (APCL) were qualified as undetected (U) for the following analytes:

  U of I
  V, U, Tl, Sb, Hg, Be

  SVL
  Hg

  APCL
  Sb, As, B, Be, Cd, Cr, Hg, Ag, Tl, V

Appendix F
Validated Small Mammal Data

APPENDIX F
SUMMER 2001 AREA-WIDE INVESTIGATION
VALIDATED SMALL MAMMAL DATA

Station ID	Sample ID	Aluminum		Antimony		Arsenic		Barium		Beryllium		Boron		Cadmium		Chromium		Copper		Lead		Manganese		Mercury		Molybdenum		Nickel		Selenium		Silver		Thallium		Uranium		Vanadium		Zinc	
		mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag
BB004	082501MABB004-1-1	68		0.27		0.17	J	7.4		-0.016	0.010 U	2.7	J	0.059	J	0.99	J	2.6	J	0.20	J	2.6	J	-0.020	0.067 UJ	0.27	J	0.42		0.29	J	0.0023	0.010 U	0.045	0.10 U	0.056		0.14	0.20 U	50	J
BB004	082901MABB004-1-2	36		0.13		0.032	J	2.6		0.075		2.1	J	1.2	J	0.59	J	2.3	J	0.32	J	2.8	J	0.0067	0.067 UJ	0.12	J	0.32		0.47	J	0.040		-0.016	0.10 U	0.0064	0.020U	0.13	0.20 U	55	J
BB004	083101MABB004-1-3	97		0.086	0.10 U	0.0019	0.020 U	3.1		0.012		2.9	J	0.0028	0.0041 UJ	0.57	J	0.81	J	0.11	J	1.2	J	-0.020	0.067 UJ	0.016	0.10 UJ	0.061		0.61	J	0.0011	0.010 U	0.025	0.10 U	0.040		0.083	0.20 U	89	J
BB005	082701MABB005-1-1	41		0.33		0.0014	0.020 U	2.4		0.021		5.4	J	0.022	J	1.2	J	2.1	J	0.12	J	2.6	J	-0.038	0.067 UJ	0.33	J	0.077		0.46	J	0.00075	0.010 U	0.041	0.10 U	0.071		0.048	0.20 U	46	J
BB005	082701MABB005-1-2	64		1.2		0.0064	0.020 U	2.3		0.025		5.7	J	0.039	J	1.3	J	2.3	J	0.098	J	4.1	J	-0.039	0.067 UJ	0.54	J	0.18		0.51	J	0.0032	0.010 U	0.052	0.10 U	0.12		0.092	0.20 U	31	J
BB005	082801MABB005-1-3	32		0.12		-0.0015	0.020 U	3.2		0.017		3.2	J	0.039	J	1.2	J	2.1	J	0.20	J	3.0	J	-0.031	0.067 UJ	0.44	J	0.18		0.83	J	0.00088	0.010 U	0.038	0.10 U	0.053		0.016	0.20 U	48	J
BB006	083101MABB006-1-1	1200		0.11		0.028	J	5.6		0.094		2.2	J	0.022	J	0.89	J	5.0	J	0.083	J	16	J	-0.020	0.067 UJ	0.089	0.10 UJ	0.47		0.27	J	0.0034	0.010 U	-0.023	0.10 U	0.013	0.020 U	0.30	J	28	J
BB006	083101MABB006-1-2	1600		0.12		0.048	J	3.9		0.095		1.8	J	0.043	J	0.65	J	5.1	J	0.15	J	22	J	-0.017	0.067 UJ	0.041	0.10 UJ	0.43		0.30	J	0.0019	0.010 U	-0.023	0.10 U	0.014	0.020 U	0.43	J	30	J
BB006	083101MABB006-1-3	100		0.16		0.065	J	4.4		0.14		3.5	J	0.37	J	0.72	J	3.2	J	0.20	J	6.9	J	0.0077	0.067 UJ	0.32	J	0.44		1.2	J	0.016		-0.029	0.10 U	0.012	0.020 U	0.30	J	32	J
BB007	083101MABB007-1-1	52		0.14		0.050	J	3.8		0.088		2.3	J	0.49	J	0.69	J	3.4	J	0.14	J	5.3	J	-0.015	0.067 UJ	0.089	0.10 UJ	0.29		0.54	J	0.0034	0.010 U	-0.021	0.10 U	0.0092	0.020 U	0.15	0.20 U	65	J
BB007	083101MABB007-1-2	790		0.092	0.10 U	0.038	J	8.2		0.085		1.3	J	0.032	J	0.62	J	2.9	J	0.11	J	11	J	-0.0049	0.067 UJ	0.082	0.10 UJ	0.37		0.41	J	0.0019	0.010 U	-0.021	0.10 U	0.014	0.020 U	0.19	0.20 U	29	J
BB007	083101MABB007-1-3	29		0.16		-0.024	0.020 U	4.4		0.14		2.4	J	0.12	J	0.73	J	3.1	J	0.024	J	2.7	J	-0.016	0.067 UJ	0.23	J	0.27		0.46	J	0.0022	0.010 U	-0.035	0.10 U	0.0097	0.020 U	0.053	0.20 U	53	J
ST026	082301MAST026-1-1	22		0.30		0.13	J	2.2		-0.024	0.010 U	2.8	J	0.14	J	1.0	J	2.5	J	0.068	J	2.8	J	-0.038	0.067 UJ	0.30	J	0.61		1.7	J	0.0021	0.010 U	0.064	0.10 U	0.083		0.051	0.20 U	33	J
ST026	082301MAST026-1-2	65		0.38		0.071	J	1.3		-0.016	0.010 U	3.5	J	0.061	J	1.9	J	2.3	J	0.15	J	2.7	J	-0.029	0.067 UJ	0.31	J	0.79		0.42	J	0.0026	0.010 U	0.053	0.10 U	0.069		0.11	0.20 U	27	J
ST026	082301MAST026-1-3	340		0.26		0.084	J	3.5		-0.015	0.010 U	2.6	J	0.049	J	1.2	J	3.0	J	0.13	J	5.5	J	-0.023	0.067 UJ	0.23	J	0.57		0.35	J	0.0030	0.010 U	0.045	0.10 U	0.066		0.17	0.20 U	29	J
ST049	090201MAST049-1-1	70		0.14		0.0025	0.020 U	9.5		0.091		9.5	J	0.033	J	1.6	J	3.4	J	0.051	J	3.6	J	-0.021	0.067 UJ	0.10	0.10 UJ	0.34		0.26	J	0.0022	0.010 U	-0.022	0.10 U	0.017	0.020 U	0.24	J	51	J
ST049	090401MAST049-1-2	400		0.083	0.10 U	0.014	0.020 U	8.6		0.012		4.3	J	0.13	J	0.70	J	1.5	J	0.079	J	5.2	J	-0.022	0.067 UJ	0.088	0.10 UJ	0.22		0.55	J	0.0026	0.010 U	0.023	0.10 U	0.039		0.22	J	24	J
ST049	090501MAST049-1-3	110		0.10		-0.014	0.020 U	4.0		0.020		6.2	J	0.027	J	1.5	J	2.7	J	0.065	J	4.7	J	-0.046	0.067 UJ	0.32	J	0.14		0.45	J	0.0014	0.010 U	0.038	0.10 U	0.060		0.20	0.20 U	23	J
ST076	090501MAST076-1-1	45		0.14		-0.0057	0.020 U	3.6		0.022		7.0	J	0.012	J	2.0	J	1.9	J	0.29	J	2.3	J	-0.046	0.067 UJ	0.42	J	0.52		1.2	J	0.00085	0.010 U	0.046	0.10 U	0.065		-0.056	0.20 U	37	J
ST076	090501MAST076-1-2	90		0.095	0.10 U	0.0045	0.020 U	2.3		0.018		5.5	J	0.018	J	1.9	J	2.1	J	0.095	J	2.8	J	-0.032	0.067 UJ	0.22	J	0.21		0.62	J	0.0020	0.010 U	0.036	0.10 U	0.057		0.043	0.20 U	26	J
ST130	082401MAST130-1-1	59		0.32		0.094	J	6.7		-0.025	0.010 U	2.7	J	0.032	J	1.2	J	3.0	J	0.20	J	3.0	J	-0.041	0.067 UJ	0.49	J	0.52		0.57	J	0.0023	0.010 U	0.071	0.10 U	0.089		0.054	0.20 U	30	J
ST130	082501MAST130-1-2	73		0.43		0.070	J	2.6		-0.026	0.010 U	2.3	J	0.025	J	1.60	J	3.2	J	0.27	J	3.0	J	-0.045	0.067 UJ	0.46	J	0.57		0.54	J	0.0019	0.010 U	0.087	0.10 U	0.097		0.12	0.20 U	57	J
ST130	082501MAST130-1-3	35		0.29		0.081	J	2.7		-0.020	0.010 U	2.7	J	0.028	J	1.30	J	2.6	J	0.14	J	3.2	J	-0.031	0.067 UJ	0.45	J	0.40		0.76	J	0.0018	0.010 U	0.060	0.10 U	0.072		0.097	0.20 U	38	J
ST153	082901MAST153-1-1	220		0.093	0.10 U	0.057	J	2.1		0.018		3.7	J	0.039	J	0.94	J	1.8	J	0.076	J	4.1	J	-0.034	0.067 UJ	0.16	J	0.34		4.8	J	0.0017	0.010 U	0.037	0.10 U	0.053		0.21	J	30	J
ST153	082901MAST153-1-2	28		0.10		0.019	0.020 U	1.6		0.019		5.4	J	0.015	J	1.3	J	1.4	J	0.037	J	1.9	J	-0.038	0.067 UJ	0.17	J	-0.060	0.010 U	1.3	J	0.00084	0.010 U	0.041	0.10 U	0.062		0.10	0.20 U	22	J
ST153	082901MAST153-1-3	100		0.11		0.016	0.020 U	2.2		0.021		5.8	J	0.027	J	1.3	J	2.2	J	0.047	J	4.7	J	-0.041	0.067 UJ	0.47	J	0.033		2.7	J	0.0011	0.010 U	0.043	0.10 U	0.066		0.067	0.20 U	27	J
ST227	082801MAST227-1-1	100		0.26		0.060	J	4.9		0.22		7.9	J	0.060	J	2.0	J	4.5	J	0.053	J	6.0	J	-0.057	0.067 UJ	0.45	J	0.57		3.4	J	0.0031	0.010 U	-0.058	0.10 U	0.015	0.020U	0.42	J	36	J
ST227	082801MAST227-1-2	140		0.12		-0.005	0.020 U	3.4		0.019		5.6	J	0.024	J	3.7	J	1.8	J	0.039	J	3.2	J	-0.041	0.067 UJ	0.34	J	1.3		0.88	J	0.0012	0.010 U	0.042	0.10 U	0.059		0.0068	0.20 U	24	J
ST227	082801MAST227-1-3	48		0.12		-0.0004	0.020 U	2.2		0.022		5.9	J	0.016	J	1.3	J	1.7	J	0.054	J	2.6	J	-0.042	0.067 UJ	0.42	J	-0.025	0.010 U	1.2	J	0.00099	0.010 U	0.050	0.10 U	0.065		0.20	0.20 U	26	J
ST235	090201MAST235-1-1	180		0.14		0.015	0.020 U	3.4		0.11		3.0	J	0.022	J	0.50	J	2.9	J	0.054	J	3.2	J	-0.022	0.067 UJ	0.089	0.10 UJ	0.30		0.25	J	0.0019	0.010 U	-0.028	0.10 U	0.010	0.020 U	0.29	J	30	J
ST235	090201MAST235-1-2	25		0.11		0.0053	0.020 U	4.0		0.10		1.2	J	0.025	J	0.63	J	2.6	J	0.074	J	1.8	J	-0.011	0.067 UJ	0.013	0.10 UJ	0.28		0.25	J	0.00042	0.010 U	-0.027	0.10 U	0.0062	0.020 U	0.019	0.20 U	30	J
ST235	090201MAST235-1-3	34		0.16		-0.048	0.020 U	5.8		0.15		2.5	J	0.017	J	0.68	J	2.5	J	0.25	J	2.5	J	-0.033	0.067 UJ	0.27	0.10 UJ	0.31		0.68	J	0.00087	0.010 U	-0.036	0.10 U	0.0076	0.020 U	0.046	0.20 U	28	J
ST237	083001MAST237-1-1	180		0.15		-0.027	0.020 U	3.7		0.14		7.5	J	0.037	J	1.2	J	2.4	J	0.12	J	5.3	J	-0.037	0.067 UJ	0.22	J	0.40		0.62	J	0.00095	0.010 U	-0.038	0.10 U	0.012	0.020 U	0.49	J	22	J
ST237	083001MAST237-1-2	51		0.098	0.10 U	0.018	0.020 U	4.8		0.090		2.0	J	0.059	J	0.59	J	2.3	J	0.096	J	5.4	J	-0.023	0.067 UJ	0.020	0.10 UJ	0.26		0.41	J	0.0013	0.010 U	-0.022	0.10 U	0.0079	0.020 U	0.13	0.20 U	27	J
ST237	083001MAST237-1-3	160		0.11		0.18	J	7.6		0.094		2.4	J	0.037	J	0.82	J	2.2	J	0.18	J	11	J	-0.015	0.067 UJ	0.071	0.10 UJ	0.33		0.43	J	0.0032	0.010 U	-0.021	0.10 U	0.0097	0.020 U	0.21	J	24	J
WD053	082501MAWD053-2-1	70		0.33		0.14	J	2.5		-0.024	0.010 U	3.0	J	0.070	J	1.4	J	3.2	J	0.11	J	5.3	J	-0.038	0.067 UJ	1.1	J	0.88		1.9	J	0.0020	0.010 U	0.072	0.10 U	0.093		0.15	0.20 U	28	J
WD053	082501MAWD053-2-2	14		0.33		0.130	J	2.8		-0.026	0.010 U	2.2	J	0.030	J	2.0	J	2.0	J	0.14	J	1.4	J	-0.0042	0.067 UJ	0.43	J	0.38		2.1	J	0.0052	0.010 U	0.070	0.10 U	0.090		0.10	0.20 U	24	J
WD053	082701MAWD053-2-3	23		0.090	0.10 U	0.0065	0.020 U	3.0		0.017		4.7	J	0.027	J	0.82	J	1.5	J	0.032	J	1.6	J	-0.041	0.067 UJ	0.25	J	0.045		2.0	J	0.00038	0.010 U	0.041	0.10 U	0.055		0.032	0.20 U	25	J
WD062	082201MAWD062-1-1	37		0.30		0.31	J	0.99		-0.018	0.010 U	6.8	J	0.25	J	1.6	J	2.9	J	0.13	J	1.7	J	-0.032	0.067 UJ	0.60	J	0.71		8.8	J	0.0088	0.010 U	0.064	0.10 U	0.074		0.16	0.20 U	45	J
WD062	082201MAWD062-1-2	27		0.27		0.18	J	0.92		0.14		3.8	J	0.18	J	1.4	J	2.9	J	0.65	J	1.7	J	-0.034	0.067 UJ	0.38	J	0.56		5.0	J	0.0110		0.0077	0.10 U	0.032		0.36	J	32	J
WD062	082201MAWD062-1-3	34		0.23		0.58	J	1.3		0.15		4.1	J	0.077	J	1.2	J	2.9	J	0.0090	0.010 UJ	1.7	J	-0.032	0.067 UJ	0.29	J	0.60		17	J	0.0040	0.010 U	-0.033	0.10 U	0.017	0.020U	0.099	0.20 U	31	J
WD081	082201MAWD081-2-1	51		0.24		0.27	J	0.49		0.17		2.0	J	0.13	J	1.3	J	2.5	J	-0.0080	0.010 U	1.8	J	-0.041	0.067 UJ	0.35	J	0.51		6.5	J	0.010		-0.043	0.10 U	0.030		0.27	J	27	J
WD081	082201MAWD081-2-2	30		0.19		0.40	J	0.65		0.13		2.3	J	0.30	J	2.1	J	11	J	3.0	J	2.3	J	-0.032	0.067 UJ	0.40	J	1.0		11	J	0.034		-0.021	0.10 U	0.025		0.55	J	27	J
WD081	082201MAWD081-2-3	30		0.16		0.32	J	0.81		0.093		2.8	J	0.15	J	1.3	J	2.1	J	0.084	J	2.2	J	-0.034	0.067 UJ	0.45	J	1.8		9.0	J	0.0091	0.010 U	-0.00091	0.10 U	0.030	0.020U	0.25	J	37	J
WD086	082201MAWD086-2-1	80		0.18		0.053	J	3.6		0.15		2.0	J	0.049	J	1.2	J	2.2	J	0.062	J	2.7	J	-0.015	0.067 UJ	0.18	J	0.47		2.2	J	0.0070	0.010 U	-0.019	0.10 U	0.021		0.27	J	38	J
WD086	082201MAWD086-2-2	47		0.16		0.12	J	4.0		0.14		4.0	J	0.047	J	1.3	J	2.8	J	0.014	J	1.8	J	-0.016	0.067 UJ	0.24	J	0.43		2.6	J	0.0077	0.010 U	-0.0063	0.10 U	0.020	0.020U	0.21	J	28	J
WD086	082201MAWD086-2-3	87		0.17		0.035	J	1.1		0.14		2.6	J	0.095	J	1.3	J	3.0	J	0.0010	0.010 UJ	2.6	J	-0.014	0.067 UJ	0.52	J	0.67		2.0	J	0.011		0.017	0.10 U	0.026		0.35	J	28	J

Notes:

Data validation was performed in accordance with Montgomery Watson SOP-NW-18.1 and USEPA Laboratory Data Validation Funtional Guidelines for Evaluating Inorganic Analyses.
Flag refers to the USEPA data qualifier (flag) assigned to the data resulting from the data validation procedure. More than one flag may be assigned during the data validation process.
Small mammal data are presented in wet weight (mg/kg)
Data qualifier definitions are:
(U) - The material was analyzed for, but was not detected above the level of the associated value. The associated value is 5 X the highest blank concentration, or the sample detection limit.
(J) - The associated value is an estimated quantity.
(R) - The data are unusable.
(UJ) - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N/A - Not Available.

Appendix G
Validated Terrestrial Invertebrate Data - Insects

APPENDIX G
SUMMER 2001 AREA-WIDE INVESTIGATION
VALIDATED TERRESTRIAL INVERTEBRATE DATA- INSECTS

Station ID	Sample ID	Aluminum mg/kg	Flag	Antimony mg/kg	Flag	Arsenic mg/kg	Flag	Barium mg/kg	Flag	Beryllium mg/kg	Flag	Boron mg/kg	Flag	Cadmium mg/kg	Flag	Chromium mg/kg	Flag	Copper mg/kg	Flag	Lead mg/kg	Flag	Manganese mg/kg	Flag	Mercury mg/kg	Flag	Molybdenum mg/kg	Flag	Nickel mg/kg	Flag	Selenium mg/kg	Flag	Silver mg/kg	Flag	Thallium mg/kg	Flag	Uranium mg/kg	Flag	Vanadium mg/kg	Flag	Zinc mg/kg	Flag
BB004	090401TIBB004-1/2	100		0.14		0.16		15		0.22		19		2.4		9.7		31		0.15		49	J			0.44		5.6	J	0.62		-0.16	0.010U	-0.005357	0.10U	0.0071	0.040U	0.31		120	
BB006	090401TIBB006-1/2																													1.1											
ST026	082501TIST026-1	450		0.13		0.22		23		0.23		20		1.7		4.2		16		0.29		79	J	0.029	0.031UJ	0.93		1.5	J	2.4		-0.19	0.010U	0.000643	0.10U	0.062		1.1		190	
ST026	082501TIST026-2	740		0.15		0.28		30		0.24		22		1.5		3.1		13		0.45		94	J	0.036	J	0.69		0.84	J	4.4		-0.19	0.010U	0.006701	0.10U	0.088		1.4		180	
ST026	082501TIST026-3	910		0.12		0.27		27		0.26		17		1.5		3.6		13		0.51		50	J	0.035	J	0.73		0.83	J	3		-0.21	0.010U	0.0075	0.10U	0.12		1.8		200	
ST049	090801TIST049-1/2	800		0.11		0.22		16		0.28		22		0.89		10		44		0.52		89	J			0.51		5.7	J	0.67		-0.23	0.010U	0.012	0.10U	0.058		1.5		140	
ST076	090801TIST076-1	940		0.089	0.10U	0.37		15		0.25		11		0.37		3.1		33		0.59		36	J			0.62		2.4	J	1.8		-0.21	0.010U	0.013	0.10U	0.046		2.1		170	
ST076	090801TIST076-2	190		0.076	0.10U	0.22		8.9		0.22		12		0.36		2.3		40		0.10		36	J			0.68		0.97	J	1.3		-0.21	0.010U	0.011	0.10U	0.0072	0.040U	0.46		180	
ST076	090801TIST076-3																													2.4											
ST130	082801TIST130-1	360		0.13		0.31		12		0.23		16		2.5		3.6		28		0.20		180	J	0.022	0.031UJ	0.36		1.4	J	2		-0.20	0.010U	0.000406	0.10U	0.024	0.040U	1.1		150	
ST130	082801TIST130-2	170		0.20		0.11		5.3		0.23		16		1.1		5.4		29		0.08		68	J	0.016	0.031UJ	0.68		3	J	1.6		-0.20	0.010U	-0.003189	0.10U	0.017	0.040U	0.56		160	
ST130	082801TIST130-3	310		0.087	0.10U	0.33		5.1		0.23		17		1.7		11		24		0.20		160	J			0.69		5.1	J	6		-0.16	0.010U	0.0011	0.10U	0.046		1.0		140	
ST153	083101TIST153-1																													4.1											
ST153	083101TIST153-2																													1.9											
ST153	083101TIST153-3																													3.3											
ST227	090101TIST227-1	97		0.15		0.54		8.7		0.21		19		1.4		2.4		33		0.092		68	J	0.020	0.031UJ	1.0		1	J	13		-0.18	0.010U	-0.002227	0.10U	0.016	0.040U	0.40		190	
ST227	090101TIST227-2	140		0.13		0.56		4.5		0.22		24		1.9		2.7		23		0.10		59	J	0.031	0.031UJ	1.3		1.1	J	14		-0.20	0.010U	0.000589	0.10U	0.025	0.040U	0.30		180	
ST227	090101TIST227-3	200		0.11		0.62		3.3		0.22		15		3.6		3.3		37		0.091		41	J	0.016	0.031UJ	1.8		1.3	J	11		-0.17	0.010U	-0.005672	0.10U	0.0043	0.040U	0.37		220	
ST235	090801TIST235-1	280		0.13		0.11		5.5		0.23		15		0.093		2.5		34		0.21		21	J	0.022	0.044U	0.53		1.1	J	0.6		-0.21	0.010U	-0.001845	0.10U	0.027	0.040U	0.63		120	
ST235	090801TIST235-2																													2.1											
ST235	090801TIST235-3	910		0.10		0.15		11		0.25		17		0.23		3.6		28		0.51		28	J	0.022	0.029U	0.23		1.6	J	0.6		-0.20	0.010U	0.0051	0.10U	0.074		2.0		120	
ST237	090301TIST237-1																													1.8											
ST237	090301TIST237-2																													1.8											
ST237	090301TIST237-3																													0.94											
WD053	082901TIWD053-2-1																													4.4											
WD053	082901TIWD053-2-3	1400		0.093	0.10U	0.53		9.8		0.31		22		1.5		9.1		13		0.82		47	J			0.56		5.2	J	3.8		-0.23	0.010U	0.040	0.10U	0.17		4.3		180	
WD062	082701TIWD062-1-1	51		0.14		0.68		1.8		0.21		9.1		4.8		2.7		46		0.044		35	J	0.013	0.031UJ	4.0		8.7	J	13		-0.16	0.010U	0.085	0.10U	0.024	0.040U	0.46		270	
WD062	082701TIWD062-1-2	62		0.093	0.10U	0.63		1.4		0.21		6.7		4.6		3.2		43		0.057		32	J	0.015	0.031UJ	3.6		9	J	18		-0.16	0.010U	0.056	0.10U	0.023	0.040U	0.22		270	
WD062	082701TIWD062-1-3	54		0.095	0.10U	0.87		1.7		0.22		9.4		7		4.7		44		0.074		47	J	0.014	0.031UJ	6.0		12	J	29		-0.16	0.010U	0.066	0.10U	0.024	0.040U	0.30		290	
WD081	082301TIWD081-2-1	160		0.30		0.55		3.8		0.23		30		5.6		8.2		11		0.31		52	J	0.016	0.031UJ	1.8		3	J	30		-0.19	0.010U	0.026	0.10U	0.62		3.8		200	
WD081	082301TIWD081-2-2	330		0.34		0.61		4.4		0.26		32		5.6		11		10		1.9		48	J	0.019	0.031UJ	1.1		3.8	J	29		-0.18	0.010U	0.035	0.10U	0.96		7.0		230	
WD081	082301TIWD081-2-3	82		0.19		0.83		3.4		0.22		14		7.3		4.9		14		0.13		63	J	0.020	0.031UJ	2.9		2.1	J	30		-0.18	0.010U	0.028	0.10U	0.28		2.4		240	
WD086	082401TIWD086-2-1	130		0.19		0.30		1.6		0.23		22		1.9		8.5		20		0.18		23	J	0.017	0.031UJ	1.2		2.6	J	7.9		-0.19	0.010U	0.095	0.10U	0.44		3.0		180	
WD086	082401TIWD086-2-2	170		0.19		0.41		2.8		0.23		31		1.5		14		14		0.19		18	J	0.020	0.031UJ	0.77		4.3	J	12		-0.19	0.010U	0.10		0.53		4.0		200	
WD086	082401TIWD086-2-3	140		0.16		0.35		2.0		0.24		19		4.2		9.7		22		0.23		30	J	0.011	0.031UJ	2.2		3.5	J	10		-0.18	0.010U	0.14		0.40		3.1		200	

Notes:
Data validation was performed in accordance with Montgomery Watson SOP-NW-18.1 and USEPA Laboratory Data Validation Funtional Guidelines for Evaluating Inorganic Analyses.
Flag refers to the USEPA data qualifier (flag) assigned to the data resulting from the data validation procedure. More than one flag may be assigned during the data validation process.
Terrestrial invertebrate- insect data are presented in dry weight (mg/kg)
Data qualifier definitions are:
(U) - The material was analyzed for, but was not detected above the level of the associated value. The associated value is 5 X the highest blank concentration, or the sample detection limit.
(J) - The associated value is an estimated quantity.
(R) - The data are unusable.
(UJ) - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N/A - Not Available.

Appendix H
Validated Terrestrial Invertebrate Data - Worms

APPENDIX H
SUMMER 2001 AREA-WIDE INVESTIGATION
VALIDATED TERRESTRIAL INVERTEBRATE DATA- WORMS

Station ID	Sample ID	Aluminum mg/kg	Flag	Antimony mg/kg	Flag	Arsenic mg/kg	Flag	Barium mg/kg	Flag	Beryllium mg/kg	Flag	Boron mg/kg	Flag	Cadmium mg/kg	Flag	Chromium mg/kg	Flag	Copper mg/kg	Flag	Lead mg/kg	Flag	Manganese mg/kg	Flag	Mercury mg/kg	Flag	Molybdenum mg/kg	Flag	Nickel mg/kg	Flag	Selenium mg/kg	Flag	Silver mg/kg	Flag	Thallium mg/kg	Flag	Uranium mg/kg	Flag	Vanadium mg/kg	Flag	Zinc mg/kg	Flag
ST026	082501EWST026-1	4800		0.11		0.98		66		0.43		7.7		8.0		7.0		1.3		2.8		140	J	0.21	J	-0.10	0.10U	2.1	J	30		-0.19	0.010U	0.074	0.10U	0.64		9.4		290	
ST026	082501EWST026-2	3200		0.12		1.8		42		0.35		8.9		8.7		6.0		2.6		2.0		77	J	0.16	J	-0.0026	0.10U	2.1	J	41		-0.20	0.010U	0.062	0.10U	0.42		6.5		300	
ST026	082501EWST026-3	6500		0.097	0.10U	0.98		85		0.47		6.8		12		7.1		1.5		3.6		160	J	0.34	J	-0.12	0.10U	2.2	J	42		-0.16	0.010U	0.099	0.10U	0.76		12		240	
ST049	090801EWST049-1																													30											
ST049	090801EWST049-2	13000		0.096	0.10U	0.65		160		0.71		35		5.3		7.5		1.3		11		530	J	0.13	J	0.0049	0.10U	2.4	J	12		-0.22	0.010U	0.17		1.7		24		210	
ST130	082101EWST130-1	15000		0.12		1.8		100		0.78		8.5		27		14		3.1		8.5		640	J			-0.12	0.10U	5.8	J	44		-0.23	0.010U	0.17		1.2		28		280	
ST130	082801EWST130-2																													41											
ST130	082801EWST130-3	16000		0.17		1.6		87		0.93		10		10		12		2.6		8.7		840	J			-0.16	0.10U	5.0	J	80		-0.26	0.010U	0.21		1.7		33		200	
ST153	083101EWST153-2	7300		0.12		0.40		95		0.54		9.4		6.5		10		1.0		5.5		550	J	0.063	J	-0.16	0.10U	1.9	J	4.6		-0.22	0.010U	0.14		1.9		21		170	
ST227	090101EWST227-1	8800		0.17		1.6		76		0.57		8.0		34		13		2.1		6.7		260	J	0.42	J	-0.0035	0.10U	5.0	J	120		0.11		0.22		1.6		31		330	
ST227	090101EWST227-2	6500		0.22		1.7		58		0.54		9.8		70		23		2.3		4.9		190	J	0.32	J	0.058	0.10U	5.4	J	180		0.042		0.33		2.4		47		400	
ST227	090101EWST227-3	9400		0.21		1.7		83		0.63		10		61		26		2.9		6.7		450	J	0.44	J	0.026	0.10U	6.0	J	260		0.043		0.56		3.3		62		360	
ST235	090801EWST235-1	5900		0.079	0.10U	0.44		57		0.56		31		2.5		10		0.91		4.9		66	J			-0.18	0.10U	2.7	J	3		-0.25	0.010U	0.090	0.10U	0.69		13		100	
ST237	090301EWST237-1	13000		0.094	0.10U	0.96		100		0.61		8.6		12		5.8		1.8		9.9		320	J	0.30	J	-0.14	0.10U	3.4	J	28		-0.16	0.010U	0.21		0.95		26		370	
ST237	090301EWST237-2	13000		0.28		0.81		100		0.62		8.0		8.3		5.9		1.9		8.5		320	J	0.14	J	-0.14	0.10U	3.4	J	18		-0.18	0.010U	0.20		0.69		25		280	
ST237	090301EWST237-3	14000		0.14		0.82		110		0.69		7.5		8.5		5.9		1.9		9.7		340	J	0.22	J	-0.15	0.10U	3.7	J	21		-0.20	0.010U	0.23		0.67		31		250	

Notes:
Data validation was performed in accordance with Montgomery Watson SOP-NW-18.1 and USEPA Laboratory Data Validation Funtional Guidelines for Evaluating Inorganic Analyses.
Flag refers to the USEPA data qualifier (flag) assigned to the data resulting from the data validation procedure. More than one flag may be assigned during the data validation process.
Terrestrial invertebrate - worm data are presented in dry weight (mg/kg)
Data qualifier definitions are:
(U) - The material was analyzed for, but was not detected above the level of the associated value. The associated value is 5 X the highest blank concentration, or the sample detection limit.
(J) - The associated value is an estimated quantity.
(R) - The data are unusable.
(UJ) - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N/A - Not Available.

Appendix I
Validated Surface Soil Data

APPENDIX I
SUMMER 2001 AREA-WIDE INVESTIGATION
VALIDATED SURFACE SOIL DATA

Station ID	Sample ID	Aluminum mg/kg	Flag	Antimony mg/kg	Flag	Arsenic mg/kg	Flag	Barium mg/kg	Flag	Beryllium mg/kg	Flag	Boron mg/kg	Flag	Cadmium mg/kg	Flag	Chromium mg/kg	Flag	Clay %	Flag	Copper mg/kg	Flag	Lead mg/kg	Flag	Manganese mg/kg	Flag	Mercury mg/kg	Flag	Molybdenum mg/kg	Flag
BB004	090401SSBB004-1	11000	R	0.96	J	6.4	R	120	J	0.49	J	-28	2.0 U	1	R	23	J	4.6		10	J	13	R	630	J	0.022	J	N/A	
BB004	090401SSBB004-2	11000	R	1.0	J	6.2	R	110	J	0.47	J	-26	2.0 U	0.76	R	21	J	1.6		9.6	J	10	R	520	J	0.023	J	N/A	
BB004	090401SSBB004-3	12000	R	0.66	J	6.7	R	130	J	0.5	J	-21	2.0 U	0.87	R	23	J	2.6		9.9	J	13	R	620	J	0.021	J	N/A	
BB005	083001SSBB005-1	29000	R	0.79	J	8.5	R	270	J	1.3	J	15		0.71	R	44	J	30		31	J	17	R	2600	J	0.044	J	N/A	
BB005	083001SSBB005-2	31000	R	0.96	J	9.0	R	280	J	1.5	J	0.91	2.0 U	0.71	R	40	J	28		28	J	17	R	2500	J	0.028	J	N/A	
BB005	083001SSBB005-3	30000	R	1.1	J	9.8	R	240	J	1.2	J	-15	2.0 U	0.57	R	38	J	28		32	J	22	R	2400	J	0.025	J	N/A	
BB006	090401SSBB006-1	25000	R	0.61	J	8.5	R	240	J	1	J	-3.6	2.0 U	0.69	R	35	J	25		21	J	21	R	3200	J	0.046	J	N/A	
BB006	090401SSBB006-2	26000	R	0.59	J	8.1	R	250	J	1	J	-2.7	2.0 U	0.73	R	35	J	24		18	J	24	R	3400	J	0.042	J	N/A	
BB006	090401SSBB006-3	25000	R	1.0	J	7.8	R	220	J	0.97	J	-22	2.0 U	0.69	R	33	J	23		19	J	22	R	2900	J	0.042	J	N/A	
BB007	090301SSBB007-1	35500	R	1.2	J	8.1	R	265	J	1.2	J	-22	2.0 U	12	R	125	J	26		17	J	23	R	810	J	0.043	J	N/A	
BB007	090301SSBB007-2	31000	R	0.97	J	8.7	R	270	J	1.2	J	0.56	2.0 U	13	R	98	J	28		16	J	22	R	830	J	0.046	J	N/A	
BB007	090301SSBB007-3	31000	R	1.2	J	7.0	R	270	J	1.1	J	-2.3	2.0 U	14	R	100	J	4.6		15	J	16	R	630	J	0.028	J	N/A	
ST026	082501SSST026-1	6500	R	0.50	J	3.0	R	82	J	0.41	J	-7.7	2.0 U	0.97	R	26	J	1.6		6.2	J	3.8	R	190	J	0.077		N/A	
ST026	082501SSST026-2	10000	R	0.74	J	3.2	R	110	J	0.63	J	-3.3	2.0 U	1	R	21	J	23		9.2	J	6.4	R	240	J	0.073	0.075 U	N/A	
ST026	082501SSST026-3	7100	R	0.57	J	2.9	R	99	J	0.49	J	-8.4	2.0 U	0.82	R	16	J	1.6		7.1	J	4.7	R	250	J	0.066	0.075 U	N/A	
ST049	090801SSST049-1	28000	R	0.033	0.38 U	8.0	R	290	J	1.1	J	-3.4	2.0 U	1.3	R	65	J	31		18	J	15	R	1800	J	0.039	J	N/A	
ST049	090801SSST049-2	28000	R	0.13	0.38 U	6.3	R	190	J	0.65	J	4		1.1	R	50	J	25		17	J	12	R	1500	J	0.040	J	N/A	
ST049	090801SSST049-3	36000	R	0.12	0.38 U	2.7	R	100	J	0.1	J	13		0.44	R	53	J	31		19	J	6.5	R	1000	J	0.038	J	N/A	
ST076	090801SSST076-1	29000	R	0.059	0.38 U	11	R	460	J	1.9	J	29		2.4	R	45	J	30		17	J	28	R	600	J	0.036	J	N/A	
ST076	090801SSST076-2	27000	R	-0.025	0.38 U	10	R	470	J	1.9	J	15		2.4	R	49	J	29		18	J	29	R	610	J	0.038	J	N/A	
ST076	090801SSST076-3	35000	R	-0.17	0.38 U	6.4	R	270	J	1.1	J	11		1.4	R	50	J	29		18	J	17	R	380	J	0.041	J	N/A	
ST130	082801SSST130-1	36000	R	0.84	J	9.3	R	210	J	1.8	J	18		4.1	R	86	J	34		31	J	17	R	1800	J	0.056	J	N/A	
ST130	082801SSST130-2	33000	R	0.93	J	7.9	R	230	J	1.7	J	5.7		3.1	R	63	J	29		29	J	19	R	2300	J	0.037	J	N/A	
ST130	082801SSST130-3	33000	R	0.70	J	7.6	R	190	J	1.7	J	4		2.6	R	62	J	8.9		24	J	16	R	1500	J	0.039	J	N/A	
ST153	083101SSST153-1	18000	R	0.90	J	5.9	R	110	J	0.76	J	-14	2.0 U	1.1	R	39	J	3.6		14	J	11	R	750	J	0.021	J	N/A	
ST153	083101SSST153-2	16000	R	1.3	J	6.1	R	100	J	0.67	J	-18	2.0 U	0.92	R	41	J	2.6		14	J	9.4	R	1100	J	0.015	J	N/A	
ST153	083101SSST153-3	20000	R	0.5	J	7.2	R	130	J	0.89	J	-20	2.0 U	1	R	46	J	5.1		18	J	11	R	1100	J	0.023	J	N/A	
ST227	090101SSST227-1	28000	R	1.0	J	8.5	R	190	J	1.1	J	-24	2.0 U	2.5	R	67	J	28		24	J	15	R	1100	J	0.051	J	N/A	
ST227	090101SSST227-2	27000	R	0.68	J	8.7	R	210	J	1.1	J	-24	2.0 U	2.2	R	59	J	29		24	J	15	R	1300	J	0.050	J	N/A	
ST227	090101SSST227-3	24000	R	1.5	J	11	R	160	J	1	J	-24	2.0 U	9.6	R	150	J	24		38	J	13	R	1000	J	0.13	J	N/A	
ST235	090801SSST235-03	18000	R	0.40	J	6.3	R	150	J	0.81	J	2.6		0.50	R	43	J	3.6		12	J	11	R	460	J	0.02	J	N/A	
ST235	090801SSST235-1	12000	R	0.79	J	5.6	R	100	J	0.57	J	-26	2.0 U	0.42	R	30	J	3.6		6.8	J	8.1	R	270	J	0.012	J	N/A	
ST235	090801SSST235-2	25000	R	0.53	J	7.5	R	205	J	0.99	J	-27	2.0 U	0.65	R	50.5	J	3.6		13	J	14	R	585	J	0.014	J	N/A	
ST237	090301SSST237-1	24000	R	0.64	J	7.2	R	150	J	1	J	-23	2.0 U	0.82	R	40	J	25		20	J	14	R	620	J	0.031	J	N/A	
ST237	090301SSST237-2	25000	R	0.76	J	8.8	R	160	J	1	J	-17	2.0 U	0.91	R	41	J	23		19	J	14	R	1100	J	0.036	J	N/A	
ST237	090301SSST237-3	24000	R	0.68	J	7.7	R	160	J	1	J	-20	2.0 U	0.89	R	39	J	23		19	J	14	R	880	J	0.031	J	N/A	
WD053	082901SSWD053-2-1	8600	R	0.73	J	16	R	48	J	0.92	J	12		1.8	R	40	J	15		27	J	7.5	R	290	J	0.13	J	N/A	
WD053	082901SSWD053-2-2	11000	R	0.51	J	15	R	53	J	1	J	-10	2.0 U	2.8	R	50	J	16		30	J	7.1	R	310	J	0.17	J	N/A	
WD053	082901SSWD053-2-3	8600	R	0.63	J	15	R	43	J	0.85	J	-34	2.0 U	1.5	R	39	J	15		30	J	7.1	R	270	J	0.12	J	N/A	
WD062	082701SSWD062-1-1	12500	R	3.7	J	39	R	88	J	2.6	J	5.8		24	R	595	J	26		87	J	9.3	R	160	J	0.51	J	N/A	
WD062	082701SSWD062-1-2	14000	R	1.7	J	34	R	90	J	2.4	J	12		28	R	670	J	26		89	J	9.1	R	150	J	0.51	J	N/A	
WD062	082701SSWD062-1-3	15000	R	1.7	J	41	R	91	J	2.3	J	12		21	R	670	J	25		86	J	8.8	R	140	J	0.52	J	N/A	
WD081	082301SSWD081-2-1	19000	R	3.4	J	21	R	140	J	1.7	J	-3.9	2.0 U	44	R	530	J	22.9		79	J	33	R	380	J	0.36		N/A	
WD081	082301SSWD081-2-2	14000	R	3.4	J	23	R	110	J	1.6	J	-11	2.0 U	48	R	630	J	20.1		84	J	29	R	290	J	0.38		N/A	
WD081	082301SSWD081-2-3	17000	R	3.5	J	23	R	110	J	1.4	J	4.9		41	R	640	J	12.6		87	J	17	R	410	J	0.39		N/A	
WD086	082401SSWD086-2-1	8800	R	6.5	J	34	R	99	J	1.8	J	0.96	2.0 U	28	R	740	J	23		130	J	12	R	300	J	0.54		N/A	
WD086	082401SSWD086-2-2	11000	R	4.5	J	32	R	120	J	1.8	J	21		28	R	740	J	23		120	J	10	R	480	J	0.49		N/A	
WD086	082401SSWD086-2-3	13000	R	4.1	J	31	R	110	J	1.7	J	15		35	R	750	J	14		120	J	11	R	500	J	0.47		N/A	

Notes:
Data validation was performed in accordance with Montgomery Watson SOP-NW-18.1 and USEPA Laboratory Data Validation Funtional Guidelines for Evaluating Inorganic Analyses.
Flag refers to the USEPA data qualifier (flag) assigned to the data resulting from the data validation procedure. More than one flag may be assigned during the data validation process.
Surface soil data are presented in dry weight (mg/kg)
Data qualifier definitions are:
(U) - The material was analyzed for, but was not detected above the level of the associated value. The associated value is 5 X the highest blank concentration, or the sample detection limit.
(J) - The associated value is an estimated quantity.
(R) - The data are unusable.
(UJ) - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
N/A - Not Available.

APPENDIX I
SUMMER 2001 AREA-WIDE INVESTIGATION
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Station ID	Sample ID	Nickel		Selenium		Silver		Thallium		Uranium		Vanadium		Zinc		Fluoride		pH		Electical Conductivity		Organic Carbon		>2 mm		Sand %		Silt %		Texture	
		mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag	mg/kg	Flag			µS/cm	Flag	mg/kg	Flag								
BB004	090401SSBB004-1	12	J	0.47		0.053		0.15	0.38 U	N/A		27	J	53	J	110	J	6.2		0.23		2.7		0		53		42		SL	
BB004	090401SSBB004-2	12	J	0.41		0.037	0.038 U	0.13	0.38 U	N/A		25	J	40	J	140	J	6		0.2		2.3		1.0		59		39		SL	
BB004	090401SSBB004-3	13	J	0.44		0.043		0.15	0.38 U	N/A		30	J	51	J	80	J	5.9		0.24		2.5		1.0		55		43		SL	
BB005	083001SSBB005-1	30	J	0.017		0.06		0.25	0.38 U	N/A		51	J	100	J	180	J	6.9		0.37		3.5		0		18		52		SiCL	
BB005	083001SSBB005-2	31	J	0.73		0.073		0.26	0.38 U	N/A		54	J	97	J	170	J	6.9		0.37		3		0		21		50		SiCL	
BB005	083001SSBB005-3	24	J	0.85		0.16		0.2	0.38 U	N/A		51	J	110	J	160	J	7.2		0.48		3		0		20		52		SiCL	
BB006	090401SSBB006-1	22	J	0.78		0.044		0.19	0.38 U	N/A		46	J	100	J	130	J	6.2		0.31		3.5		0		18		57		SiL	
BB006	090401SSBB006-2	21	J	0.61		0.041		0.2	0.38 U	N/A		46	J	100	J	98	J	6		0.23		3.6		1.0		15		61		SiL	
BB006	090401SSBB006-3	21	J	0.60		0.041		0.17	0.38 U	N/A		44	J	98	J	69	J	6		0.31		3.1		1.0		17		60		SiL	
BB007	090301SSBB007-1	41	J	3.3		0.13		0.79	J	N/A		80	J	660	J	500	J	6.6		0.23		4.6		0		13		62		SiL	
BB007	090301SSBB007-2	46	J	2.5		0.12		0.76	J	N/A		78	J	530	J	290	J	6.4		0.19		5		0		12		60		SiCL	
BB007	090301SSBB007-3	40	J	2.8		0.18		0.64	J	N/A		100	J	470	J	310	J	6.6		0.19		2.3		0		51		44		SL	
ST026	082501SSST026-1	16	J	1.5		0.082		0.12	0.38 U	N/A		15	J	33	J	240	J	7.7		0.87		1.5		24		67		31		SL	
ST026	082501SSST026-2	14	J	1		0.078		0.14	0.38 U	N/A		22	J	52	J	190	J	7.5		1.7		3		19		32		44		L	
ST026	082501SSST026-3	11	J	3.7		0.064		0.093	0.38 U	N/A		16	J	37	J	200	J	7.6		1.2		1.9		19		66		32		SL	
ST049	090801SSST049-1	26	J	1.1		0.079		0.30	0.38 U	N/A		57	J	100	J	140	J	6.7		0.46		4.7		34		17		52		SiCL	
ST049	090801SSST049-2	15	J	1.3		0.041		0.2	0.38 U	N/A		52	J	90	J	110	J	6.8		0.58		5.8		34		24		51		SiL	
ST049	090801SSST049-3	5.8	J	1.2		-0.014	0.038 U	0.12	0.38 U	N/A		57	J	95	J	59	J	6.6		0.31		4.9		36		16		53		SiCL	
ST076	090801SSST076-1	35	J	1.5		0.13		0.68	J	N/A		51	J	110	J	74	J	7.6		0.67		5.8		44		13		58		SiCL	
ST076	090801SSST076-2	38	J	1.5		0.11		0.71	J	N/A		50	J	110	J	150	J	7.4		0.62		6		29		14		57		SiCL	
ST076	090801SSST076-3	22	J	1.7		0.034	0.038 U	0.42	J	N/A		54	J	110	J	130	J	7.6		0.54		6.2		39		13		59		SiCL	
ST130	082801SSST130-1	48	J	1.3		0.22		0.4	J	N/A		75	J	180	J	79	J	6.8		0.65		3.5		40		20		46		CL	
ST130	082801SSST130-2	180	J	2.5		0.22		0.3	0.38 U	N/A		66	J	150	J	69	J	6.9		1.6		4		27		32		40		CL	
ST130	082801SSST130-3	47	J	1.7		0.16		0.34	0.38 U	N/A		63	J	130	J	220	J	6.7		0.81		1.6		30		49		42		L	
ST153	083101SSST153-1	19	J	0.97		0.13		0.17	0.38 U	N/A		40	J	93	J	360	J	6.9		0.59		2.1		28		51		45		SL	
ST153	083101SSST153-2	20	J	1.0		0.15		0.15	0.38 U	N/A		39	J	72	J	390	J	7.6		0.71		1.4		58		65		32		SL	
ST153	083101SSST153-3	24	J	0.92		0.099		0.26	0.38 U	N/A		48	J	100	J	300	J	7.2		0.52		2.1		29		49		46		SL	
ST227	090101SSST227-1	34	J	4.7		0.26		0.28	0.38 U	N/A		69	J	140	J	180	J	6.8		0.48		4.8		27		17		55		SiCL	
ST227	090101SSST227-2	30	J	4.4		0.24		0.31	0.38 U	N/A		66	J	150	J	280	J	7		0.82		5.6		34		14		58		SiCL	
ST227	090101SSST227-3	72	J	29		1.3		0.51	J	N/A		140	J	370	J	380	J	7		0.73		4		25		22		54		SiL	
ST235	090801SSST235-03	18	J	0.77		0.062		0.15	0.38 U	N/A		37	J	62	J	66	J	7.3		0.65		2		29		52		45		SL	
ST235	090801SSST235-1	13	J	0.36		0.050		0.097	0.38 U	N/A		27	J	39	J	130	J	7.4		0.76		0.84		29		49		47		SL	
ST235	090801SSST235-2	22	J	0.41		0.095		0.20	0.38 U	N/A		48	J	70	J	120	J	7.6		0.56		1.1		26		56		40		SL	
ST237	090301SSST237-1	24	J	1.0		0.070		0.24	0.38 U	N/A		50	J	100	J	200	J	7		0.70		5.15		28		18		58		SiL	
ST237	090301SSST237-2	25	J	2.3		0.076		0.24	0.38 U	N/A		51	J	100	J	130	J	7.2		0.60		3.5		30		20		57		SiL	
ST237	090301SSST237-3	24	J	1.3		0.061		0.28	0.38 U	N/A		49	J	98	J	210	J	7.2		0.57		4.4		21		20		56		SiL	
WD053	082901SSWD053-2-1	68	J	5.1		0.075		0.4	J	N/A		34	J	150	J	130	J	7.4		0.40		0.28		0		69		16		SL	
WD053	082901SSWD053-2-2	79	J	5.0		0.12		0.37	0.38 U	N/A		42	J	190	J	120	J	7.4		0.31		0.34		0		66		18		SL	
WD053	082901SSWD053-2-3	67	J	5.3		0.062		0.34	0.38 U	N/A		34	J	150	J	200	J	7.4		0.28		0.26		0		70		15		SL	
WD062	082701SSWD062-1-1	215	J	33		3.4		1.0	J	N/A		255	J	860	J	960	J	7.2		0.68		3.4		0		28		47		L	
WD062	082701SSWD062-1-2	220	J	28		3.1		1.2	J	N/A		290	J	860	J	850	J	7.2		0.68		3.9		0		30		45		L	
WD062	082701SSWD062-1-3	200	J	36		2.6		1.2	J	N/A		260	J	790	J	640	J	7.2		0.69		3.7		0		29		46		L	
WD081	082301SSWD081-2-1	180	J	19		4.5		1.5	J	N/A		450	J	760	J	1000	J	7.3		1.1		3		0		40		37		L	
WD081	082301SSWD081-2-2	200	J	24		3.3		1.4	J	N/A		530	J	930	J	740	J	7.4		0.68		3.5		0		44		36		L	
WD081	082301SSWD081-2-3	200	J	19		4.4		1.4	J	N/A		420	J	860	J	1000	J	7.4		0.59		2.8		0		55		32		SL	
WD086	082401SSWD086-2-1	290	J	17		4.0		1.1	J	N/A		250	J	990	J	1200	J	6.8		0.64		3.5		1.0		27		50		SiL/L	
WD086	082401SSWD086-2-2	320	J	12		3.6		1.4	J	N/A		290	J	1100	J	750	J	6.9		0.52		3.3		0		30		48		L	
WD086	082401SSWD086-2-3	290	J	17		0.87		1.6	J	N/A		330	J	920	J	990	J	6.8		0.68		3.4		0		46		40		L	

Notes:

Data validation was performed in accordance with Montgomery Watson SOP-NW-18.1 and USEPA Laboratory Data Validation Funtional Guidelines for Evaluating Inorganic Analyses.

Flag refers to the USEPA data qualifier (flag) assigned to the data resulting from the data validation procedure. More than one flag may be assigned during the data validation process.

Surface soil data are presented in dry weight (mg/kg)

Data qualifier definitions are:

(U) - The material was analyzed for, but was not detected above the level of the associated value. The associated value is 5 X the highest blank concentration, or the sample detection limit.

(J) - The associated value is an estimated quantity.

(R) - The data are unusable.

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N/A - Not Available.

Appendix J
Validated Vegetation Data

APPENDIX J
SUMMER 2001 AREA-WIDE INVESTIGATION
VALIDATED VEGETATION DATA

Station ID	Sample ID	Aluminum mg/kg	Flag	Antimony mg/kg	Flag	Arsenic mg/kg	Flag	Barium mg/kg	Flag	Beryllium mg/kg	Flag	Boron mg/kg	Flag	Cadmium mg/kg	Flag	Chromium mg/kg	Flag	Copper mg/kg	Flag	Lead mg/kg	Flag	Manganese mg/kg	Flag	Mercury mg/kg	Flag	Molybdenum mg/kg	Flag	Nickel mg/kg	Flag	Selenium mg/kg	Flag	Silver mg/kg	Flag	Thallium mg/kg	Flag	Uranium mg/kg	Flag	Vanadium mg/kg	Flag	Zinc mg/kg	Flag
BB004	090401VEBB004-1	86		0.24		0.21		66		0.0021	0.010 U	37		0.58		2.5	J	4.3	J	0.75		140	J	0.046		1.3		0.65		0.099		0.12		0.12		0.046		0.14	0.16 U	21	J
BB004	090401VEBB004-2	68		0.22		0.18		57		0.00040	0.010 U	27		0.42		1.7	J	4.2	J	0.72		180	J	0.044		1.4		0.37		0.052		0.11		0.11		0.042		0.26		19	J
BB004	090401VEBB004-3	74		0.22		0.21		63		0.0040	0.010 U	29		0.25		2.0	J	3.8	J	0.73		200	J	0.048		1.0		0.49		0.12		0.11		0.12		0.046		0.18		14	J
BB005	083001VEBB005-1	250		0.042	0.10 U	0.19		31		0.0079	0.010 U	21		0.061		0.55	J	7.8	J	0.76		74	J	0.032	J	1.2		0.61		0.11		-0.031	0.010 U	-0.0054	0.10 U	0.0058	0.040 U	0.53		20	J
BB005	083001VEBB005-2	180		0.038	0.10 U	0.16		32		0.0090	0.010 U	24		0.070		0.63	J	5.5	J	0.53		88	J	0.034	J	1.8		0.63		0.12		-0.030	0.010 U	-0.0046	0.10 U	0.0059	0.040 U	0.30		16	J
BB005	083001VEBB005-3	260		0.028	0.10 U	0.17		28		0.011		20		0.062		0.66	J	4.2	J	0.73		100	J	0.059	J	2.2		0.61		0.10		-0.027	0.010 U	-0.0037	0.10 U	0.0059	0.040 U	0.46		19	J
BB006	090401VEBB006-1	63		0.20		0.17		57		0.00040	0.010 U	23		0.098		1.7	J	4.0	J	0.62		120	J	0.036		0.75		240		0.20		0.10		0.10		0.039	0.040 U	0.13	0.16 U	25	J
BB006	090401VEBB006-2	68		0.22		0.24		82		0.0054	0.010 U	48		0.30		1.5	J	6.4	J	0.67		190	J	0.078		0.61		0.51		0.14		0.11		0.11		0.043		0.19		45	J
BB006	090401VEBB006-3	56		0.21		0.16		46		0.00020	0.010 U	24		0.11		1.3	J	3.8	J	0.48		140	J	0.049		0.69		0.24		0.21		0.10		0.11		0.039	0.040 U	-0.0025	0.16 U	23	J
BB007	090301VEBB007-1	100		0.23		0.22		48		0.0039	0.010 U	37		0.30		1.9	J	3.9	J	1.05		52	J	0.21	J	0.97		0.31		0.32		0.13		0.13		0.046		0.15		32	J
BB007	090301VEBB007-2	70		0.26		0.32		81		0.010		32		0.87		1.4	J	7.4	J	0.88		100	J	0.039	J	1.9		0.50		0.42		0.14		0.14		0.046		0.059	0.16 U	46	J
BB007	090301VEBB007-3	140		0.24		2.1		91		0.0040	0.010 U	30		3.7		1.4	J	7.9	J	1.3		400	J	0.034	J	1.1		0.70		0.38		0.27		0.13		0.046		0.15	0.16 U	82	J
ST026	082501VEST026-1	290		0.030	0.10 U	0.21		53		0.0067	0.010 U	19		0.25		1.0	J	3.9	J	0.39		51	J	0.0080	0.075 UR	0.56		0.72		0.35		-0.030	0.010 U	-0.00051	0.10 U	0.033	0.040 U	0.97		31	J
ST026	082501VEST026-2	260		0.15		0.23		73		0.016		29		0.17		1.2	J	3.9	J	0.50		100	J	0.0070	0.075 UR	0.61		0.78		0.89		-0.027	0.010 U	0.0020	0.10 U	0.028	0.040 U	1.0		28	J
ST026	082501VEST026-3	120		0.097	0.10 U	0.19		34		0.017		64		0.11		1.5	J	5.4	J	0.60		37	J	0.010	0.075 UR	0.71		0.82		0.99		-0.028	0.010 U	-0.0021	0.10 U	0.022	0.040 U	0.98		22	J
ST049	090801VEST049-1	210		0.22		0.24		78		0.0057	0.010 U	13		0.14		1.5	J	3.8	J	0.67		610	J	0.027	0.033 UJ	0.85		0.28		0.20		0.11		0.11		0.052		0.19		24	J
ST049	090801VEST049-2	480		0.24		0.32		64		0.044		23		1.8		9.9	J	3.0	J	1.0		260	J	0.037	J	0.71		1.9		0.23		0.093		0.14		0.84		5.5		66	J
ST049	090801VEST049-3	270		0.21		0.21		44		0.0043	0.010 U	12		0.24		1.9	J	4.3	J	0.72		120	J	0.032	0.033 UJ	0.95		0.45		0.16		0.10		0.11		0.061		0.41		29	J
ST076	090801VEST076-1	220		0.21		0.24		68		0.010	0.010 U	15		0.17		1.7	J	4.6	J	0.81		200	J	0.043	0.067 UJ	1.2		0.35		0.51		0.10		0.11		0.052		0.16		27	J
ST076	090801VEST076-2	270		0.22		0.22		62		0.016		9.8		0.23		1.6	J	4.4	J	0.70		84	J	0.023	0.033 UJ	0.53		0.58		0.73		0.17		0.13		0.060		0.68		27	J
ST076	090801VEST076-3	190		0.20		0.20		51		0.0063	0.010 U	11		0.23		1.7	J	4.8	J	0.72		93	J	0.028	0.033 UJ	0.91		0.70		0.62		0.12		0.11		0.048		0.39		33	J
ST130	082801VEST130-1	280		0.045	0.10 U	0.20		32		0.020		46		0.28		1.1	J	5.8	J	0.35		26	J	0.025	J	0.72		1.1		1.1		-0.027	0.010 U	-0.00072	0.10 U	0.021	0.040 U	1.0		31	J
ST130	082801VEST130-2	270		0.021	0.10 U	0.23		31		0.014		35		0.18		0.95	J	4.3	J	0.33		440	J	0.030	J	0.35		0.97		0.88		-0.029	0.010 U	0.0075	0.10 U	0.021	0.040 U	0.98		25	J
ST130	082801VEST130-3	170		0.17		0.17		20		0.016		35		0.37		0.83	J	7.4	J	0.58		200	J	0.020	J	0.45		0.91		1.1		-0.023	0.010 U	0.0072	0.10 U	0.024	0.040 U	0.70		33	J
ST153	083101VEST153-1	310		0.031	0.10 U	0.22		33		0.0037	0.010 U	30		0.34		0.67	J	3.1	J	0.90		36	J	0.037	J	1.3		0.59		0.55		-0.030	0.010 U	0.0071	0.10 U	0.019	0.040 U	0.92		28	J
ST153	083101VEST153-2	160		0.020	0.10 U	0.17		58		0.0084	0.010 U	28		0.13		0.93	J	4.7	J	0.61		160	J	0.026	J	0.74		1.0		0.27		-0.030	0.010 U	-0.0054	0.10 U	0.014	0.040 U	0.55		19	J
ST153	083101VEST153-3	410		0.024	0.10 U	0.33		47		0.024		43		0.36		1.6	J	9.9	J	0.52		200	J	0.033	J	1.1		1.5		0.75		-0.032	0.010 U	0.0010	0.10 U	0.060		1.4		40	J
ST227	083101VEST227-1	77		0.27		0.30		37		0.00062	0.010 U	68		0.18		1.7	J	3.5	J	0.50		230	J	0.018	J	1.1		0.38		3.9		0.13		0.12		0.047		0.19		21	J
ST227	090101VEST227-2	96		0.22		0.56		45		0.0043	0.010 U	50		0.25		1.4	J	4.0	J	0.58		200	J	0.018	J	1.1		0.49		12		0.15		0.11		0.042		0.21		23	J
ST227	090101VEST227-3	120		0.22		0.86		46		0.0057	0.010 U	60		0.38		2.8	J	3.4	J	0.43		530	J	0.022	J	0.89		1.4		19		0.12		0.12		0.080		1.6		29	J
ST235	090801VEST235-1	400		0.20		0.23		23		0.011		13		0.089		1.8	J	4.0	J	0.78		61	J	0.041		0.79		0.51		0.16		0.089		0.10		0.059		0.82		23	J
ST235	090801VEST235-2	360		0.20		0.25		28		0.014		16		0.077		2.0	J	4.0	J	0.68		120	J	0.038		0.77		0.48		0.27		0.094		0.11		0.058		0.71		21	J
ST235	090801VEST235-3	430		0.26		0.28		33		0.017		12		0.10		2.1	J	5.0	J	0.94		68	J	0.036		1.1		0.48		0.097		0.11		0.12		0.068		0.76		24	J
ST237	090301VEST237-1	120		0.21		0.20		38		0.0021	0.010 U	50		0.27		1.6	J	4.3	J	0.50		100	J	0.024	J	0.71		0.44		0.23		0.10		0.11		0.052		0.41		29	J
ST237	090301VEST237-2	170		0.22		0.23		37		0.0077	0.010 U	48		0.21		1.6	J	4.1	J	0.65		170	J	0.037	J	0.70		0.44		0.19		0.11		0.11		0.050		0.48		21	J
ST237	090301VEST237-3	120		0.23		0.23		29		0.0062	0.010 U	38		0.35		1.6	J	4.6	J	0.60		120	J	0.041	J	0.71		0.55		0.32		0.16		0.12		0.053		0.66		37	J
WD053	082901VEWD053-2-1	89		0.092	0.10 U	0.23		20		0.0080	0.010 U	31		0.37		0.83	J	5.4	J	0.56		90	J	0.029	J	2.8		1.7		1.7		-0.027	0.010 U	0.14		0.012	0.040 U	0.30		32	J
WD053	082901VEWD053-2-2	210		0.076	0.10 U	0.28		19		0.019		41		1.4		1.6	J	5.6	J	0.51		79	J	0.038	J	3.9		2.7		1.3		-0.027	0.010 U	0.11		0.042		1.1		31	J
WD053	082901VEWD053-2-3	190		0.065	0.10 U	0.32		28		0.024		51		1.7		1.7	J	5.5	J	0.37		110	J	0.033	J	3.6		3.7		2.5		-0.032	0.010 U	0.043	0.10 U	0.038	0.040 U	0.88		32	J
WD062	082701VEWD062-1-1	36		0.063	0.10 U	0.16		18		0.0050	0.010 U	20		1.6		0.69	J	4.0	J	0.47		42	J	0.020	J	5.0		3.5		1.7		-0.022	0.010 U	0.20		0.021	0.040 U	0.73		91	J
WD062	082701VEWD062-1-2	41		0.054	0.10 U	0.19		15		0.0046	0.010 U	22		1.2		0.74	J	4.6	J	0.44		54	J	0.043	J	7.3		4.0		2.4		-0.018	0.010 U	0.15		0.022	0.040 U	0.34		120	J
WD062	082701VEWD062-1-3	30		0.043	0.10 U	0.55		19		0.0058	0.010 U	30		1.5		0.65	J	4.0	J	0.43		25	J	0.019	J	6.0		4.8		19		-0.020	0.010 U	0.18		0.029	0.040 U	0.70		74	J
WD081	082301VEWD081-2-1	51		0.058	0.10 U	0.98		16		0.013		38	J	1.3		1.2	J	7.1	J	0.48		62	J	0.032	0.075 UR	5.2		2.8		39		-0.017	0.010 U	0.040	0.10 U	0.058		0.80		82	J
WD081	082301VEWD081-2-2	37		0.26	0.10 U	0.33		14		0.010	0.010 U	25		1.4		0.94	J	4.9	J	0.44		72	J	0.0067	0.075 UR	3.4		1.9		9.1		-0.020	0.010 U	0.060	0.10 U	0.047	0.040 U	0.78		71	J
WD081	082301VEWD081-2-3	44		0.081	0.10 U	0.73		20		0.0094	0.010 U	22		1.1		0.91	J	4.1	J	0.31		59	J	0.060	0.075 UR	3.9		2.1		26		-0.014	0.010 U	0.084	0.10 U	0.037	0.040 U	0.74		37	J
WD086	082401VEWD086-2-1	37		0.045	0.10 U	0.57		17		0.0029	0.010 U	19		0.94		0.74	J	3.7	J	0.26		47	J	0.0080	0.075 UR	3.2		1.8		4.4		-0.024	0.010 U	0.068	0.10 U	0.025	0.040 U	0.76		36	J
WD086	082401VEWD086-2-2	83		0.12		0.46		6.9		0.014		28		1.5		5.7	J	6.8	J	1.7		50	J	-0.0020	0.075 UR	2.7		4.5		7.5		-0.013	0.010 U	0.36		0.15		2.2		56	J
WD086	082401VEWD086-2-3	58		0.068	0.10 U	0.32		5.4		0.012		29		1.8		3.7	J	5.9	J	0.53		30	J	0.020	0.075 UR	2.7		4.0		4.7		-0.018	0.010 U	0.42		0.093		2.1		41	J

Notes:
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